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Encoding guidelines for portable multimedia CE products using MP4 file format with AVC video codec and AAC audio codec

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

This Technical Specification cancels and replaces the first edition published in 2009. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) added 23,976 fps to all classes;

b) added new class (class network SD);

c) added some metadata for CE content;

d) inserted some editorial improvements and clarifications.

IEC/TS 62592, which is a Technical Specification, has been prepared by technical area 6: Storage media, data structures, equipment and systems, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this Technical Specification is based on the following documents:

Enquiry draft	Report on voting
100/1926/DTS	100/1970/RVC

Full information on the voting for the approval of this Technical Specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

0 Introduction

0.1 MP4 file format

ISO base media file format, ISO/IEC 14496-12, has been developed by ISO/IEC JTC 1/SC 29/WG 11 and WG1 as a common base media file format of audio, video and image applications. It provides a file format to contain timed media information for a presentation in a flexible, extensible format. The extensions to support specific codecs and systems are specified as the series of standard ISO/IEC 14496. The MP4 file format (MPEG-4 file format), ISO/IEC 14496-14, is an extension to support MPEG-4 systems in ISO base media file format. The extension to support Advanced Video Coding (AVC), ISO/IEC 14496-10 and ITU-T H.264[1], is standardized as AVC file format, ISO/IEC 14496-15. In this Technical Specification, the family of ISO base media file format is referred to as MP4 file format, which is the name widely used in the industry. The MP4 file format is designed very flexibly so that the series of the standard can be applied to various kinds of applications and can bring the maximum performances for the applications.

MP4 file format is adopted by various Consumer Electronics (CE) devices, e.g. broadcasting receivers, disc recorders / players, AV content distribution, portable AV recorders / players, and so on. In the CE audio, video and multimedia applications, MP4 file format with Advanced Video Coding (AVC), (ISO/IEC 14496-10 and ITU-T H.264) and Advanced Audio Coding (AAC), (ISO/IEC 13818-3 and ISO/IEC 14496-3), is employed most popularly.

AVC (ISO/IEC 14496-10 and ITU-T H.264) specifies profiles and levels to ensure interoperability of decoding procedure of a video elementary stream, which fits various levels of application. AVC, ISO/IEC 14496-10 and ITU-T H.264, specifies the bitstream syntax and its decoding process.

0.2 Issues to be considered in implementation on portable CE devices

To implement applications using MP4 file format into CE products, the characteristics of CE industry must be considered. The characteristics of CE industry and products are different from IT equipment especially personal computers (PCs) which have strong computational power and flexible software solution. That is:

- CE devices are designed with limited resources, processing power and memory size;
- most CE devices can not update software or hardware afterwards; and
- manufacturers have to assure the capability and the quality of the product for consumers, who are not familiar with processes inside the device;
- CE devices need to support functionalities, e.g. fast forward / backward play which are widely supported by existing CE devices. Manufacturers have to ensure such functionalities regardless of creators of the content (bitstreams).

Given these criteria, manufacturers need to check all the performance of the products because any defect in the products may generate serious complaints among consumers. Since the MP 4 file format is so flexible, the number of combination of setting parameters is very large and it takes tremendous workload and cost to check the performance for each combination of parameters. Even AVC (ISO/IEC 14496-10 and ITU-T H.264) specifies the decoding procedure and conformance point by a profile and a level. Furthermore, the constraints on bitstreams must be specified in order to ensure functionalities, which are widely supported by CE devices. Therefore, in most CE systems, the combination of encoding parameters is limited and the dedicated encoding rules are specified for the system, which enable designing and manufacturing process practical to guarantee the quality of the product. In general, these encoding rules are proprietary to the involved parties.

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1 ITU-T H.264 is equivalent to ISO/IEC 14496-10.

0.3 Encoding rules for open system and application

Currently, the content of audio, video and multimedia products are provided by commercial content providers through specific sales channels such as optical discs, CDs, DVDs and Blu-ray Discs. Additional content is provided by broadcasters and commercial content providers. However, more recently end-user generated content is increasing and placed on many Internet sites enabled by the availability of digital video cameras and Internet related technology. In this situation, portable CE devices are required to store and reproduce such content for consumer satisfaction. Accordingly, portable CE devices need to guarantee the capability to decode MP4 files with AVC (ISO/IEC 14496-10 and ITU-T H.264) and AAC (ISO/IEC 13818-3 and ISO/IEC 14496-3) which are most commonly used as the file format and codecs.

- To assure decoding of such MP4 files, CE device manufacturers have to check the performance for the files encoded by unknown parameters. However, it is impossible to achieve this with limited manpower and technical resources as mentioned above. This situation may cause a problem in decoding quality and is not beneficial for both end-users and manufacturers. CE device manufacturers also have to ensure functionalities, e.g. fast forward / backward play, regardless of the creators of the content (bitstreams).

To solve this issue, this Technical Specification specifies the encoding rules for the MP4 files targeted to be stored and reproduced by portable CE devices so that the decoding of the content encoded by these guidelines is guaranteed by the portable CE product manufacturer with reasonable cost and resources.

The encoding rules are specified considering the capability of current portable CE products. However, the rules should be revised depending on the progress of CE technologies in an appropriate time frame.

ENCODING GUIDELINES FOR PORTABLE MULTIMEDIA CE PRODUCTS USING MP4 FILE FORMAT WITH AVC VIDEO CODEC AND AAC AUDIO CODEC

1 Scope

This Technical Specification specifies encoding guidelines for portable multimedia CE products using ISO base media file format and its family (ISO/IEC 14496-12, ISO/IEC 14496-14, and ISO/IEC 14496-15) with AVC[2] (ISO/IEC 14496-10 and ITU-T H.264) and AAC[2] (ISO/IEC 13818-3 and ISO/IEC 14496-3). These guidelines may also be applicable to portable non-CE products.

This Technical Specification is applicable to the creation of MP4 files with AVC and AAC which are intended for storage, reproduction and display by portable CE products. It is applicable to both content generation software and hardware.

These guidelines are intended to encourage global interoperability between portable CE products by recommending the use of specific parameters to allow efficient interworking of devices which may have limited resources so that the decoding of content encoded in accordance with these guidelines is assured. In addition, the guidelines provide for simplified testing and verification of the interoperability of portable CE products.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 639-2:1998, *Codes for the representation of names of languages – Part 2: Alpha-3 code*

ISO/IEC 10646:2012, *Information technology – Universal Coded Character Set (UCS)*

ISO/IEC 10918-1, *Information technology – Digital compression and coding of continuous-tone still images – Part 1: Requirements and guidelines*

ISO/IEC 13818-3, *Information technology – Generic coding of moving pictures and associated audio information – Part 3: Audio*

ISO/IEC 14496-1:2010, *Information technology – Coding of audio-visual objects – Part 1: Systems*

ISO/IEC 14496-2:2004, *Information technology – Coding of audio-visual objects – Part 2: Visual*

ISO/IEC 14496-3:2009, *Information technology – Coding of audio-visual objects – Part 3: Audio*

ISO/IEC 14496-10:2012, *Information technology – Coding of audio-visual objects – Part 10: Advanced Video Coding*

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2 The full wording for AAC and AVC can be found in 3.2.

ISO/IEC 14496-12:2008, *Information technology – Coding of audio-visual objects – Part 12: ISO base media file format*

ISO/IEC 14496-14:2003, *Information technology – Coding of audio-visual objects – Part 14: MP4 file format*

ISO/IEC 14496-15:2010, *Information technology – Coding of audio-visual objects – Part 15: Advanced Video Coding (AVC) file format*

ISO/IEC 15444-12, *Information technology – JPEG 2000 image coding system – Part 12: ISO base media file format*