

IEEE Standard for Adaptive Streaming

IEEE Computer Society

Sponsored by the
IEEE Standards Activities Board

IEEE Standard for Adaptive Streaming

Sponsor

IEEE Standards Activities Board
of the
IEEE Computer Society

Approved 5 December 2018

IEEE-SA Standards Board

Abstract: The media presentation description (MPD) format and media segment format for dynamic and adaptive streaming over networks such as Hypertext Transfer Protocol (HTTP) are specified in this standard. Particularly, the specified formats support multi-stream synchronization, content protection, and content authentication. The target applications and services include, but are not limited to, Internet media streaming, Internet Protocol television (IPTV), and video on demand.

Keywords: adaptive streaming, content security, IEEE 1857.7™, media presentation, MPD, media presentation description, multi-stream, ownership, segment

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2019 by The Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 15 March 2019. Printed in the United States of America.

IEEE is a registered trademark in the U.S. Patent & Trademark Office, owned by The Institute of Electrical and Electronics Engineers, Incorporated.

PDF: ISBN 978-1-5044-5419-3 STD23477
Print: ISBN 978-1-5044-5420-9 STDPD23477

IEEE prohibits discrimination, harassment, and bullying.

For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

Important Notices and Disclaimers Concerning IEEE Standards Documents

IEEE documents are made available for use subject to important notices and legal disclaimers. These notices and disclaimers, or a reference to this page, appear in all standards and may be found under the heading “Important Notices and Disclaimers Concerning IEEE Standards Documents.” They can also be obtained on request from IEEE or viewed at <http://standards.ieee.org/ipr/disclaimers.html>.

Notice and Disclaimer of Liability Concerning the Use of IEEE Standards Documents

IEEE Standards documents (standards, recommended practices, and guides), both full-use and trial-use, are developed within IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (“IEEE-SA”) Standards Board. IEEE (“the Institute”) develops its standards through a consensus development process, approved by the American National Standards Institute (“ANSI”), which brings together volunteers representing varied viewpoints and interests to achieve the final product. IEEE Standards are documents developed through scientific, academic, and industry-based technical working groups. Volunteers in IEEE working groups are not necessarily members of the Institute and participate without compensation from IEEE. While IEEE administers the process and establishes rules to promote fairness in the consensus development process, IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

IEEE Standards do not guarantee or ensure safety, security, health, or environmental protection, or ensure against interference with or from other devices or networks. Implementers and users of IEEE Standards documents are responsible for determining and complying with all appropriate safety, security, environmental, health, and interference protection practices and all applicable laws and regulations.

IEEE does not warrant or represent the accuracy or content of the material contained in its standards, and expressly disclaims all warranties (express, implied and statutory) not included in this or any other document relating to the standard, including, but not limited to, the warranties of: merchantability; fitness for a particular purpose; non-infringement; and quality, accuracy, effectiveness, currency, or completeness of material. In addition, IEEE disclaims any and all conditions relating to: results; and workmanlike effort. IEEE standards documents are supplied “AS IS” and “WITH ALL FAULTS.”

Use of an IEEE standard is wholly voluntary. The existence of an IEEE standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard.

In publishing and making its standards available, IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity nor is IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing any IEEE Standards document, should rely upon his or her own independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

IN NO EVENT SHALL IEEE BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO: PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE PUBLICATION, USE OF, OR RELIANCE UPON ANY STANDARD, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE AND REGARDLESS OF WHETHER SUCH DAMAGE WAS FORESEEABLE.

Translations

The IEEE consensus development process involves the review of documents in English only. In the event that an IEEE standard is translated, only the English version published by IEEE should be considered the approved IEEE standard.

Official statements

A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered or inferred to be the official position of IEEE or any of its committees and shall not be considered to be, or be relied upon as, a formal position of IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position of IEEE.

Comments on standards

Comments for revision of IEEE Standards documents are welcome from any interested party, regardless of membership affiliation with IEEE. However, IEEE does not provide consulting information or advice pertaining to IEEE Standards documents. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Since IEEE standards represent a consensus of concerned interests, it is important that any responses to comments and questions also receive the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to comments or questions except in those cases where the matter has previously been addressed. For the same reason, IEEE does not respond to interpretation requests. Any person who would like to participate in revisions to an IEEE standard is welcome to join the relevant IEEE working group.

Comments on standards should be submitted to the following address:

Secretary, IEEE-SA Standards Board
445 Hoes Lane
Piscataway, NJ 08854 USA

Laws and regulations

Users of IEEE Standards documents should consult all applicable laws and regulations. Compliance with the provisions of any IEEE Standards document does not imply compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

IEEE draft and approved standards are copyrighted by IEEE under U.S. and international copyright laws. They are made available by IEEE and are adopted for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of engineering practices and methods. By making these documents available for use and adoption by public authorities and private users, IEEE does not waive any rights in copyright to the documents.

Photocopies

Subject to payment of the appropriate fee, IEEE will grant users a limited, non-exclusive license to photocopy portions of any individual standard for company or organizational internal use or individual, non-commercial use only. To arrange for payment of licensing fees, please contact Copyright Clearance Center, Customer Service, 222 Rosewood Drive, Danvers, MA 01923 USA; +1 978 750 8400. Permission to photocopy portions of any individual standard for educational classroom use can also be obtained through the Copyright Clearance Center.

Updating of IEEE Standards documents

Users of IEEE Standards documents should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect.

Every IEEE standard is subjected to review at least every ten years. When a document is more than ten years old and has not undergone a revision process, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE standard.

In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit the IEEE Xplore at <http://ieeexplore.ieee.org/> or contact IEEE at the address listed previously. For more information about the IEEE-SA or IEEE's standards development process, visit the IEEE-SA Website at <http://standards.ieee.org>.

Errata

Errata, if any, for all IEEE standards can be accessed on the IEEE-SA Website at the following URL: <http://standards.ieee.org/findstds/errata/index.html>. Users are encouraged to check this URL for errata periodically.

Patents

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken by the IEEE with respect to the existence or validity of any patent rights in connection therewith. If a patent holder or patent applicant has filed a statement of assurance via an Accepted Letter of Assurance, then the statement is listed on the IEEE-SA Website at <http://standards.ieee.org/about/sasb/patcom/patents.html>. Letters of Assurance may indicate whether the Submitter is willing or unwilling to grant licenses under patent rights without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination to applicants desiring to obtain such licenses.

Essential Patent Claims may exist for which a Letter of Assurance has not been received. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims, or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

Participants

At the time this standard was completed, the Audio Video Coding Working Group had the following membership:

Wen Gao, *Chair*
Cliff Reader, *Vice Chair*
Luntian Mou, *Editor*

Xilin Chen
Zongming Guo
Cheng Huang
Tiejun Huang

Li Liu
Yongliang Liu
Xin Wang

Yiling Xu
Xinggong Zhang
Haiwu Zhao
Chao Zhou

The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

Ping An
Demetrio Bucaneg
Keith Chow
Weiming Dong
Wen Gao
Randall Groves
Chenchen Gu
Yun He
Werner Hoelzl
Qingming Huang
Tiejun Huang
Noriyuki Ikeuchi
Meng Jian
Ming Jiang
Guorong Li
Haojie Li

Houqiang Li
Fan Liang
Dong Liu
Qian Liu
Xiaohui Liu
Siwei Ma
Luntian Mou
Xingde Pan
Honggang Qi
Cliff Reader
Guangming Shi
Li Song
Walter Struppler
Li Su
Jiande Sun

Yonghong Tian
Ronggang Wang
Xiaochen Wang
Yaowei Wang
Bo Wu
Lifang Wu
Qianqian Xu
Xinchen Ye
Oren Yuen
Chenxiong Zhang
Jian Zhang
Nan Zhang
Weigang Zhang
Yifan Zhang
Haiwu Zhao
Jianhua Zheng

When the IEEE-SA Standards Board approved this standard on 5 December 2018, it had the following membership:

Jean-Philippe Faure, *Chair*
Gary Hoffman, *Vice Chair*
John D. Kulick, *Past Chair*
Konstantinos Karachalios, *Secretary*

Ted Burse
Guido R. Hiertz
Christel Hunter
Joseph L. Koepfinger*
Thomas Koshy
Hung Ling
Dong Liu

Xiaohui Liu
Kevin Lu
Daleep Mohla
Andrew Myles
Paul Nikolich
Ronald C. Petersen
Annette D. Reilly

Robby Robson
Dorothy Stanley
Mehmet Ulema
Phil Wennblom
Philip Winston
Howard Wolfman
Jingyi Zhou

*Member Emeritus

Introduction

This introduction is not part of IEEE Std 1857.7-2018, IEEE Standard for Adaptive Streaming.

This standard specifies the media presentation description (MPD) format and media segment format for dynamic and adaptive streaming over networks such as Hypertext Transfer Protocol (HTTP).

Contents

1. Overview	9
1.1 Scope	9
1.2 Purpose	9
2. Normative references.....	9
3. Definitions	10
4. Abbreviations and acronyms	11
5. Conventions.....	12
6. Architecture	12
7. Media presentation description (MPD)	14
7.1 Overview	14
7.2 XML structure	14
7.3 Hierarchical data model.....	14
7.4 Program information.....	41
7.5 Descriptors.....	42
7.6 Events	43
8. Segment.....	50
8.1 Introduction	50
8.2 Segment types.....	50
8.3 Segment formats for ISO base media file format (ISOBMFF).....	51
8.4 Segment formats for MPEG-2 TS	52
9. Content security.....	53
9.1 Introduction	53
9.2 MPD security.....	54
9.3 Media content segment encryption	55
9.4 Media content authentication.....	58
9.5 URL authorization	60
Annex A (normative) MPD Schema	61
Annex B (informative) Examples for XML encryption of MPD confidential elements and attributes	68
Annex C (informative) Examples for XML signature of MPD elements.....	70
Annex D (informative) Bibliography	72

IEEE Standard for Adaptive Streaming

1. Overview

1.1 Scope

This standard specifies the media presentation description (MPD) format and media segment format for dynamic and adaptive streaming over networks such as Hypertext Transfer Protocol (HTTP). Particularly, the specified formats support multi-stream synchronization, content protection, and content authentication.

1.2 Purpose

This standard specifies the MPD format and media segment format for dynamic and adaptive streaming over networks such as HTTP, with highlighted features of multi-stream synchronization, content protection, and content authentication. The target applications and services include, but are not limited to, Internet video, on-demand streaming, and live streaming.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

GB/T 20090.1, Information technology—Advanced coding of audio and video—Part 1: System.¹

GB/T 20090.9, Information technology—Advanced coding of audio and video—Part 9: File format.

IETF RFC 1738, Uniform Resource Locators (URL).²

IETF RFC 2616, Hypertext Transfer Protocol – HTTP/1.1.

IETF RFC 3986, Uniform Resource Identifier (URI): Generic Syntax.

¹ GB/T documents are available from the Standardization Administration of China (<https://www.chinesestandard.net>) and from the American National Standards Institute (<http://www.ansi.org/>).

² IETF RFCs are available from the Internet Engineering Task Force (<https://www.ietf.org/rfc.html>).