

SMPTE STANDARD

for Television — Declarative Data Essence — Unidirectional Hypertext Transport Protocol



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Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in Part XIII of its Administrative Practices.

SMPTE Standard 364M was prepared by Technology Committee D27.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Standard. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

Introduction

The unidirectional hypertext transfer protocol, or UHTTP, is a simple, robust data transfer protocol that is designed to deliver efficiently resource data in a one-way broadcast-only environment. This transfer protocol is appropriate for delivery of HTML and other content resources using IP multicast over television vertical blanking interval (IP/VBI), in IP multicast carried in MPEG-2, or in other unidirectional transport systems. The UHTTP protocol is used to deliver television-related content resources (such as web pages, images, and scripts) which are broadcast along with a television signal.

Resources sent using the UHTTP protocol are divided into a set of data segments encapsulated in UDP packets. Typically, these packets are delivered via multicast IP, but this is not required. When delivered via IP multicast, the address and port used must be exclusively for UHTTP. That is, other UDP-based protocol data would be indistinguishable from UHTTP data, and if combined, may result in unpredictable receiver behavior. Each packet contains enough header information to begin capturing the data at any time during the broadcast, even midway through the transfer. This header contains a unique identifier (in the form of a UUID [Annex A]) that uniquely identifies the transfer, and additional information that enables the receiver to place the data following the header in the appropriate location within the transfer. Additional header information indicates to the receiver how long to continue listening for additional data.

UHTTP includes the ability to gather segments over multiple retransmissions to correct for missing packets. It is also possible to group resources together for all-or-none delivery within a UHTTP transfer. The protocol also includes a simple forward error correcting mechanism which provides for the ability to restore missing data in the event of limited packet loss.

1 Scope

This standard describes the unidirectional hypertext transfer protocol, or UHTTP. UHTTP is a one-way data transfer protocol that is designed to deliver resource data in a one-way broadcast-only environment. This transfer protocol is appropriate for delivery of HTML and other content resources using IP multicast over television vertical blanking interval (IP/VBI) and other unidirectional transport systems.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword "reserved" indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword "forbidden" indicates "reserved" and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

3 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

IETF RFC 2616, Hypertext Transfer Protocol — HTTP/1.1

IETF RFC 2387, The MIME Multipart/Related Content-Type

ISO/IEC 11578:1996, Information Technology — Open Systems Interconnection — Remote Procedure Call (RPC), Annex A, Universal Unique Identifier

4 Data Transfer Features Enabled by the UHTTP Protocol

4.1 Robust Delivery: Gathering Data over Multiple Transmissions

Data can be resent via UHTTP using the same globally unique TransferID. The data are delivered as individual segments, each of which is encapsulated within a UDP message, potentially delivered via IP multicast. Information in the header allows a receiving application to receive segments out of order or multiple

times. If the transfer data are sent repeatedly, the receiving service can fill in missing ranges using these retransmissions. This provides robust (though not necessarily reliable) data delivery. Additionally, forward error correction (FEC), using an exclusive-or-based algorithm provides for recovery of some missing segments in the face of segment loss without retransmission.

4.2 Metainformation in the Form of HTTP-Style Headers

The protocol provides for the inclusion of HTTP-style headers preceding the resource data. These headers may include information describing the content type of the resource and content location in the form of a URL (universal resource locator). It may also be used to describe groups of resources as a multipart construction. Other metainformation, including date stamping and expiration dates, may be used to provide additional information about the resource content.

4.3 UHTTP Protocol Versions

Two versions of the UHTTP protocol are defined in this standard. Version 0, the original version, limits the size of the delivered resources to approximately 4 gigabytes each. Version 1 supports delivery of resources as large as approximately 256 terabytes.

The only differences between the two versions are the value in the "version" field of the UHTTP header, the sizes of the "retransmit expiration," "resource size" and "segment start byte offset" fields of the UHTTP header, and the sizes of the "HTTP header start" and "HTTP body size" fields in the HTTPHeaderMap."

5 UHTTP Header Format

5.1 Basic UHTTP Header Format

This clause describes the format of the message packets that carry UHTTP data. It describes the information needed to create the messages using the protocol on the broadcast side and to turn those messages back into resources on the receiving side.

The UHTTP header is at the start of every UHTTP IP/UDP datagram. All values are network byte order.

For version 0 of the protocol, the UHTTP header has the format given in Figure 1. For version 1 of the protocol, the UHTTP header has the format given in Figure 2.

The fields are described in Table 1.

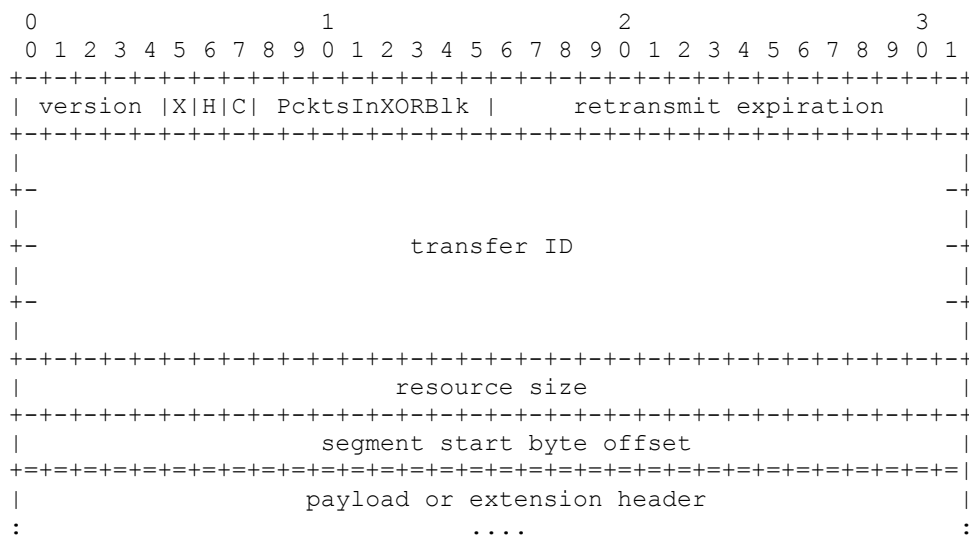


Figure 1 – UHTTP header for version 0 of the protocol

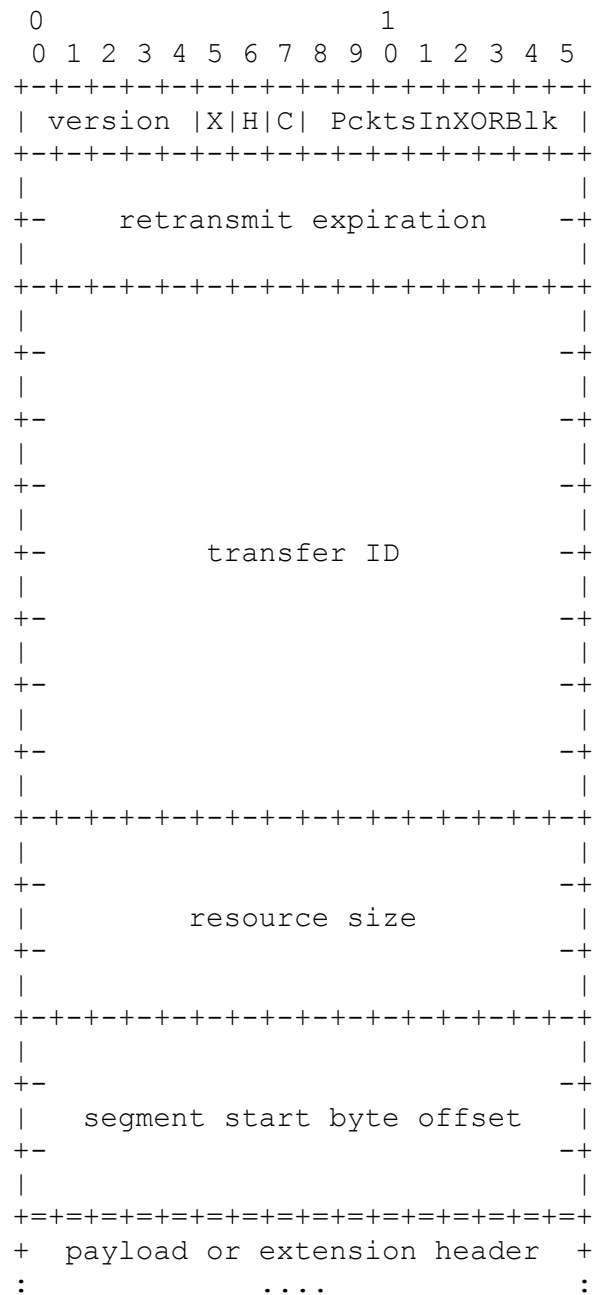


Figure 2 – UHTTP header for version 1 of the protocol