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| **Status** | **Contribution** |
| **Title** | **Video and File Format unspecified nal\_unit\_type** |
| **Authors** | **Walt Husak, Michael Dolan (Dolby); Dave Singer (Apple)** |

# Background & Problem

This contribution is about the video provisions in 14496-10 (AVC), clause 7.4.1 and 23008-2 (HEVC), clause 7.4.2.2 on “unspecified” values of the nal\_unit\_type field. During discussions in Geneva in the File Format AHG regarding the use of these field values, it was noted that:

1. Unspecified values are not managed today, so all values are available to all users and applications;
2. Some entities have defined NAL unit payloads for values in this range (including IETF’s RTP specification) some expecting them not to collide (multiple different payloads with the same nal\_unit\_type value);
3. 14496-15 defines two values itself (extractors) which precludes their use by others; and
4. 14496-15 is proposed to constrain inclusion of some values as well as export of some values.

Without better guidance and management, value collisions and conflicting semantics can be defined causing interoperability problems. At the application boundaries, both semantics and values can collide, e.g. ISO BMFF allows the set {x, y, z} but the elementary stream environment only permits {x, y}. Further, within a single application, collisions will occur since there is no management of the use of the fields by non-MPEG users.

The text in 14496-10 & 23008-2, noting “particular care must be taken” does not provide any specific guidance or encourage the possibility of managing the use.

# Proposal

In order to address the situation, we propose that clarifications by made to the video specs about the expectations of managing these values; and then also document specific management technique(s) be defined in MPEG-defined applications, specifically ISO/IEC 14496-15.

## Proposed text changes to 14496-10

*Change clause 7.4.1:*

NOTE 2 – NAL unit types 0 and 24..31 may be used as determined by the application. No decoding process for these values of nal\_unit\_type is specified in this Standard. Since different applications might use NAL unit types 0 and 24..31 for different purposes, particular care must be exercised in the design of encoders that generate NAL units with nal\_unit\_type equal to 0 or in the range of 24 to 31, inclusive, and in the design of decoders that interpret the content of NAL units with nal\_unit\_type equal to 0 or in the range of 24 to 31, inclusive. This specification does not define any management for these values. These nal\_unit\_type code values may only be suitable for use in contexts in which collisions of usage (multiple different payloads with the same nal\_unit\_type value) are either unimportant, or not possible, or are managed, e.g. defined or managed in the controlling application or transport specification, or by controlling the environment in which streams are distributed.

## Proposed text changes to 23008-2

*Change clause 7.4.2.2:*

NOTE 1 – NAL unit types in the range of UNSPEC48..UNSPEC63 may be used as determined by the application. No decoding process for these values of nal\_unit\_type is specified in this Specification. Since different applications might use these NAL unit types for different purposes, particular care must be exercised in the design of encoders that generate NAL units with these nal\_unit\_type values, and in the design of decoders that interpret the content of NAL units with these nal\_unit\_type values. This specification does not define any management for these values. These nal\_unit\_type code values may only be suitable for use in contexts in which collisions of usage (multiple different payloads with the same nal\_unit\_type value) are either unimportant, or not possible or are managed, e.g. defined or managed in the controlling application or transport specification, or by controlling the environment in which streams are distributed.

## Proposed text changes to 14496-15

*Change all “unspecified” row(s) of Table 2, Table3, and Table 6:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Value of nal\_unit\_type** | **Description** | **Video elementary stream (sample entry 'avc1' or 'avc2')** | **Video elementary stream (sample entry 'avc3' or 'avc4')** | **Parameter set elementary stream** |
| x | * + - * 1. Unspecified | ~~Not specified by this part of ISO/IEC 14496~~See Annex F | ~~Not specified by this part of ISO/IEC 14496~~See Annex F | ~~Not specified by this part of ISO/IEC 14496~~See Annex F |

*Change A.1:*

* 1. Introduction

Aggregators and Extractors are file format internal structures enabling efficient grouping of NAL units or extraction of NAL units from other tracks.

Aggregators and Extractors use a syntax that is similar to the NAL unit syntax but does not follow the start code emulation prevention mechanism required for the NAL unit syntax as specified in ISO/IEC 14496-10 or ISO/IEC 23008-2. These NAL-unit-like structures are seen as NAL units in the context of the sample structure. While accessing a sample, Aggregators shall be removed (leaving their contained or referenced NAL units) and Extractors shall be replaced by the data they reference. Aggregators and Extractors shall not be output by file parsers.

See Annex F for more information about use of “unspecified” nal\_unit\_type values.

~~These structures use NAL unit types reserved for the application/transport layer by ISO/IEC 14496-10 or ISO/IEC 23008-2.~~

~~NOTE 1: The following is from ISO/IEC 14496-10:~~

~~“NOTE – NAL unit types 0 and 24..31 may be used as determined by the application. No decoding process for these values of nal\_unit\_type is specified in this Recommendation | International Standard.”~~

~~NOTE 2: The following is from ISO/IEC 23008-2:~~

~~"NOTE 1 – NAL unit types in the range of UNSPEC48..UNSPEC63 may be used as determined by the application. No decoding process for these values of nal\_unit\_type is specified in this Specification. Since different applications might use these NAL unit types for different purposes, particular care must be exercised in the design of encoders that generate NAL units with these nal\_unit\_type values, and in the design of decoders that interpret the content of NAL units with these nal\_unit\_type values."~~

*Add a new Annex F:*

# Annex F – Unspecified nal\_unit\_type value management

This Annex describes a recommended management mechanism for the nal\_unit\_type fields that are defined in ISO/IEC 14496-10 (AVC), clause 7.4.1 and ISO/IEC 23008-2 (HEVC), clause 7.4.2.2 for use 'as determined by the application'. Some values are defined in this standard and some are available for use under the conditions specified below.

In an AVC or HEVC context, all these codes are 'user definable' as defined in this annex. The tables below define their use in AVC, scalable and layered coding.

**Table W. AVC nal\_unit\_type value assignments**

|  |  |
| --- | --- |
| **nal\_unit\_type value** | **assignment** |
| 0 | User definable |
| 24-31 | User definable |

**Table X. SVC/MVC nal\_unit\_type value assignments**

|  |  |
| --- | --- |
| **nal\_unit\_type value** | **assignment** |
| 0 | User definable |
| 24-29 | User definable |
| 30-31 | As defined in Annex A |

**Table Y. Layered and Multiview HEVC nal\_unit\_type value assignments**

|  |  |
| --- | --- |
| **nal\_unit\_type value** | **assignment** |
| 0 | User definable |
| 48-49 | As defined in Annex A |
| 50-63 | User definable |

nal\_unit\_type values that are marked “user definable” are only suitable for use when the possibility of collision (multiple different payloads with the same nal\_unit\_type value) is managed. Within the file format, a best practice is to set the SampleEntry format field to a sample entry code value registered at MP4RA that is not defined in this specification, e.g. not ‘hev1’, and the management of this value space is then defined by the specification of that sample entry code. Other ways to avoid collision include controlling the environment in which files are distributed.

User defined values should not be transferred to the video decoder unless the payload is known to obey the rules for the format of a NAL unit, including being designed to prevent start code emulation.