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# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

**can** indicates that something is possible

**cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

**will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

# Introduction

TR 26.998 (5G Glass-type AR/MR) identified multiple aspects of normative work to support “5G/AR Real-time Communication” (clause 8.4). TR 26.998 identified normative work needed to support delivery of immersive media via RTP for IMS-based and WebRTC-based conversational services. To support XR split rendering as described in clause 8.6 of TR 26.998, RTP is also needed to transport immersive media and metadata information between the edge and device.

To improve support for the above XR services and enablers, it is necessary to configure RTP with specific settings and features that enable immersive experiences. Further improvements in performance and QoE over the 5G system can be achieved by specifying RTP configurations that are integrated and optimized for the 5G system, and leverage cross-layer optimizations used by other 3GPP specifications.

As these RTP configurations will be specified for use by multiple services, service enablers, and potentially, application developers, it is very important that they do not introduce unnecessary complexities that would discourage commercial deployment of the configurations. Therefore, technologies specified here should be commercially relevant and not introduce implementation and interoperability complexity without clearly demonstrating performance gains or new relevant functionalities.

# 1 Scope

The present document focuses on RTP [x] over UDP [x], optimizing the use of RTP for the uni-directional and bi-directional transport of real-time immersive media and associated metadata.

The following services and enablers are explicitly considered by this specification (in no specific order):

- IMS-based conversational XR services [x]

- WebRTC-based conversational XR services [x]

- WebRTC-based conversational services using traditional media [x]

- XR split-rendering, i.e., real-time transport of media between UE and network edge [x]

New transport protocols like QUIC [x] may be considered in a future update of this specification.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] ITU-T Rec H.264: "Advanced video coding specification".
<https://www.itu.int/rec/T-REC-H.264-202108-I/en>

[3] ITU-T Rec H.265: "High efficiency video coding specification ".
<https://www.itu.int/rec/T-REC-H.265-202108-I/en>

…

[x] <doctype> <#>[ ([up to and including]{yyyy[-mm]|V<a[.b[.c]]>}[onwards])]: "<Title>".

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**Data Burst:** A data burst is a set of multiple PDUs generated and sent by the application such that there is an idle period between two data bursts. A Data Burst can be composed of one or multiple PDU Sets.

**PDU Set:** One or more PDUs carrying the payload of one unit of information generated at the application level (e.g. frame(s), video slice(s), metadata, etc.).

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

Symbol format (EW)

<symbol> <Explanation>

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

Abbreviation format (EW)

<ABBREVIATION> <Expansion>

# 4 RTP Functionalities

## 4.1 Multiple Simultaneous RTP Streams in an RTP Session

TBA

## 4.2 Multiple RTP Sessions

TBA

## 4.3 RTP Retransmission

TBA

## 4.4 RTP Header Extensions

### 4.4.1 General

TBA

### 4.4.2 RTP Header Extension for PDU Set Marking

#### 4.4.2.1 General

The RTP Header Extension for PDU Set marking can be used by an AS (e.g., MRF) or a sender UE that sends media to a receiver UE over RTP.

The RTP Header Extension for PDU Set marking shall support both RTP Header Extension formats (i.e., the one-byte and the two-byte formats) according to RFC 8285.

If the RTP Header Extension for PDU Set marking is the only RTP header extension used, the endpoints shall use the 1-byte header format for maximum savings. If other 2-byte RTP header extension elements are used, then the 2-byte header may be used.

NOTE: The headers are not shown with padding as this depends on other prospective extension elements in use, as per RFC 8285 alignment specifications.

#### 4.4.2.2 One-byte RTP Header Extension Format

The one-byte RTP Header Extension for the marking of PDU Sets and End of Bursts is defined as follows:

 0 1 2 3

 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

 | 0xBE | 0xDE | length |

 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

 | ID | L=5 |E| EDB | PSI | PSSN | PSN |

 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

 | PSSize |

 +.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+

#### 4.4.2.3 Two-byte RTP Header Extension Format

The two-byte RTP Header Extension for the marking of PDU Sets and End of Bursts is defined as follows:

 0 1 2 3

 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

 | 0x100 | appbits | length |

 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

 | ID | L=6 |E| EDB | PSI | PSSN

 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

 | PSN | PSSize |

 +-+-+-+-+-+-+-+-+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+.+

#### 4.4.2.4 Semantics

The semantics of the fields of the RTP Header Extension for the marking of PDU Set and End of Bursts are defined as follows:

- **End PDU of the PDU Set [E] (1 bit):** This field is a flag that shall be set to 1 for the last PDU of the PDU Set and set to 0 for all other PDUs of the PDU Set.

- **End of Data Burst [EDB] (3 bits):** The EDB field is 3 bits in length and indicates the end of a Data Burst. The 3 bits encode the End of Data Burst indication as per the encoding and guidelines provided in Clause 4.4.2.6.1.

- **PDU Set Importance [PSI] (4 bits):** The PDU Set Importance field indicates the importance of this PDU Set compared to other PDU Sets within the same QoS flow. Lower values shall indicate a higher importance PDU Set with the highest importance PDU Set indicated by 0 and the lowest importance PDU Set indicated by 15.

NOTE 1: A complete set of guidelines for setting the PSI field for various audio/video codecs are provided in Clause 4.4.2.6.2

Editor’s Note: AS/UE are unaware of QoS flows and so the above text needs to be revised to remove the term. The PSI value needs to be set considering one or more RTP streams (depending on multiplexing and other aspects that are under discussion in reference to the guidelines). Once the guidelines are finalized, the text above will be revised possibly with the introduction of a new term in place for QoS flow that consists of one or more RTP streams.

- **PDU Set Sequence Number [PSSN] (10 bits):** The field encodes the sequence number of the PDU Set to which the current PDU belongs acting as a 10-bit numerical identifier for the PDU Set.

NOTE 2: This value wraps around at 1023, however, using the RTP packet sequence number and PSSN pair a receiver may uniquely distinguish between any PDU Sets.

- **PDU Sequence Number within a PDU Set [PSN] (6 bits):** The sequence number of the current PDU within the PDU Set. The PSN shall be set to 0 for the first PDU in the PDU Set and incremented monotonically for every PDU in the PDU set in order of transmission from the sender.

NOTE 3: A receiver may use the RTP packet sequence number together with the PSN to distinguish between PDUs within a PDU Set that contains more than 64 PDUs.

- **PDU Set Size [PSSize] (24 bits):** The PDU Set Size indicates the total size of all PDUs of the PDU Set to which this PDU belongs. This field is optional and subject to an SDP signaling offer/answer negotiation, where the Application Server may indicate whether it will be able to provide the size of the PDU Set for that RTP stream. If not enabled, the field should not be present. If enabled, but the Application Server is not able to determine the PDU Size for a particular PDU Set, it should set the value to 0 in all PDUs of that PDU Set. The PSSize shall indicate the size of a PDU Set including RTP/UDP/IP header encapsulation overhead of its corresponding PDUs. The PSSize is expressed in bytes.

NOTE 4: This field may be optionally present given the signaling of the “pdu-set-size” extension attribute in the SDP offer/answer negotiation as per Clause 4.4.2.5.

NOTE 5: Guidelines to set the PDU Set Size in bytes by an Application Server are provided in Clause 4.4.2.6.3.

#### 4.4.2.5 SDP Signaling

An AS or sender UE capable of sending PDU set marking HE shall use the SDP attribute extmap for PDU set marking HE in the media description of the RTP stream(s) carrying the PDU set HE. A receiver that does not support PDU set marking HE can ignore the RTP header when included. The signaling of the PDU Set and End-of-Burst marking RTP header extension shall follow the SDP signaling design and the syntax and semantics of the "extmap" attribute as outlined in RFC8285.The URN for the PDU Set marking shall be set to "**urn:3gpp:pdu-set-marking:rel-18**".

The header extension identifier shall be registered with IANA as maintained in [Real-Time Transport Protocol (RTP) Parameters (iana.org)](https://www.iana.org/assignments/rtp-parameters/rtp-parameters.xhtml#rtp-parameters-10).

The ABNF syntax for the extmap attribute for the signaling of PDU Set Information and End of Burst marking is defined as follows:

*extmap-attr="a=extmap:" 1\*5DIGIT ["/" direction] SP "urn:3gpp:pdu-set-marking:rel-18" SP extensionattributes*

*extensionattributes = \*3(format / "pdu-set-size")*

*format = "short" / "long"*

The extension attributes have the following semantics:

- format: indicates if the RTP header extension for PDU Set and End-of-Burst marking uses the 1-byte (short) or the 2-byte (long) format.

- pdu-set-size: if present, this attribute indicates that the application server will provide the PDU Set size in bytes in the RTP header extension with every RTP packet. This results in an additional 3 bytes of length for the RTP header extensi

#### 4.4.2.6 Guidelines for PDU Set Marking

##### 4.4.2.6.1 End of Data Burst Field

NOTE: These detailed guidelines are FFS.

##### 4.4.2.6.2 PDU Set Importance Field

NOTE: The following aspects need to be further defined:

- Default value for importance when the sender cannot define importance

- Codec level aspect:

- video: importance when PDU set is i) slice, ii) frame iii) parameter sets iv) tile set v) other?

- audio: when and if to use PDU set marking HE in an audio frame.

- text/metadata: when and if to use PDU set marking HE in text/metadata

- image: a frame is a PDU set and the importance for all frames are i) same ii) set based on application aspects.

- Importance across bitstreams

- Multiplexed streams: importance marking when a 5-tuple corresponds to more than one bitstream

- Importance marking considerations for non-multiplexed bitstreams

4.4.2.6.2.1 General

The PDU sets that contain audio data shall be set with highest importance compared with other media PDU sets.

NOTE: PDU sets that carry immersive audio data are not set with highest importance compared with other media PDU sets. The importance value of immersive audio PDU sets is FFS.

The PDU sets that contains the reference frames present in the video bitstream are set with higher importance compared with non-reference frames present in the video bitstream. The Intra Random Access Pictures (IRAP) pictures such as Instantaneous Decoder Refresh (IDR) frames, Clean Random Access (CRA) frames and Broken Link Access (BLA) frames are very important in a video stream and shall be set with higher importance.

In video coding, temporal scalability is the option to decode only some of the frames in a video stream instead of the whole stream. This enables a media server to reduce the bitrate sent towards viewers who doesn’t have enough bitrate or CPU to handle the whole stream. Pictures with lowest temporal identifier value are used as reference pictures in the bitstream and are important for decoding the dependent frames.

The following clauses provides the guidelines on setting the importance field in a PDU set RTP header extension for various video codecs.

4.4.2.6.2.2 H.264 Codec

In an H.264 bitstream, NAL units with the nal\_unit\_type field assigned the value 5 (refer to Table 7.1 in AVC specification [2]) are Instantaneous Decoding Refresh (IDR) pictures. When the Type field value in the NAL Unit header of an RTP packet is 5, then the corresponding PDUs in that PDU set should be set with higher importance value.

The parameter set NAL units such as Sequence Parameter Set (SPS) and Picture Parameter Set (PPS) are important for decoding the bitstream. Therefore, PDU sets with a payload Type field value equal to 7, 8, 13 or 15 (refer to Table 7.1 in AVC specification [2]) in the NAL Unit header of the RTP packet should be set with higher importance.

+---------------+

|0|1|2|3|4|5|6|7|

+-+-+-+-+-+-+-+-+

|F|NRI| Type |

+---------------+

*Figure 1.* *NAL unit type octet in an RTP packet payload*

The NAL unit type octet contains the NRI (nal\_ref\_idc) field highlighted in Figure 1. A value of b00 indicates that the content of the NAL unit is not used to reconstruct reference pictures for inter picture prediction. Such NAL units can be discarded without risking the integrity of the reference pictures. Values greater than b00 indicate that the decoding of the NAL unit is required to maintain the integrity of the reference pictures. The highest transport priority is 11, followed by 10, and then by 01; finally, 00 is the lowest.

PDU sets with an NRI field value 0x00 in the NAL Unit header of RTP packet are of lowest important. The importance value in the PDU set header extension for such PDU sets should be high. PDU sets with an NRI field value 0x11 in the NAL Unit header of RTP packet are of highest important. The importance value in the PDU set header extension for such PDU sets should be lower compared with PDU sets with other NRI field values.

The Type and NRI field in the NAL unit header indicate the relative transport priority. They can be used to set the PDU Set importance. The PDU set importance value assignment based on the Type and NRI field values is for further study.

4.4.2.6.2.3 HEVC Codec

Different from H.264 (AVC), H.265 (HEVC) NAL unit header is two bytes, contains a 6-bit Type field and no NRI field. NAL unit types 0–31 indicate Video Coding Layer (VCL) NAL unit types; 32–40 indicate non-VCL NAL unit types. NAL unit types 41–47 are reserved, and types 48–63 are unspecified.

All VCL NAL units of the same access unit must have the same value of NAL unit type and that value defines the type of the access unit and its coded picture. There are three basic classes of pictures in H.265 (HEVC): intra random access point (IRAP) pictures, leading pictures, and trailing pictures.

In an HEVC bitstream, NAL units with the nal\_unit\_type field assigned a value in the range 16 to 23 (inclusive) (refer to Table 7.1 in HEVC specification [3]) are Intra Random Access Pictures (IRAP) pictures. This includes IDR, CRA, and BLA picture types as well as types 22 and 23, which currently are reserved for future use.

When the Type field value in the NAL Unit header of RTP packet is in the range 16 to 23 (inclusive), then the corresponding PDUs in that PDU set should be set with higher importance value.

The parameter set NAL units such as Sequence Parameter Set (SPS), Picture Parameter Set (PPS), Video Parameter Set (VPS) are important for decoding the bitstream. Therefore, PDU sets with payload Type field value in the NAL Unit header of RTP packet in the range 32 to 34 (inclusive) should be set with higher importance.

RFC 7798 specifies Aggregation Packets (APs) to enable the reduction of packetization overhead for small NAL units, such as most of the non-VCL NAL units, which are often only a few octets in size. An AP aggregates NAL units within one access unit. Each NAL unit to be carried in an AP is encapsulated in an aggregation unit. An AP consists of a payload header (denoted as PayloadHdr) followed by two or more aggregation units. In an AP, the Type field in the PayloadHdr MUST be equal to 48. APs are typically used to aggregate parameters sets (VPS, SPS, PPS) into a single packet.

When aggregation Packets (APs) are used, the sender should consider the NAL unit types of the aggregation units while assigning the importance value. For example, if the aggregation unit contains parameter sets, the PDU set importance value for such PDUs should be lower.

+---------------+---------------+

|0|1|2|3|4|5|6|7|0|1|2|3|4|5|6|7|

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

|F| Type | LayerId | TID |

+-------------+-----------------+

*Figure 2.* *The Structure of the HEVC NAL Unit Header*

It could be that there are PDUs with different NAL unit types in a PDU set. For example, if the first PDU in PDU set is a prefix SEI message or Access Unit Delimiter (AUD), it would be misleading if the sender looked only at the first PDU of the PDU set to determine the importance value.

The sender should ignore the NAL units with non-VCL NAL unit types 35 and 39 and instead consider NAL unit types of the subsequent VCL NAL units while determining importance value for such PDUs.

A leading picture is a picture that follows a particular IRAP picture in decoding order and precedes it in output order. There are two types of leading pictures in H.265 (HEVC): Random access decodable leading (RADL) pictures and Random access skipped leading (RASL) pictures. A RADL picture is a leading picture that is guaranteed to be decodable when random access is performed at the associated IRAP picture. Therefore, RADL pictures are only allowed to reference the associated IRAP picture and other RADL pictures of the same IRAP picture A RASL picture is a leading picture that may not be decodable when random access is performed from the associated IRAP picture. Only other RASL pictures are allowed to be dependent on a RASL picture.

Hence, in HEVC bitstreams, RASL pictures can be discarded during random access. HEVC provides mechanisms to enable specifying the conformance of a bitstream wherein the originally present RASL pictures have been discarded. Consequently, system components can discard RASL pictures, when needed, without worrying about causing the bitstream to become non-compliant.

PDU sets that contain RADL pictures should be assigned an importance value higher than the importance value assigned to the IRAP pictures but lower than the importance value assigned to the RASL pictures in the bitstream.

PDU sets with Type field value equal to 6 or 7 (refer to Table 7.1 in HEVC specification [3]) in the NAL Unit header of RTP packet are RADL pictures and they are of lowest importance compared to the IRAP but higher importance compared to the RADL pictures. The importance value in the PDU set header extension for RADL picture PDU sets should be set with higher value compared to importance value of IRAP picture PDU sets.

PDU sets with Type field value equal to 8 or 9 (refer to Table 7.1 in HEVC specification [3]) in the NAL Unit header of RTP packet are RASL pictures and they are of lowest importance compared to the IRAP and RADL pictures. The importance value in the PDU set header extension for such PDU sets should be set with higher value compared to importance value of IRAP and RADL picture PDU sets.

In H.265 (HEVC), each leading picture and trailing picture type has two type values. The even picture type numbers indicate sub-layer non-reference pictures and odd picture type numbers indicate sub-layer reference pictures. An encoder can use the sub-layer non-reference picture types for pictures that are not used for reference for prediction of any picture in the same temporal sub-layer. Note that a sub-layer non-reference picture may still be used as a reference picture for prediction of a picture in a higher temporal sub-layer.

PDU sets that contain sub-layer reference picture types should be assigned a lower PDU set importance value compared to the PDU sets with the corresponding sub-layer non-reference picture types.

Besides, PDU sets with TID value 1 (lowest possible value) as shown in Figure 2 should be set with higher importance. The importance value for such pictures should be lower for IRAP pictures and slightly higher for non-IRAP pictures compared to the pictures with higher TID values.

Pictures with highest TID value cannot be used as reference pictures and can be discarded at the network level when the throughput is not good, or network conditions are unstable. PDU sets with higher TID values in the NAL Unit header of RTP packet or with higher nuh\_temporal\_id\_plus1 value in the NAL unit header of the bitstream are set with higher importance value compared with the PDU sets with lower TID values.

PDU sets with the highest TID value in the NAL Unit header of RTP packet or with highest nuh\_temporal\_id\_plus1 value in the NAL unit header of the bitstream are set with lowest importance. The importance value for such pictures should be set with highest value.

The Type and TID field in the NAL unit header indicates the relative transport priority. They can be used to be set the PDU Set importance. While they can also indicate different QoS requirements, which can be used to provide different protects against transmission losses, e.g. reliabilities (tolerable frame/slice error rate), priorities.

4.4.2.6.2.4 PDU set importance based on affected PDU sets

When the transport layer is forced to perform immediate dropping/discarding of a PDU set but has a freedom of selection among the PDU sets, the PDU set with smaller degrees of artifact would be the better choice in most cases. Dropping of a PDU set may corrupt the decoded output of itself and the other PDU sets though they may already be transmitted perfectly to the receiving end or yet in a queue waiting to be transmitted. The degrees of artifact can be explicitly transferred as the number of affected frames which precedes/follows the PDU set, or can be implicitly transferred as the importance value where the lower value means the higher PDU sets are affected while higher values proportionally mean less number of PDU sets are affected for example. By considering such a quantization of various affected PDU sets can be translated into importance field, using 4 bits to represent 16 possible size ranges is recommended.

The information on the size of propagation error which caused by the dropping of each PDU set may be provided by the application layer. The information may present the size of error propagation implicitly with a proportional mapping of error propagation size to an index such as the importance of the PDU set in the media stream.

The importance value of a PDU Set in PDU set information RTP HE is set as follows:

- The error propagation size is mapped to importance field value. The higher the error propagation size of a PDU set, that PDU set is more important, and it shall be assigned with the lower PDU set importance value. PDU sets with low error propagation are of less importance and the PDU set importance value for such PDU sets shall be higher compared to PDU sets with higher error propagation size.

4.4.2.6.2.5 Considerations for PSI mapping across bitstreams

Senders should consider that multiplexed RTP streams are treated as a single QoS flow and set the PSI field accordingly, i.e., the PSI field for one bitstream will affect the PDU sets in other multiplexed streams as well.

In some cases, dependencies may exist across bitstreams even when they are not multiplexed, particularly for XR services.

In case of such dependencies, it may not be enough to have PSI values based on codecs and media types alone. PSI values shall be set in this case based on the following, which are listed in an increasing order of importance.

- The PDU set is necessary for the processing of some PDU sets of the stream to which it belongs.

- The PDU set is necessary for the processing of all the other PDU sets of the stream to which it belongs.

- The PDU set is necessary for the processing of some PDU sets of the stream to which it belongs and also necessary for the processing of some PDU sets of some other streams to which it does not belong.

- The PDU set is necessary for the processing of all PDU sets of the stream to which it belongs and also of some other streams to which it does not belong.

- The PDU set is necessary for the processing of all PDU sets of all streams.

[Editor’s Note1] Alignment between all the clauses in Guidelines section is required.

[Note1] Relative importance of PSI values is only applicable within a single QoS flow.

##### 4.4.2.6.3 PDU Set Size Field

NOTE: These detailed guidelines are FFS.

#### 4.4.2.7 Guidelines for AS

This clause describes guidelines for an AS that is on the media path between two or more UEs, e.g., an MRF, MCU etc. Such an AS may receive media over RTP with PDU set marking HE added by the sender UE.

NOTE: These detailed guidelines are FFS.

## 4.5 RTP Forward Error Correction

TBA

## 4.6 SRTP

TBA

# 5 RTCP Feedback Reporting Procedures

## 5.1 General

TBA

# X Examples for styles

The main text of the document should start here, after the above clauses have been added.

The following styles and editing techniques are aimed to help in the formatting of the document using the 3GPP Template: 3GPP\_70.dot, available from the 3GPP FTP site (<https://www.3gpp.org/ftp/Information/All_Templates>).

## X.1 Heading styles

Heading styles are included in the 3GPP TS Template and are used as follows:

**Do not use any built-in automatic numbering** for 3GPP documents. Although this is sometimes useful in the early drafting stages of a document, once the document has been placed under change control, the clause numbering needs to be fixed in order to keep cross-reference consistency as the 3GPP specification set develops.

Heading 1: Used for Main clauses (1, 2, 3, etc.). Also used for Annex clauses (A.1, A.2, etc.).

Heading 2: Used for Main clauses (4.1, 4.2, 5.1, 5.2, etc.). Also used for Annex clauses (A.1.1, A.1.2, etc.).

Heading 3: Used for 2nd level clauses (4.1.1, 4.1.2, 5.1.1, 5.1.2, etc.). Also used for Annex clauses (A.2.1.1, A.2.1.2, etc.).

Heading 4 & 5: Used for 3rd and 4th level clauses and Annex clauses.

Heading 6 & 7: **Not used**, instead use style "H6" so that the title appears in the document, but does not appear in the Table of Contents.

Heading 8: Used for Main Annex titles in Specifications (3GPP TS) (e.g. Annex A (normative): ).

Heading 9: Used for Main Annex titles in Reports (3GPP TR) (e.g. Annex A: ).

## X.2 Other common styles

Normal: Used for main document text.

NO: Used for Notes in the text (Allows Tab and Indent). See example below.

NW: Same as NO, but Without line space after. Used when there are many notes in sequence.

NOTE 1: This is an example of a note formatted in style NW. The style is designed to allow space for note numbering and line wrap with a hanging indent. There is no line space after.

NOTE 2: This is an example of a note formatted in style NO. The style is designed to allow space for note numbering and line wrap with a hanging indent. There is a line space after.

Bullet styles: The following bullet styles are provided.

B1: Bullet level 1 for main bullet points.

B2: Bullet level 2 for sub bullets.

B3-B5: for further sub bullets.

NOTE: Bullets are usually formatted manually, using a hyphen ( - ) or alphanumeric identifiers: a), b), or 1), 2) etc. followed by a tab character. **Automatic bullet features should not be used** as they may be lost if template styles are re-applied later.

Table styles: **TAH**, **TAL**, **TAC**, **TAR**, **TAN**, for **TA**ble **H**eaders, **L**eft justified, **C**entred, **R**ight justified and **N**otes in tables: Style **TH** is used for the **T**able **H**eading (title or caption). See example below.

Table 1: Example of table styles

|  |  |  |
| --- | --- | --- |
| Col 1 Header (TAH) | Col 2 Header (TAH) | Col 3 Header (TAH) |
| Left Justified (TAL) | Centred (TAC) | Right Justified (TAR) |
| NOTE: A special style is provided for notes within a table (TAN). |

Warning: The default setting for table cells is to disallow rows to break at a page boundary. If you include tables with very long cells, likely to extend beyond the bottom of the page (bearing in mind the table header and the page header and footers, and the margin settings), then you must enable that row's "Allow row to break across pages" setting.

Figure styles: Figures and graphics are formatted with style "**TH**" which keeps the figure with the following paragraph, usually the figure title. **F**igure **T**itles (captions) are formatted with style "**TF**". See example below.



Figure 1: Example figure layout. To remove "float over text" select the graphic and "Format Object ..." - De‑select "float over text" in the Position Tab

# Page setup parameters

This clause defines the margin parameters and the header to be used (implemented in the macros).

Title page (= title section)

A4 portrait, Top: 4 cm, Bottom: 19 cm, Left: 1,5 cm, Right: 1,5 cm, Gutter: 0 cm, Header: 0 cm, Footer: 0 cm.

Portrait sections

A4 portrait, Top: 2.5 cm, Bottom: 2 cm, Left: 2 cm, Right: 2 cm, Gutter: 0 cm, Header: 1,5 cm, Footer: 0,6 cm.

Landscape sections

A4 landscape, Top: 2 cm, Bottom: 2 cm, Left: 2 cm, Right: 2,5 cm, Gutter: 0 cm, Header: 1,5 cm, Footer: 0,6 cm.

Headers and footers

Header

The following contains the master location for all headers (except for the title section). These paragraphs contain framed fields which will result in one header line and are bookmarked "header".

The left-most entry contains a possible additional document reference, e.g. " Release 17", identified on the title page by the use of the ZGSM character style.

**Release 18**

The centre entry is the page number.

**10**

The right-most entry repeats the title page information, identified by the use of the ZA paragraph style.

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NOTE: For documents which are split into more than one file, the possible additional document reference and the title page information need to be hardcoded in all files except the one containing the title section.

 NOTE: It has been found that opening very long documents with MS Word 2016 onwards (including versions of Word packaged in MS Office 365) can take a very long time, as can navigating around the document. This applies both in draft view and in print layout view. To solve this problem, the page header **for each section** of the document may be hard-coded, replicating the text which would otherwise have been automated via the use of ZGSM and ZA styles.

Footer

The footer contains always "3GPP" (except for the title page).

3GPP

# Annex <A> (normative):<Normative annex for a Technical Specification>

Start each annex on a new page.

Annexes are labelled A, B, C, etc. and designated either "normative" or "informative" depending on their content.

Normative annexes only to appear in Technical Specifications. Use style "Heading 8".

Annex <B> (informative):
<Informative annex for a Technical Specification>

Informative annexes may appear in both Technical Specifications and Technical Reports. Use style "Heading 8" for use in TSs.

Informative annexes shall not contain requirements for the implementation of the Technical Specification.

# B.1 Heading levels in an annex

Heading levels within an annex are used as in the main document, but for Heading level selection, the "A.", "B.", etc. are ignored. e.g. **B.1.2** is formatted using ***Heading 2*** style.

Annex <D> (informative):
Bibliography

Use style "Heading 8" in TSs and "Heading 9" in TRs. Do not use "informative" in the title in TRs.

The Bibliography is optional. If it exists, it shall follow the last technical annex in the document.

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

Bibliography format

<Publication>: "<Title>".

Annex <E> (informative):
Index

Use style "Heading 8" in TSs and "Heading 9" in TRs. Do not use "informative" in the title in TRs.

The Index is optional. If it exists, it shall immediately precede the Changes history annex.

Generate the index using MS Word's index field feature.

Annex <F> (informative):
Change history

This is the last annex for TS/TSs which details the change history using the following table.
This table is to be used for recording progress during the WG drafting process till TSG approval of this TS/TR.
For TRs under change control, use one line per approved Change Request
Date: use format YYYY-MM
CR: four digits, leading zeros as necessary
Rev: blank, or number (max two digits)
Cat: use one of the letters A, B, C, D, F
Subject/Comment: for TSs under change control, include full text of the subject field of the Change Request cover
New vers: use format [n]n.[n]n.[n]n

|  |
| --- |
| Change history |
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2023-04 | SA4#123-e | S4-230719 |  |  |  | Initial version, with text from WID in SP-220613 and S4-230713 | 0.0.1 |
| 2023-05 | SA4#124 | S4-231xxx |  |  |  | Implementing S4-230848, S4-230965, S4-231026, S4-231028 | 0.1.0 |