**3GPP TSG- Meeting #**

**, , - revision of S4-250956**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  |
| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **x** |

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|  |
| ***Title:***  |  |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | A capture type SDP parameter would be useful for setting the session to a certain suppression mode or set ranges for the suppression. The talk spurt indication in Annex A is limited. Diegetic and non-diegetic terms are currently not defined. |
|  |  |
| ***Summary of change:*** | Capture type parameter is added to the IVAS SDP and PI request for suppression is added. Talk spurt indication in IVAS RTP is updated to onset signalling and relevant PI data is added. Terms are added for diegetic and non-diegetic. |
|  |  |
| ***Consequences if not approved:*** | It is not possible to negotiate suppression levels for an IVAS session. The talk spurt indication does not take into account other types of audio and is not able to indicate immersive aspects for an audio onset. Diegetic term is vague in the specification. |
|  |  |
| ***Clauses affected:*** | 3.1, A.3.2, A.3.5, A.4 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Rev1: capture-type parameter renamed to sup-mode (suppression mode), the parameter description is edited and updated accordingly. |

CHANGE 1

## 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].

**diegetic:** rendered according to head tracking information.

**frame:** an array of audio samples or metadata spanning a 20-ms time duration.

**non-diegetic:** rendered independently of head tracking information.

CHANGE 2

## A.3.2 RTP Header Usage

The format of the RTP header is specified in [34]. This IVAS RTP payload format uses the fields of the RTP header in a manner consistent with the usages in [34].

The assignment of the RTP payload type for IVAS is out of scope of this document. In most cases SDP would be used to signal the payload type for dynamic assignment.

The RTP clock rate for IVAS is 16000, regardless of the audio bandwidth. A clock rate of 16000 is also used for the AMR-WB [36] and EVS codecs [3]; having a unique clock rate across all payload types of one media avoids the issues described in [37].

The RTP timestamp defines the sampling instant (media time) of the first sample of the first IVAS frame in an RTP packet. The duration of one IVAS frame is 20 ms. Thus, the media time is increased for each successive IVAS frame of an RTP packet by 320 ticks. The RTP timestamp of a packet is used for the first PI data in the IVAS RTP payload. The timing of PI frames during DTX is explained in clause A.3.5.4.

If a frame in the RTP packet is an onset frame, the RTP header marker bit (M) shall be set to 1. For all other RTP packets the marker bit shall be set to zero (M=0). However, since the frame may have multiple audio transport channels, it is not clear for which audio transport channel(s) the onset is applicable. Hence, it is not sufficient to only use the marker bit to detect onset frames at the media receiver. The media receiver needs to monitor the content of the audio transport channels to determine audio onsets for each individual audio transport channel. The onsets for the audio transport channels can be marked with the relevant PI data presented in clause A.3.5.6.4.

CHANGE 3

### A.3.5.5 Supported PI data types

Supported PI types are listed in tables A.3.5.5-1 and A.3.5.5-2 and described in the following subsections. Table A.3.5.5-1 lists PI types for forward direction signalling. Table A.3.5.5-1A lists the PI types for reverse direction signalling. Table A.3.5.5-2 lists additional PI types.

Table A.3.5.5-1: Supported forward direction PI types in an IVAS session.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type bits** | **Forward direction PI type** | **Description** | **SDP indication** | **Size (bytes)** | **Described in clause** |
| 00000 | SCENE\_ORIENTATION | Describes the orientation of a spatial audio scene in unit quaternions. | fsco | 8 | A.3.5.6.1.2 |
| 00001 | DEVICE\_ORIENTATION\_COMPENSATED | Describes the orientation of a device in unit quaternions. The orientation is compensated in the transmitted audio. | fdoc | 8 | A.3.5.6.1.3 |
| 00010 | DEVICE\_ORIENTATION\_UNCOMPENSATED | Describes the orientation of a device in unit quaternions. The orientation is not compensated in the transmitted audio. | fdou | 8 | A.3.5.6.1.3 |
| 00011 | ACOUSTIC\_ENVIRONMENT | Selects and optionally describes the acoustic environment. | face | 1,5 or 8 | A.3.5.6.2 |
| 00100 | AUDIO\_DESCRIPTION | Describes the content in the transmitted audio | faud | 1 to 5 | A.3.5.6.3 |
| 00101 | AUDIO\_ONSET | Describes the source of an onset. | fauo | 1 | A.3.5.6.4 |

**Table A.3.5.5-1A : Supported reverse direction PI types in an IVAS session.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type bits** | **Reverse direction PI type** | **Description** | **SDP indication** | **Size (bytes)** | **Described in clause** |
| 10011 | DYNAMIC\_AUDIO\_SUPPRESSION | Describes receiver’s preference with respect to audio suppression | rdas | 2 | A.3.5.7.4 |

Table A.3.5.5-2: Additional PI types in an IVAS session.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type bits** | **PI type** | **Description** | **SDP indication** | **Size (bytes)** |
| 00100-11110 | Reserved | - | - | - |
| 11111 | NO\_PI\_DATA | Indicates an empty PI data frame. | nopi | 0 |

NO\_PI\_DATA PI data type can be used to indicate empty PI data sections. The PM marker bits for a NO\_PI\_DATA PI data type shall be set as PM=10, see table A.3.5.2-2. For example, if an IVAS RTP payload includes multiple audio frames, and some of the audio frames do not have associated PI data, NO\_PI\_DATA PI type can be used.

CHANGE 4

#### A.3.5.6.3 Audio Description PI data (forward direction)

Audio Description (AD) PI data frames can be used to describe the audio content (e.g. speech/music/general audio) transmitted from sender to receiver.

The size of AD PI data varies from 1 to 5 bytes and depends on the IVAS format as described in Table A.3.5.6.3-1. Wherein for OSBA and OMASA formats the number of discrete coded objects are as per Table 5.8-1 and Table 5.9-1 respectively.

Table A.3.5.6.3-1: Audio Description PI data size

|  |  |
| --- | --- |
| **IVAS format** | **Size (Bytes)** |
| stereo | 1 |
| SBA | 1 |
| MASA | 1 |
| ISM | Number of Objects |
| MC | 2 (1 for center channel + 1 for all other channels) |
| OMASA | 1 + Number of Discrete coded Objects |
| OSBA | 1 + Number of Discrete coded Objects |

Each Byte in AD PI data payload is an audio identifier (AID) that is defined as follows.

AID: An 8 bit identifier, as described in figure A.3.5.6.3-1, to specify type of audio that is being transmitted. This identifier contains V, M, A, E and B field, as defined in Table A.3.5.6.3-2, Table A.3.5.6.3-3, Table A.3.5.6.3-4, Table A.3.5.6.3-5 and Table A.3.5.6.3-6 respectively, which specifies whether audio contains speech, music or ambiance or a combination of these audio types. The E field indicates if the metadata (e.g., orientation, gain, position, direction, etc.) for this audio is editable by the media receiver for rendering. The B field indicates if a stereo stream is binaural or default stereo, i.e., non-binaural. A value of AID where all V, M and A fields equal to 0 corresponds to an unspecified audio type which indicates that an audio description is not available for the related audio frames. The reserved bits in AID shall be set to 0 and be ignored by a receiver.

The latest received AD PI data is used until a new AD PI data is received.

|  |
| --- |
|  0 1 2 3 4 5 6 7 +-+-+-+-+-+-+-+-+ |V|M|A|E|B| RES | +-+-+-+-+-+-+-+-+ |

Figure A.3.5.6.3-1: Audio Identifier.

Table A.3.5.6.3-2: V field in Audio Identifier Byte

|  |  |
| --- | --- |
| **code** | **value** |
| 0 | Non-speech |
| 1 | speech |

Table A.3.5.6.3-3: M field in Audio Identifier Byte

|  |  |
| --- | --- |
| **code** | **value** |
| 0 | Non-Music |
| 1 | Music |

Table A.3.5.6.3-4: A field in Audio Identifier Byte

|  |  |
| --- | --- |
| **code** | **value** |
| 0 | Absence of background Ambiance |
| 1 | Presence of background Ambiance |

Table A.3.5.6.3-5: E field in Audio Identifier Byte

|  |  |
| --- | --- |
| **code** | **value** |
| 0 | Audio metadata for rendering is not editable |
| 1 | Audio metadata for rendering is editable |

Table A.3.5.6.3-6: B field in Audio Identifier Byte

|  |  |
| --- | --- |
| **code** | **value** |
| 0 | Stereo stream is not binaural (default stereo) |
| 1 | Stereo stream is binaural |

In an example scenario for OSBA format, if the discretely coded objects contain only clean speech then the corresponding Audio Identifier byte should have V field set to 1 and M and A field set to 0 whereas if the coded SBA component contain only background ambiance then the corresponding Audio Identifier byte should have A field set to 1 and V and M field set to 0. Setting E field to 1 indicates that the related audio metadata for rendering can be edited.

#### A.3.5.6.4 Audio onset PI data

AUDIO\_ONSET PI data frames can be used to describe the source of an audio onset(s) within the transmitted audio. The PI data frame comprises 1-bit flags to indicate if there is an onset in the transmitted audio (1) or not (0). Table A.3.5.6.3-1 presents the number of indication bits used for each coded format in the AUDIO\_ONSET PI data frame. For Stereo, SBA and MASA the first bit in the AUDIO\_ONSET PI data indicates if the audio contains an onset (1) or not (0). For ISM, the first one to four bits indicate if the associated individual audio object contains an onset (1) or not (0). For MC, the first bit indicates if the center channel contains an onset (1) or not (0) and the second bit indicates if any of the other channels contain an onset (1) or not (0). For OMASA and OSBA, the first bit indicates if the MASA or SBA part, respectively, contain an onset (1) or not (0) and the following one to four bits indicate if the individual audio objects contain an onset (1) or not (0). Any unused bits in the AUDIO\_ONSET PI data shall be treated as reserved, set to zero and ignored.

Table A.3.5.6.3-1: Number of onset indication bits in the audio onset PI data for each coded format.

|  |  |
| --- | --- |
| **IVAS format** | **Number of onset indication bits** |
| Stereo | 1 |
| SBA | 1 |
| MASA | 1 |
| ISM | Number of Objects |
| MC | 2 (1 for center channel + 1 for all other channels) |
| OMASA | 1 + Number of Discrete coded Objects |
| OSBA | 1 + Number of Discrete coded Objects |

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### A.3.5.7 Reverse direction PI data types

#### A.3.5.7.4 Dynamic Audio Suppression

The Dynamic Audio Supression (DAS) PI data describes receiver’s preference with respect to the type of audio content (for e.g., Speech only) that should be enhanced and the amount of suppression to be applied to the background noise, where the background noise is defined as the type of audio content that should be suppressed according to the receiver preference.

The size of DAS PI data is 2 bytes and is described in figure A.3.5.7.4-1. The DAS PI data payload contains an Audio Identifier (AID) byte and a Suppression Level Indicator (SLI) byte, as illustrated in Figure A.3.5.7.4-1. The value of AID field shall be non-zero for the audio identifier bits (V, M, A) and the reserved bits in AID shall be set to 0, unless defined. Likewise, there are 4 useable bits of the SLI while the 4 other (reserved) bits shall be set to 0. The AID byte contains V, M and A field, as defined in Table A.3.5.6.3-2, Table A.3.5.6.3-3 and Table A.3.5.6.3-4 respectively, which specifies whether receiver’s preference is speech, music or ambiance or a combination of these audio types. The Suppression Level Indicator, as defined in table A.3.5.7.4-1, allows specifying a desired degree of suppression where audio signal components other than what is specified by the AID field are considered as undesired audio component. The SLI takes values from 0 to 15 wherein the expected amount of audio suppression is proportional (in approximate logarithmic domain) to the indicator value with 0 indicating minimum audio suppression and 15 indicating maximum audio suppression as offered by the sender side. If the ns-mode SDP parameter is negotiated, the minimum and maximum available audio suppression levels can be determined by the ns-mode SDP parameter. For example, if the ns-mode parameter for the session is negotiated as nominal to max-suppression, the SLI value of 0 would reflect to the nominal suppression mode of the media sender and the SLI value of 15 would reflect to the max-suppression mode of the media sender.

The latest received DAS PI data is used until a new DAS PI data is received.

|  |
| --- |
|  0 1 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ |V|M|A| RES | SLI | RES | +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ + AID + SLI + |

Figure A.3.5.7.4-1: DAS PI data byte

Table A.3.5.7.4-1: Suppression Level Indicator

|  |  |  |
| --- | --- | --- |
| **SLI Size bits** | **Value** | **Description** |
| 0000 | 0 | Minimum suppression offered by the sender side |
| 0001 | 1 | … |
| … | … | … |
| 1110 | 14 | … |
| 1111 | 15 | Maximum suppression offered by the sender side |

CHANGE 6

# A.4 Payload Format Parameters

## A.4.1 IVAS Media Type Registration

The media type for the IVAS codec is to be allocated from the standards tree. This clause defines parameters of the IVAS payload format. This media type registration covers real-time transfer via RTP and non-real-time transfers via stored files. All media type parameters defined in this document shall be supported.

Media type name: audio

Media subtype name: IVAS

Required parameters: none

Optional parameters:

The parameters defined below apply to RTP transfer only:

**ptime**: see [32].

**maxptime**: see [32].

**dtx/dtx-recv**: as defined in Annex A of [3].

**max-red**: see [36].

**channels**: The number of audio channels shall not be present.

NOTE: The use of the channels parameter as defined in [35] does not permit signaling all IVAS Immersive mode coded formats; formats need to be derived from the cf/cf-send/cf-recv parameters.

**im-s**: This ivas-mode-switch (ims) parameter defines the mode at the start or update of the session for the direction specified by the session directionality attribute or the suffixPermissible values are 0 and 1. If ivas-mode-switch is 0 or not present, IVAS Immersive mode is used. If ivas-mode-switch is 1, depending on the setting of evs-mode-switch, EVS Primary or AMR-WB IO mode is used The mode initially used in the session may later be modified.

**ims-send/ims-recv**: ims parameter in send or receive direction.

NOTE: The evs-mode-switch parameter only applies to the direction for which the ivas-mode-switch parameter is 1.

**cmr:** As defined in Annex A of [3] for the EVS Primary and AMRWB-IO modes. For IVAS Immersive modes the bit rate, bandwidth and format requests are disabled when cmr is -1. The bitrate, bandwidth and format requests are enabled when cmr is 0 or the cmr parameter is not present. When cmr is 1 the bit rate requests using the initial E byte shall be present in every packet (but may be NO\_REQ); format and bandwidth requests for IVAS Immersive modes are optional when cmr is 1.

The following parameters are applicable only to IVAS Immersive operation:

NOTE: IVAS computational complexity and memory demands of depend on the setting of the following parameters for source codec bit rate, audio bandwidth, and coded format; in addition, factors beyond the signaling, such as complexity of a specific implementation and the (rendered) output format may be significant.

**ibr**: Specifies the range of source codec bitrate for IVAS Immersive mode in the session, in kilobits per second, for the direction specified by the session directionality attribute or the suffix. The ibr parameter can either have: a single bitrate (ibr1); or a hyphen-separated pair of two bitrates (ibr1-ibr2). If a single value is included, this bitrate, ibr1, is used. If a hyphen-separated pair of two bitrates is included, ibr1 and ibr2 are used as the minimum bitrate and the maximum bitrate respectively. ibr1 shall be smaller than ibr2. ibr1 and ibr2 have a value from the set in Table 4.2-2 of the present document. If this parameters is not present and not otherwise specified by ibr-send or ibr-recv, all bitrates consistent with the IVAS codec capabilities are allowed in the session.

**ibr-send/ibr-recv**: ibr parameter in send or receive direction.

**ibw**: Specifies the audio bandwidth for IVAS Immersive modes to be used in the session, for the direction specified by the session directionality attribute or the suffix. ibw has a value from the set: wb, swb, fb, wb-swb, and wb-fb. wb, swb, and fb represent wideband, super-wideband, and fullband respectively, and wb-swb, and wb-fb represent all bandwidths from wideband to super-wideband, and fullband respectively. If this parameter is not present and not otherwise specified by ibw-send or ibw-recv, all bandwidths consistent with the negotiated bitrate(s) are allowed in the session.

**ibw-send/ibw-recv**: ibw parameter in send or receive direction.

**cf**: Specifies the IVAS Immersive mode coded-format (cf) transmitted in the IVAS Immersive mode frames in the session. IVAS coded format corresponds to the format represented in the IVAS Immersive mode coded frames, which is generally the input format to the encoder. The cf parameter is a list of supported comma-separated IVAS Immersive mode coded formats in the order of preference, using the identifiers from Table A.4.1-1 of the present document (column "Identifier"). Selection of the format is application-specific and out of scope of this document. EVS frames in the session are in mono format; switching to mono shall be possible.

Table A.4.1-1: IVAS coded-format

|  |  |  |
| --- | --- | --- |
| Identifier | Full Name | Clause |
| Stereo | Stereo Operation | 4.2.3 |
| SBA | Scene-based Audio (SBA, Ambisonics) Operation | 4.2.4 |
| MASA | Metadata-assisted Spatial Audio (MASA) Operation | 4.2.5 |
| ISM | Objects (Independent Streams with Metadata, ISM) Operation | 4.2.6 |
| MC | Multi-Channel (MC) Operation | 4.2.7 |
| OMASA | Combined Objects and MASA (OMASA) Operation | 4.2.9 |
| OSBA | Combined Objects and SBA (OSBA) Operation | 4.2.8 |

Mono is not listed as an IVAS Immersive mode coded-format as EVS is always supported and shall be used for mono.

**cf-send/cf-recv**: cf parameter in send or receive direction. If the cf-recv parameter is not present and not otherwise specified by cf, all IVAS coded formats consistent with the negotiated bitrate(s) are allowed in the session in receive direction.

**ns-mode**: Specifies the supported noise suppression modes for the session. Permissive values are: no-suppression, nominal and max-suppression. No-suppression and max-suppression modes indicate no suppression and maximum suppression performed by the media sender, respectively. Nominal mode indicates a suppression level between no-suppression and max-suppression modes performed by the media sender. If the parameter is empty or not present, all suppression modes are allowed for the session. With a single parameter value the session is fixed to the negotiated suppression mode. With more than one parameter value, the values are listed in a comma separated list and and the session can use noise suppression levels within the listed minimum and maximum suppression range. The first listed suppression mode shall be used at the start or update of the session. If DAS PI type (see A.3.5.7.4) is negotiated for the session, the suppression request limits may be determined by the ns-mode parameter.

**ns-mode-send/ns-mode-recv**: ns-mode parameter in send or receive direction.

**pi-types**: Specifies the supported PI data types for the session. The pi-types parameter is a list of supported comma-separated PI data types using the SDP indications listed in tables A.3.5.5-1 and A.3.5.5-2. If the pi-types parameter is not present and not otherwise specified by pi-types-send or pi-types-recv, PI data is not enabled for the session.

**pi-types-send/pi-types-recv**: pi-types parameter in send or receive direction.

**pi-br**: Specifies the maximum peak bitrate for the PI data section (excluding the E-bytes for indication) for each packet in the session in kilobits per second. Bitrate calculation for PI data shall take the packet interval, i.e. value of ptime into account. The parameter indicates the maximum bitrate for the PI data. If pi-br parameter is not present and not otherwise specified by pi-br-send or pi-br-recv, a default value of 0 shall be used.

**pi-br-send/pi-br-recv**: pi-br parameter in send or receive direction.

The following parameters are applicable only to EVS Primary and AMR-WB IO modes:

**evs-mode-switch**: as defined in Annex A of [3]. If ivas-mode-switch is 0 or not present, evs-mode-switch should not be present and shall be ignored.

**hf-only**: as specified in Annex A of [3] except that the default and only allowed value of hf-only shall be 1 in this payload format. As the only allowed value for this parameter is 1 it is not required to include this parameter.

NOTE: There is no compact format support in this payload format, contrary to the EVS payload format in Annex A of [3] that enables the compact format by default.

**ch-send:** Shall not be present. The EVS modes in this payload format shall be mono-only

**ch-recv:** Shall not be present. The EVS modes in this payload format shall be mono-only.

The following parameters are applicable only to EVS Primary modes:

**br**: as defined in Annex A of [3]. If this parameter is not present and the ibr parameter is present, then the limits of the ibr parameter apply also to this parameter if within the allowed range of the br parameter. Otherwise the default limits as defined in Annex A of [3] apply.

**br-send**: as defined in Annex A of [3]. If this parameter is not present and the ibr-send parameter is present, then the limits of the ibr-send parameter apply also to this parameter if within the allowed range of the br-send parameter. Otherwise the default limits as defined in Annex A of [3] apply.

**br-recv**: as defined in Annex A of [3]. If this parameter is not present and the ibr-recv parameter is present, then the limits of the ibr-recv parameter apply also to this parameter if within the allowed range of the br-recv parameter. Otherwise the default limits as defined in Annex A of [3] apply.

**bw**: as defined in Annex A of [3]. If this parameter is not present and the ibw parameter is present, then the limits of the ibw parameter apply also to this parameter if within the allowed range of the bw parameter. Otherwise the default limits as defined in Annex A of [3] apply.

NOTE: Narrow-band is not supported for IVAS operation

**bw-send**: as defined in Annex A of [3]. If this parameter is not present and the ibw-send parameter is present, then the limits of the ibw-send parameter apply also to this parameter if within the allowed range of the ibw-send parameter. Otherwise the default limits as defined in Annex A of [3] apply.

**bw-recv**: as defined in Annex A of [3]. If this parameter is not present and the ibw-recv parameter is present, then the limits of the ibw-recv parameter applies also to this parameter if within the allowed range of the bw-recv parameter. Otherwise the default limits as defined in Annex A of [3] apply.

**ch-aw-recv**: as defined in Annex A of [3]

The following parameters are applicable only to EVS AMR-WB IO modes:

**mode-set**: as defined in Annex A of [3]

**mode-change-period**: see [36].

**mode-change-capability**: as defined in Annex A of [3]

**mode-change-neighbor**: see [36]

## A.4.2 Mapping media type parameters into SDP

The information carried in the media type specification has a specific mapping to fields in the Session Description Protocol (SDP) [32], which is commonly used to describe RTP sessions. When SDP is used to specify sessions employing the IVAS codec, the mapping is as follows:

- The media type ("audio") goes in SDP "m=" as the media name.

- The media subtype (payload format name) goes in SDP "a=rtpmap" as the encoding name. The RTP clock rate in "a=rtpmap" shall be 16000, and the encoding parameters (number of channels) shall be omitted.

- The parameters "ptime" and "maxptime" go in the SDP "a=ptime" and "a=maxptime" attributes, respectively.

- Any remaining parameters go in the SDP "a=fmtp" attribute by copying them directly from the media type parameter string as a semicolon-separated list of parameter=value pairs.

Mapping to fields in SDP is specified in clause 6 of [33].

## A.4.3 Detailed Description of Usage of SDP Parameters

### A.4.3.1 Offer-Answer Model Considerations

The following considerations apply when using SDP Offer-Answer procedures to negotiate the use of IVAS payload in RTP:

**hf-only**: Shall not be included in the SDP offer. The answerer shall include this parameter only if it is set to 1 in the SDP offer. If the value in the SDP offer is not equal to 1, the payload type shall be rejected.

**ims**: When the ivas-mode-switch (ims) is defined for the send and the receive directions, ims should be used but ims-send and ims-recv may also be used. ims can be used even if the session is negotiated to be sendonly, recvonly, or inactive. For sendonly session, ims and ims-send can be interchangeably used. For recvonly session, ims and ims-recv can be interchangeably used. When ims is not offered for a payload type, the answerer may include ims for the payload type in the SDP answer. When ims is offered for a payload type and the payload type is accepted, the answerer shall not modify or remove ims for the payload type in the SDP answer.

**ims-send**: When ims-send is not offered for a payload type, the answerer may include ims-recv for the payload type in the SDP answer. When ims-send is offered for a payload type and the payload type is accepted, the answerer shall not modify or remove ims-send for the payload type in the SDP answer.

**ims-recv**: When ims-recv is not offered for a payload type, the answerer may include ims-send for the payload type in the SDP answer. When ims-recv is offered for a payload type and the payload type is accepted, the answerer shall not modify or remove ims-recv for the payload type in the SDP answer.

**cmr**: When cmr is not offered for a payload type, the answerer may include cmr for the payload type in the SDP answer. When cmr is offered for a payload type and the payload type is accepted, the answerer shall not modify or remove cmr for the payload type in the SDP answer.

**ibr**: When the same bitrate or bitrate range is defined for the send and the receive directions, ibr should be used but ibr-send and ibr-recv may also be used. ibr can be used even if the session is negotiated to be sendonly, recvonly, or inactive. For sendonly session, ibr and ibr-send can be interchangeably used. For recvonly session, ibr and ibr-recv can be interchangeably used. When ibr is not offered for a payload type, the answerer may include ibr for the payload type in the SDP answer. When ibr is offered for a payload type and the payload type is accepted, the answerer shall include ibr in the SDP answer which shall be identical to or a subset of ibr for the payload type in the SDP offer.

**ibr-send**: When ibr-send is not offered for a payload type, the answerer may include ibr-recv for the payload type in the SDP answer. When ibr-send is offered for a payload type and the payload type is accepted, the answerer shall include ibr-recv in the SDP answer, and the ibr-recv shall be identical to or a subset of ibr-send for the payload type in the SDP offer.

**ibr-recv**: When ibr-recv is not offered for a payload type, the answerer may include ibr-send for the payload type in the SDP answer. When ibr-recv is offered for a payload type and the payload type is accepted, the answerer shall include ibr-send in the SDP answer, and the ibr-send shall be identical to or a subset of ibr-recv for the payload type in the SDP offer.

**ibw**: When the same bandwidth or bandwidth range is defined for the send and the receive directions, ibw should be used but ibw-send and ibw-recv may also be used. ibw can be used even if the session is negotiated to be sendonly, recvonly, or inactive. For sendonly session, ibw and ibw-send can be interchangeably used. For recvonly session, ibw and ibw-recv can be interchangeably used. When ibw is not offered for a payload type, the answerer may include ibw for the payload type in the SDP answer. When ibw is offered for a payload type and the payload type is accepted, the answerer shall include ibw in the SDP answer, which shall be identical to or a subset of ibw for the payload type in the SDP offer.

**ibw-send**: When ibw-send is not offered for a payload type, the answerer may include ibw-recv for the payload type in the SDP answer. When ibw-send is offered for a payload type and the payload is accepted, the answerer shall include ibw-recv in the SDP answer, and the ibw-recv shall be identical to or a subset of ibw-send for the payload type in the SDP offer.

**ibw-recv** When ibw-recv is not offered for a payload type, the answerer may include ibw-send for the payload type in the SDP answer. When ibw-recv is offered for a payload type and the payload is accepted, the answerer shall include ibw-send in the SDP answer, and the ibw-send shall be identical to or a subset of ibw-recv for the payload type in the SDP offer.

**cf**: When the same IVAS Immersive mode coded formats are defined for the send and the receive directions, cf should be used but cf-send and cf-recv may also be used. For sendonly session, cf and cf-send can be interchangeably used. For recvonly session, cf and cf-recv can be interchangeably used.

NOTE: The IVAS codec does not support switching of coded formats (see Table A.4.1-1) without reinitialization. Change of formats would therefore require reinitialization handling for the IVAS codec on application level.

**cf-send**: The SDP offer shall contain the cf-send parameter and list at least one but may list several IVAS Immersive mode coded formats. The SDP answer shall include at least one IVAS Immersive mode coded format in cf-recv or and should respond with the one most preferred coded format from the list in the SDP offer. If more than one format is present in the SDP answer, the first format shall be used at the start of a session and may only be modified by the adaptation mechanisms present in this specification. When cf-send is offered for a payload type and the payload type is accepted, the answerer shall include cf-recv in the SDP answer, and the cf-recv shall be identical to or a subset of the cf-send parameter for the payload type in the SDP offer. If cf-recv is not offered for a payload type, cf-send in the answer may indicate any coded format.

**cf-recv** When cf-recv is offered for a payload type and the payload type is accepted, the answerer shall include cf-send in the SDP answer, and the cf-send shall be identical to or a subset of the cf-recv parameter for the payload type in the SDP offer.

**ns-mode**: If present, the parameter in the SDP offer shall list at least one suppression mode supported by the media sender in the session. With a single parameter value the session is fixed to the negotiated suppression mode. With more than one parameter value, the values are listed in a comma separated list and and the session can use noise suppression levels within the listed minimum and maximum suppression range. The first listed suppression mode shall be used at the start or update of the session. When the same suppression modes are defined for the send and the receive directions, ns-mode should be used but ns-mode-send and ns-mode-recv may also be used. For sendonly session, ns-mode and ns-mode-send can be interchangeably used. For recvonly session, ns-mode and ns-mode-recv can be interchangeably used. When ns-mode is not offered for a payload type, the answerer may include ns-mode for the payload type in the SDP answer. When ns-mode is offered for a payload type and the payload type is accepted, the answerer shall include ns-mode in the SDP answer, which shall be identical to or a subset of ns-mode for the payload type in the SDP offer.

**ns-mode-send**: When ns-mode-send is not offered for a payload type, the answerer may include ns-mode-recv for the payload type in the SDP answer. When ns-mode-send is offered for a payload type and the payload is accepted, the answerer shall include ns-mode-recv in the SDP answer, and the ns-mode-recv shall be identical to or a subset of ns-mode-send for the payload type in the SDP offer.

**ns-mode-recv**: When ns-mode-recv is not offered for a payload type, the answerer may include ns-mode-send for the payload type in the SDP answer. When ns-mode-recv is offered for a payload type and the payload is accepted, the answerer shall include ns-mode-send in the SDP answer, and the ns-mode-send shall be identical to or a subset of ns-mode-recv for the payload type in the SDP offer.

**pi-types**: The SDP offer shall list at least one but may list several supported pi types when pi data is enabled in the offer. When one or more of the offered pi types are supported, the SDP answer shall be identical to or a subset of the pi types listed in the SDP offer. When the same pi types are defined for the send and the receive directions, pi-types should be used but pi-types-send and pi-types-recv may also be used. For sendonly session, pi-types and pi-types-send can be interchangeably used. For recvonly session, pi-types and pi-types-recv can be interchangeably used. When none of the offered pi-types is supported, the answerer shall not include pi-types in the SDP answer.

**pi-types-send:** When pi-types-send is offered in the SDP offer and it is accepted, the answerer shall include pi-types-recv in the SDP answer, and the pi-types-recv shall be identical to or a subset of the pi-types-send parameter in the SDP offer.

**pi-types-recv**: When pi-types-recv is offered in the SDP offer and it is accepted, the answerer shall include pi-types-send in the SDP answer, and the pi-types-send shall be identical to or a subset of the pi-types-recv parameter in the SDP offer.

**pi-br**: When the same bitrate is defined for the send and the receive directions, pi-br should be used but pi-br-send and pi-br-recv may also be used. pi-br can be used even if the session is negotiated to be sendonly, recvonly, or inactive. For sendonly session, pi-br and pi-br-send can be interchangeably used. For recvonly session, pi-br and pi-br-recv can be interchangeably used. When pi-br is not offered in the SDP offer, the answerer shall not include pi-br in the SDP answer. When pi-br is offered in the SDP offer and it is accepted, the answerer shall include pi-br in the SDP answer which shall be identical or lower than pi-br in the SDP offer.

**pi-br-send**: When pi-br-send is offered in the SDP offer and it is accepted, the answerer shall include pi-br-recv in the SDP answer, and the pi-br-recv shall be identical or lower than pi-br-send in the SDP offer.

**pi-br-recv**: When pi-br-recv is offered in the SDP offer and it is accepted, the answerer shall include pi-br-send in the SDP answer, and the pi-br-send shall be identical or lower than pi-br-recv in the SDP offer.

The offer-answer considerations for the remaining EVS parameters are as described in TS 26.445 Annex A.3.3.1 [3].

END OF CHANGES