**3GPP TSG-SA4 Meeting #131 S4-250230**

**Geneva, Switzerland, 17-22 February 2025 Revision of S4-250230**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** |  | **rev** | **1** | **Current version:** |  |  |
|  | | | | | | | | |
| *For* [***HE******LP***](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:*** | Integrating IVAS into 3GPP MTSINP and MTSIMA MO | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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 can be 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:*** | | 3GPP MTSINP and MTSIMA MO can be used to configure speech codecs, AMR and AMR-WB, EVS, but not IVAS. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Parameters to control operation modes are introduced to MTSINP and MTSIMA. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | IVAS cannot be configured with 3GPP MTSINP and MTSIMA MO. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 15.1, 15.2, 17.2, 17.3.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |



## 15.1 General

The MTSI client in the terminal may use the OMA-DM solution specified in this clause for enhancing the SDP negotiation and resource reservation process. If a MTSI client in the terminal uses this feature, it is mandatory for the MTSI client in the terminal to implement the Management Object (MO) as described in this clause.

The 3GPP MTSINP (MTSI Network Preference) MO defined in this clause may be used to manage the QoS profile settings which express the network preference for the MTSI client in the terminal. The MO covers parameters that the MTSI client in the terminal could make use of in SDP negotiation and resource reservation process. If a MTSI client in the terminal supports the feature, the usage of the MO includes:

1. During SDP negotiation process, MTSI client in the terminal should start SDP negotiation based on the MO parameters.

2. During resource reservation process, MTSI client in the terminal should start QoS negotiation based on the MO parameters.

The following parameters in MTSI should be included in the Management Object (MO):

Speech codec (AMR, AMR-WB, EVS, IVAS) and bearer QoS parameters

Video codec (H.264 (AVC), H.265 (HEVC)) and bearer QoS parameters

Real Time text bearer QoS parameters

Indication of the priority when there are more than one alternative for a media type is included. Version numbering is included for possible extending of MO.

The Management Object Identifier shall be: urn:oma:mo:ext-3gpp-mtsinp:1.0.

Protocol compatibility: The MO is compatible with OMA Device Management protocol specifications, version 1.2 and upwards, and is defined using the OMA DM Device Description Framework as described in the Enabler Release Definition OMA-ERELD \_DM-V1\_2[67].

## 15.2 Nodes Definition

The following nodes and leaf objects in figure 15.1 shall be contained under the 3GPP\_MTSINP node if a MTSI client in the terminal support the feature described in this clause (information of DDF for this MO is given in Annex H):



Figure 15.1: MTSI network preference management object tree

**Node: /*<X>***

This interior node specifies the unique object id of a MTSI network preferences management object. The purpose of this interior node is to group together the parameters of a single object.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

The following interior nodes shall be contained if the MTSI client in the terminal supports the "MTSI network preferences Management Object".

**/*<X>*/Speech**

The Speech node is the starting point of the speech codec definitions (if any speech codec are available)

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/<X>**

This interior node is used to allow a reference to a list of speech codec objects.

- Occurrence: OneOrMore

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/ID**

This leaf node represents the identification number of a set of parameters for speech session.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/TAG**

This leaf node represents the identification tag of a set of parameters for speech session. It is recommended to have at least a node, for example, ID, TAG, or implementation-specific ones, for the identification purpose such that each set of parameters can be distinguished and accessed.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/Priority**

This leaf represents the priority of a set of parameters for speech session. Lower value means higher priority and the value is used in the terminal for client initiated QoS handling. The priority uses a 16 bit unsigned integer.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

- Values: Zero or higher

**/*<X>*/Speech/<X>/IPver**

This leaf represents the version of the Internet Protocol used in the session.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

- Values: "IPv4", "IPv6"

**/*<X>*/Speech/<X>/Codec**

This leaf gives the MIME subtype name of speech codec. This leaf is preferably pre-configured by the device.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

- Values: MIME subtype name of speech codec, e.g., "AMR", "AMR-WB", "EVS", "IVAS".

The value "AMR" refers to the AMR speech codec as defined in 3GPP. The value "AMR-WB" refers to the AMR-WB speech codec as defined in 3GPP. The value "EVS" refers to the EVS speech codec as defined in 3GPP. The value "IVAS" refers to the IVAS codec as defined in 3GPP.

**/*<X>*/Speech/<X>/Bandwidth**

This interior node is used to allow a reference to a list of parameters related to speech bandwidth assignment.

- Occurrence: One

- Format: node

- Minimum Access Types: Get

- Values: positive integer

**/*<X>*/Speech/<X>/Bandwidth/AS**

This leaf gives the preferred speech codec bandwidth by the network for the bearer set-up, including RTP/UDP/IP headers. It provides the value for "b=AS" line for speech part used in the end-to-end SDP negotiation process, which represents the bit rate in kbits/sec.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/Bandwidth/RS**

This leaf provides the value for "b=RS" line for speech part used in the end-to-end SDP negotiation process, which represents the bit rate in bits/sec.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/Bandwidth/RR**

This leaf provides the value for "b=RR" line for speech part used in the end-to-end SDP negotiation process, which represents the bit rate in bits/sec.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/RateSet**

This leaf node represents a list of bit rates used by speech codec. Depending on the codec, each value can be understood as either the highest rate or the average rate. The entries in the list may either be generic, i.e., usable for any codec, but can also be codec-specific. The default usage is the generic list where the bit rates in bits/sec are included, e.g., "5000, 6000, 7500, 12500". A codec-specific list may indicate the desired modes. For example, in the case of AMR, the list could be "0, 2, 4, 7".

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/EVS**

This interior node is used to allow a reference to a list of parameters related to the configuration of EVS speech codec.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/EVS/Br**

This leaf gives the value of br, a parameter representing the range or value of bit-rate for EVS speech codec defined in [125].

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/EVS/Bw**

This leaf gives the value of bw, a parameter representing the range or value of bandwidth for EVS speech codec defined in [125].

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/ConRef**

This node specifies a reference to QoS parameters Management Object. The interior node’s leaf nodes specify the network preferred QoS parameters as defined in TS 24.008 and they should be used in the bearer request when client initiated QoS happen. Implementation specific MO may be referenced.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/Ext**

The Ext is an interior node where the vendor specific information can be placed (vendor meaning application vendor, device vendor etc.). Usually the vendor extension is identified by vendor specific name under the ext node. The tree structure under the vendor identified is not defined and can therefore include one or more un-standardized sub-trees.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/IVAS**

This interior node is used to allow a reference to a list of parameters related to the configuration of IVAS codec.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/IVAS/Ibr**

This leaf gives the value of ibr, a parameter representing the range or value of immersive bit-rate (ibr) for the IVAS codec defined in [186].

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/IVAS/Ibw**

This leaf gives the value of ibw, a parameter representing the range or value of immersive bandwidth (ibw) for IVAS codec defined in [186].

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/IVAS/Br**

This leaf gives the value of br, a parameter representing the range or value of bit-rate for mono operation of the IVAS codec defined in [186].

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/IVAS/Bw**

This leaf gives the value of bw, a parameter representing the range or value of bandwidth for mono operation of the IVAS codec defined in [186].

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/IVAS/PCA**

This leaf gives the value of pca, a parameter to activate PCA in SBA format FOA at 256 kbps in the IVAS codec defined in [186].

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get**/*<X>*/Video**

The Video node is the starting point of the video codec definitions (if any video codec are available)

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/<X>**

This interior node is used to allow a reference to a list of video codec objects.

- Occurrence: OneOrMore

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/<X>/ID**

This leaf node represents the identification number of a set of parameters for video session.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/<X>/TAG**

This leaf node represents the identification tag of a set of parameters for video session. It is recommended to have at least a node, for example, ID, TAG, or implementation-specific ones, for the identification purpose such that each set of parameters can be distinguished and accessed.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Video/<X>/Priority**

This leaf represents the priority of a set of parameters for speech session. Lower value means higher priority and the value is used in the terminal for client initiated QoS handling. The priority uses a 16 bit unsigned integer.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

- Values: Zero or higher

**/*<X>*/Video/<X>/IPver**

This leaf represents the version of the Internet Protocol used in the session.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

- Values: "IPv4", "IPv6"

**/*<X>*/Video/<X>/Codec**

This leaf gives the MIME subtype name of video codec. This leaf is preferably pre-configured by the device.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

- Values: MIME subtype name of video codec, e.g., "H264", "H265".

The values "H264" and "H265" refer to the H.264 (AVC) and H.265 (HEVC) codecs as defined by MPEG and ITU respectively. The usage of H.264 (AVC) and H.265 (HEVC) codecs (profiles, levels etc) is described in the document TS 26.114 Chapter 5.5.2.

**/*<X>*/Video/<X>/Bandwidth**

This interior node is used to allow a reference to a list of parameters related to video bandwidth assignment.

- Occurrence: One

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/<X>/Bandwidth/AS**

This leaf gives the preferred video codec bandwidth by the network for the bearer set-up, including RTP/UDP/IP headers. It provides the value for "b=AS" line for video part used in the end-to-end SDP negotiation process, which represents the bit rate in kbits/sec.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/<X>/Bandwidth/RS**

This leaf provides the value for "b=RS" line for video part used in the end-to-end SDP negotiation process, which represents the bit rate in bits/sec.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/<X>/Bandwidth/RR**

This leaf provides the value for "b=RR" line for video part used in the end-to-end SDP negotiation process, which represents the bit rate in bits/sec.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/<X>/Bandwidth/Source**

This leaf gives the preferred video encoding bandwidth in kbits/sec.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

**/*<X>*/Video/<X>/Bandwidth/PayloadSize**

This leaf gives the preferred payload size for video, excluding payload header, which represents the amount of encoded video data in bytes transported over a RTP packet.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/<X>/ProfileLevel**

This interior node is used to allow a reference to a list of parameters related to the profile and level of video codec.

- Occurrence: One

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/<X>/ProfileLevel/H264**

This leaf gives the profile-level-id of H.264 (AVC) video codec, which indicates the profile that the codec supports and the highest level supported for the signaled profile [24], [25].

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Video/<X>/ProfileLevel/H265**

This interior node is used to allow a reference to a list of parameters related to the profile and level of H.265 (HEVC) video codec.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/<X>/ProfileLevel/H265/Profile**

This leaf gives the value of profile-id, a parameter representing the profile of H.265 (HEVC) video codec defined in [119], [120].

- Occurrence: One

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/<X>/ProfileLevel/H265/Level**

This leaf gives the value of level-id, a parameter representing the level of H.265 (HEVC) video codec defined in [119], [120]. Level indicates the maximum computational complexity supported by the offerer in performing decoding for the given profile.

- Occurrence: One

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/<X>/ImageAttr**

This interior node is used to allow a reference to a list of parameters related to the image sizes supported or preferred, specified with the "imageattr" attribute. (see clause A.4)

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/<X>/ImageAttr/Send**

This leaf gives the supported image sizes for the send direction. The value is a string such as "176, 144, 224, 176, 272, 224, 320, 240" which means four image sizes, 176x144, 224x176, 272x224, and 320x240 are supported for the send direction. The maximum image size in this leaf shall not exceed the maximum size limited by the offered codec level.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Video/<X>/ImageAttr/Recv**

This leaf gives the supported image sizes and their preferences for the receive direction. The value is a string such as "176, 144, 0.5, 224, 176, 0.5, 272, 224, 0.6, 320, 240, 0.5" which means four image sizes, 176x144, 224x176, 272x224, and 320x240 are supported for the receive direction but 272x224 is preferred since it might fit the available space on the display of the receiver better than the other image sizes. The maximum image size in this leaf shall not exceed the maximum size limited by the offered codec level. The value representing the level of preference by the offerer, defined in [76], is between 0 and 1 inclusive and 0.5 by default.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Video/<X>/ConRef**

This node specifies a reference to QoS parameters Management Object. The interior node’s leaf nodes specify the network preferred QoS parameters as defined in TS 24.008 and they should be used in the bearer request when client initiated QoS happen. Implementation specific MO may be referenced.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Video/<X>/Ext**

The Ext is an interior node where the vendor specific information can be placed (vendor meaning application vendor, device vendor etc.). Usually the vendor extension is identified by vendor specific name under the ext node. The tree structure under the vendor identified is not defined and can therefore include one or more un-standardized sub-trees.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Text**

The Text node is the starting point of the real time text codec definitions (if the real time text codec is available).

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Text/<X>**

This interior node is used to allow a reference to the real time text codec objects.

- Occurrence: OneOrMore

- Format: node

- Minimum Access Types: Get

**/*<X>*/Text/<X>/ID**

This leaf node represents the identification number of a set of parameters for text session.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Text/<X>/TAG**

This leaf node represents the identification tag of a set of parameters for text session. It is recommended to have at least a node, for example, ID, TAG, or implementation-specific ones, for the identification purpose such that each set of parameters can be distinguished and accessed.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Text/<X>/Priority**

This leaf represents the priority of a set of parameters for text session. Lower value means higher priority and the value is used in the terminal for client initiated QoS handling. The priority uses a 16 bit unsigned integer.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

- Values: Zero or higher

**/*<X>*/Text/<X>/IPver**

This leaf represents the version of the Internet Protocol used in the session.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

- Values: "IPv4", "IPv6"

**/*<X>*/Text/<X>/TextFormat**

This leaf node represents the MIME subtype name of text conversation protocol. The value "t140" refers to T.140 defined in ITU-T [26], [27].

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

- Values: MIME subtype name of the text conversation protocol, e.g., "t140"

**/*<X>*/Text/<X>/Bandwidth**

This interior node is used to allow a reference to a list of parameters related to text bandwidth assignment.

- Occurrence: One

- Format: node

- Minimum Access Types: Get

**/*<X>*/Text/<X>/Bandwidth/AS**

This leaf provides the value for "b=AS" line for text part used in the end-to-end SDP negotiation process, which represents the bit rate in kbits/sec.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/Bandwidth/RS**

This leaf provides the value for "b=RS" line for text part used in the end-to-end SDP negotiation process, which represents the bit rate in bits/sec.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/<X>/Bandwidth/RR**

This leaf provides the value for "b=RR" line for text part used in the end-to-end SDP negotiation process, which represents the bit rate in bits/sec.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Text/<X>/RedundancyLevel**

This leaf node represents the level of redundancy when redundancy is used with T.140 text.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

- Values: 0, 100, 200, 300

**/*<X>*/Text/*<X>*/SamplingTime**

This leaf node, defined in clause 9.4, represents the period for which text may be buffered before transmission. Buffering time, defined in [31], has an identical meaning as this node, i.e., the shortest period between text transmissions. Default value is 300 ms.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Text/<X>/ConRef**

This node specifies a reference to QoS parameters Management Object. The interior node’s leaf nodes specify the network preferred QoS parameters as defined in TS 24.008 and they should be used in the bearer request when client initiated QoS happen. Implementation specific MO may be referenced.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Text/<X>/Ext**

The Ext is an interior node where the vendor specific information can be placed (vendor meaning application vendor, device vendor etc.). Usually the vendor extension is identified by vendor specific name under the ext node. The tree structure under the vendor identified is not defined and can therefore include one or more un-standardized sub-trees.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Ext**

The Ext is an interior node where the vendor specific information can be placed (vendor meaning application vendor, device vendor etc.). Usually the vendor extension is identified by vendor specific name under the ext node. The tree structure under the vendor identified is not defined and can therefore include one or more un-standardized sub-trees.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

## 15.3 Example Configuration of 3GPP MTSINP MO

The examples below are configurations of 3GPP MTSINP MO for selected speech, text, and video sessions in Annex A. An example of SDP offer for speech session is shown in Table A.6.1, which includes two RTP payload types for AMR-NB. Parameter values in Table 15.1 may apply to both payload types and additional SDP parameters such as max-red may be included under the Ext node as vendor extensions. Depending on the implementation, two sets of session parameters may be defined for the two payload types respectively.

Table 15.1: Example configuration of MTSINP for speech session

|  |  |  |  |
| --- | --- | --- | --- |
| **Speech** | ID | | 4 |
| TAG | | Undefined |
| Priority | | 2 |
| IPver | | IPv4 |
| Codec | | "AMR" |
| Bandwidth | AS | 30 |
| RS | 0 |
| RR | 2000 |
| RateSet | | Undefined |
| ConRef | | Undefined |

An example configuration of MTSINP for video session is shown in Table 15.3, which includes the RTP payload types for H.264. Although the "b=AS" value can also be computed with the Source and PayloadSize nodes, a different value with appropriate implementation margin can be directly assigned to the AS node. If the AS, Source, and PayloadSize nodes are defined together, the AS node value should be used for setting "b=AS". In Table 15.3, the "b=AS" values of 315, for H.264, are computed assuming IPv4 addressing. Note that the Priority node of H.264 is assigned values of 5, which shows that depending on service policy, parameters sets of lower priority may be preferred in the construction of SDP offer. If the ImageAttr node is to be defined, the maximum image size in either the Send or Recv node shall not exceed the maximum size limited by the offered codec level, which is 352x288 for Baseline profile at level 1.1.

Table 15.2: Example configuration of MTSINP for text session

|  |  |  |  |
| --- | --- | --- | --- |
| **Text** | ID | | 3 |
| TAG | | Undefined |
| Priority | | 1 |
| IPver | | IPv4 |
| TextFormat | | "t140" |
| Bandwidth | AS | 2 |
| RS | 0 |
| RR | 500 |
| RedundancyLevel | | 200 |
| ConRef | | Undefined |
| **Text** | ID | | 4 |
| TAG | | Undefined |
| Priority | | 2 |
| IPver | | IPv4 |
| TextFormat | | "t140" |
| Bandwidth | AS | 2 |
| RS | 0 |
| RR | 500 |
| RedundancyLevel | | 0 |
| ConRef | | Undefined |

An example of SDP offer for video session is shown in Table A.4.4b, which includes a RTP payload type for H.264. Although the "b=AS" value can also be computed with the Source and PayloadSize nodes, a different value with appropriate implementation margin can be directly assigned to the AS node. If the AS, Source, and PayloadSize nodes are defined together, the AS node value should be used for setting "b=AS". In Table 15.3, the "b=AS" values of 315 and 57 kbps, for H.264 and H.263 respectively, are computed assuming IPv4 addressing. Note that the Priority nodes of H.264 and H.263 are assigned values of 5 and 3 respectively, which shows that depending on service policy, parameters sets of lower priority may be preferred in the construction of SDP offer. If the ImageAttr node is to be defined, as for H.264 in Table A.4.10a, the maximum image size in either the Send or Recv node shall not exceed the maximum size limited by the offered codec level, which is 352x288 for Baseline profile at level 1.1.

Table 15.3: Example configuration of MTSINP for video session

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Video** | ID | | | 4 |
| TAG | | | Undefined |
| Priority | | | 5 |
| IPver | | | IPv4 |
| Codec | | | "H264" |
| Bandwidth | AS | | 315 |
| RS | | 0 |
| RR | | 2500 |
| Source | | 300 |
| PayloadSize | | 1250 |
| ProfileLevel | H263 | Profile | Undefined |
| Level | Undefined |
| MPEG4 | | Undefined |
| H264 | | "42e00c" |
| ImageAttr | Send | | "176, 144, 224, 176, 272, 224, 320, 240" |
| Receive | | "176, 144, 0.5, 224, 176, 0.5, 272, 224, 0.6, 320, 240, 0.5" |
| ConRef | | | Undefined |
| **Video** | ID | | | 1 |
| TAG | | | Undefined |
| Priority | | | 3 |
| IPver | | | IPv4 |
| Codec | | | "H263-2000" |
| Bandwidth | AS | | 57 |
| RS | | 0 |
| RR | | 2500 |
| Source | | 48 |
| PayloadSize | | 250 |
| ProfileLevel | H263 | Profile | 0 |
| Level | 10 |
| MPEG4 | | Undefined |
| H264 | | Undefined |
| ImageAttr | Send | | Undefined |
| Receive | | Undefined |
| ConRef | | | Undefined |

## 17.2 Media adaptation management object

The following nodes and leaf objects in figure 17.1 shall be contained under the 3GPP\_MTSIMA node if the MTSI client in terminal supports the feature described in this clause. Information of DDF for this MO is given in Annex J.

Figure 17.1: MTSI media adaptation management object tree

**Node: /*<X>***

This interior node specifies the unique object id of a MTSI media adaptation management object. The purpose of this interior node is to group together the parameters of a single object.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

The following interior nodes shall be contained if the MTSI client in terminal supports the "MTSI media adaptation management object".

**/*<X>*/Speech**

The Speech node is the starting point of parameters related to speech adaptation if any speech codec are available.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>***

This interior node is used to allow a reference to a list of speech adaptation parameters.

- Occurrence: OneOrMore

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ID**

This leaf node represents the identification number of a set of parameters related to speech adaptation.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/TAG**

This leaf node represents the identification tag of a set of parameters for speech adaptation. It is recommended to have at least a node, for example, ID, TAG, or implementation-specific ones, for the identification purpose such that each set of parameters can be distinguished and accessed.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/PLR**

This interior node is used to allow a reference to a list of parameters related to packet loss rate (PLR).

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/PLR/MAX**

This leaf node represents the maximum PLR tolerated when redundancy is not used, before the receiver signals the sender to attempt adaptation that reduces PLR or operate at modes more robust to packet loss.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

- Values: 0 ~ 100 %

**/*<X>*/Speech/*<X>*/PLR/LOW**

This leaf node represents the minimum PLR tolerated, before the receiver signals the sender to probe for higher bit rate, increase the packet rate, reduce redundancy, or perform other procedures that could improve speech quality under such favorable conditions.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

- Values: 0 ~ 100 %

**/*<X>*/Speech/*<X>*/PLR/STATE\_REVERSION**

This leaf node represents the maximum PLR tolerated after adaptation state machine has taken actions, based on the measured PLR lower than LOW. Once PLR exceeds this threshold, the receiver decides that the actions taken to improve speech quality were not successful.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

- Values: 0 ~ 100 %

**/*<X>*/Speech/*<X>*/PLR/RED\_INEFFECTIVE**

This leaf node represents the maximum PLR tolerated, after adaptation state machine has taken actions to increase redundancy. Once PLR exceeds this threshold, the receiver decides that the situation was not improved but degraded.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

- Values: 0 ~ 100 %

**/*<X>*/Speech/*<X>*/PLR/DURATION\_MAX**

This leaf node represents the duration (ms) of sliding window over which PLR is observed and computed. The computed value is compared with the MAX threshold.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/PLR/DURATION\_LOW**

This leaf node represents the duration (ms) of sliding window over which PLR is observed and computed. The computed value is compared with the LOW threshold.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/PLR/DURATION\_STATE\_REVERSION**

This leaf node represents the duration (ms) of sliding window over which PLR is observed and computed. The computed value is compared with the STATE\_REVERSION threshold.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/PLR/DURATION\_RED\_INEFFECTIVE**

This leaf node represents the duration (ms) of sliding window over which PLR is observed and computed. The computed value is compared with the RED\_INEFFECTIVE threshold.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/PLR/DURATION**

This leaf node represents the duration (ms) of sliding window over which PLR is observed and computed. The computed value is compared with the PLR thresholds.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/PLB**

This interior node is used to allow a reference to a list of parameters related to an event, packet loss burst (PLB), in which a large number of packets are lost during a limited period.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/PLB/LOST\_PACKET**

This leaf node represents the number of packets lost during a period of PLB/DURATION.

- Occurrence: One

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/PLB/DURATION**

This leaf node represents the period (ms) for which LOST\_PACKET is counted.

- Occurrence: One

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ECN**

This interior node is used to allow a reference to a list of parameters related to Explicit Congestion Notification (ECN) to IP.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ECN/USAGE**

This leaf node represents a Boolean parameter that enables or disables ECN-based adaptation.

- Occurrence: ZeroOrOne

- Format: bool

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ECN/MIN\_RATE**

This leaf node represents the minimum bit rate (bps, excluding IP, UDP, RTP and payload overhead) that speech encoder should use during ECN-based adaptation.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ECN/STEPWISE\_DOWNSWITCH**

This leaf node represents a Boolean parameter that selects which down-switch method to use, i.e., direct or step-wise, for ECN-triggered adaptation.

- Occurrence: ZeroOrOne

- Format: bool

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ECN/RATE\_LIST**

This leaf node represents the list of bit rates to use during stepwise down-switch. This parameter is only applicable when stepwise down-switch is used.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ECN/INIT\_WAIT**

This leaf node represents the time (ms) that the sender should wait before an up-switch is attempted in the beginning of the session if no rate control information or reception quality feedback information is received.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ECN/INIT\_UPSWITCH\_WAIT**

This leaf node represents the time (ms) that the sender should wait at each step during up-switch in the beginning of the session.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ECN/CONGESTION\_WAIT**

This leaf node represents the minimum interval (ms) between detection of ECN-CE and up-switch from the reduced rate.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ECN/CONGESTION\_UPSWITCH\_WAIT**

This leaf node represents the waiting time (ms) at each step during up-switch after a congestion event, except for the initial up-switch which uses the ECN/CONGESTION\_WAIT time.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ICM**

This interior node is used to allow a reference to a list of parameters related to Initial Codec Mode (ICM).

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ICM/INITIAL\_CODEC\_RATE**

This leaf node represents the bit rate (bps, excluding IP, UDP, RTP and payload overhead) that the speech encoder should use when starting the encoding in the beginning of the session.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ICM/INITIAL\_CODEC\_BANDWIDTH**

This leaf node represents the audio bandwidth that the EVS speech encoder should use when starting the encoding in the beginning of the session, unless specified by bw, bw-send, or bw-recv parameter.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

- Values: nb, wb, swb, fb

**/*<X>*/Speech/*<X>*/ICM/INITIAL\_CODEC\_BANDWIDTH\_IVAS**

This leaf node represents the audio bandwidth that the IVAS encoder should use when starting the encoding in the beginning of the session, unless specified by bw, bw-send, or bw-recv parameter.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

- Values: wb, swb, fb

**/*<X>*/Speech/*<X>*/ICM/INIT\_WAIT**

This leaf node represents the time (ms) that the sender should wait before an up-switch is attempted in the beginning of the session if no rate control information or reception quality feedback information is received.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ICM/INIT\_UPSWITCH\_WAIT**

This leaf node represents the time (ms) that the sender should wait at each step during up-switch in the beginning of the session.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ ICM/INIT\_PARTIAL\_REDUNDANCY\_OFFSET\_SEND**

This leaf node represents the initial partial redundancy offset (-1, 0, 2, 3, 5, or 7) that the EVS speech encoder should use when starting the encoding in the beginning of the session that uses channel aware mode, unless asked otherwise by the far-end MTSI client in terminal with the ch-aw-recv parameter .

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/ ICM/INIT\_PARTIAL\_REDUNDANCY\_OFFSET\_RECV**

This leaf node represents the initial partial redundancy offset (-1, 0, 2, 3, 5, or 7) that the MTSI client in terminal should ask the far-end MTSI client in terminal with the ch-aw-recv parameter to use when starting the encoding in the beginning of the session that uses channel aware mode.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/MEDIA\_ROBUSTNESS**

This interior node is used to allow a reference to a list of parameters related to Media Robustness Adaptation that can be used for the CHEM feature. Each unique codec type is identified by the CODEC\_ID under a corresponding instance of the MEDIA\_ROBUSTNESS node which groups the parameters associated with the codec type/CODEC\_ID.

- Occurrence: ZeroOrMore

- Format: node

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>/*MEDIA\_ROBUSTNESS/CODEC\_ID**

This leaf node represents the codec MIME type.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/MEDIA\_ROBUSTNESS/TAG**

This leaf node represents the identification tag of a set of parameters for speech robustness adaptation of a codec type identified by the CODEC\_ID. It is recommended to have at least a node, for example, TAG, or implementation-specific ones, for the identification purpose such that each set of parameters can be distinguished and accessed.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/MEDIA\_ROBUSTNESS/CFG\_BIT\_RATE\_LIST**

This interior node is used to provide a list of the bit rates of the configurations of the codec type (CODEC\_ID) listed from the bit rate of the least robust configuration first to the bit rate of the most robust listed last.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/MEDIA\_ROBUSTNESS/CFG\_RED\_LIST**

This interior node is used to provide a list of the redundancy levels of the configurations of the codec type (CODEC\_ID) listed from the redundancy level of the least robust configuration first to the redundancy level of the most robust listed last.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/MEDIA\_ROBUSTNESS/HIGH\_PLR\_THRESH\_LIST**

This interior node is used to provide a list of the high PLR thresholds for each codec configuration except for the most robust configuration. A high PLR threshold for a given codec configuration is the highest tolerable PLR at that codec configuration before the MTSI client requests a more robust codec configuration that will yield lower PLR.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/MEDIA\_ROBUSTNESS/LOW\_PLR\_THRESH\_LIST**

This interior node is used to provide a list of the low PLR thresholds for each codec configuration except for the least robust configuration. A low PLR threshold for a given codec configuration is the lowest tolerable PLR at that codec configuration before the MTSI client requests a less robust codec configuration that will yield better quality.

- Occurrence: One

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/MEDIA\_ROBUSTNESS/DJB\_PLR**

This interior node indicates whether the estimated PLR is measured before or after de-jitter buffering.

- Occurrence: One

- Format: boolean

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/MEDIA\_ROBUSTNESS/PLR\_AVG\_WINDOW**

This interior node indicates the duration of the sliding window used by the media receiver to estimate the received PLR.

- Occurrence: One

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/N\_INHIBIT**

This leaf node represents the period (number of speech frames) for which adaptation is disabled to avoid the ping-pong effects, when adaptation state machine transitions from one state to another then back to the original state.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/N\_HOLD**

This leaf node represents the period (proportion of PLR/DURATION) that can substitute other periods such as DURATION\_LOW or DURATION\_RED\_INEFFECTIVE, when they are not available.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/T\_RESPONSE**

This leaf node represents the expected response time (ms) for a request to be fulfilled. If a request transmitted to the far-end is not granted within a period of T\_RESPONSE, the request can be considered lost during transmission or the far-end MTSI client in terminal might have decided not to grant it.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Speech/*<X>*/Ext**

The Ext is an interior node where the vendor specific information can be placed (vendor meaning application vendor, device vendor etc.). Usually the vendor extension is identified by vendor specific name under the ext node. The tree structure under the vendor identified is not defined and can therefore include one or more un-standardized sub-trees.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video**

The Video node is the starting point of parameters related to video adaptation if any video codec are available.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/*<X>***

This interior node is used to allow a reference to a list of video adaptation parameters.

- Occurrence: OneOrMore

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/ID**

This leaf node represents the identification number of a set of parameters related to video adaptation.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/TAG**

This leaf node represents the identification tag of a set of parameters for video adaptation. It is recommended to have at least a node, for example, ID, TAG, or implementation-specific ones, for the identification purpose such that each set of parameters can be distinguished and accessed.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/PLR**

This interior node is used to allow a reference to a list of parameters related to PLR.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/PLR/MAX**

This leaf node represents the maximum PLR tolerated, before the receiver signals the sender to reduce the bit rate such that PLR is reduced.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

- Values: 0 ~ 100 %

**/*<X>*/Video/*<X>*/PLR/LOW**

This leaf node represents the minimum PLR tolerated, before the receiver signals the sender to increase the bit rate.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

- Values: 0 ~ 100 %

**/*<X>*/Video/*<X>*/PLR/DURATION\_MAX**

This leaf node represents the duration (ms) of sliding window over which PLR is observed and computed. The computed value is compared with the MAX threshold.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/PLR/DURATION\_LOW**

This leaf node represents the duration (ms) of sliding window over which PLR is observed and computed. The computed value is compared with the LOW threshold.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/PLB**

This interior node is used to allow a reference to a list of parameters related to PLB.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/PLB/LOST\_PACKET**

This leaf node represents the number of packets lost during a period of PLB/DURATION.

- Occurrence: One

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/PLB/DURATION**

This leaf node represents the period (ms) for which LOST\_PACKET is counted.

- Occurrence: One

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/MIN\_QUALITY**

This interior node is used to allow a reference to a list of parameters related to the minimum video quality.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/MIN\_QUALITY/BIT\_RATE**

This interior node is used to allow a reference to a list of parameters related to the minimum bit rate.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/<X>/Video/*<X>*/MIN\_QUALITY/BIT\_RATE/ABSOLUTE**

This leaf node represents the minimum bit rate (kbps) that video encoder should use.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

**/<X>/Video/*<X>*/MIN\_QUALITY/BIT\_RATE/RELATIVE**

This leaf node represents the minimum bit rate (proportion of the bit rate negotiated for the video session) that video encoder should use.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

- Values: 0 ~ 100 %

**/<X>/Video/*<X>*/MIN\_QUALITY/FRAME\_RATE**

This interior node is used to allow a reference to a list of parameters related to the minimum frame rate.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/<X>/Video/*<X>*/MIN\_QUALITY/FRAME\_RATE/ABSOLUTE**

This leaf node represents the minimum frame rate (fps, frames per second) that video encoder should use.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

**/<X>/Video/*<X>*/MIN\_QUALITY/FRAME\_RATE/RELATIVE**

This leaf node represents the minimum frame rate (proportion of the maximum frame rate limited by the codec profile/level negotiated for the video session) that video encoder should use.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

- Values: 0 ~ 100 %

**/*<X>*/Video/*<X>*/MIN\_QUALITY/QP**

This interior node is used to allow a reference to a list of parameters related to video quantisation.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/MIN\_QUALITY/QP/H264**

This leaf node represents the maximum value of luminance quantization parameter QPY that video encoder should use if H.264 is negotiated for the video session.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

- Values: 0 ~ 51

**/*<X>*/Video/*<X>*/ECN**

This interior node is used to allow a reference to a list of parameters related to Explicit Congestion Notification (ECN) to IP.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/ECN/STEP\_UP**

This leaf node represents the proportion of current encoding rate estimated by video receiver, which is used to ask video sender to increase the rate by this value.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/ECN/STEP\_DOWN**

This leaf node represents the decrease in the requested maximum encoding rate over current rate, when a down-switch is requested by the receiver.

- Occurrence: ZeroOrOne

- Format: chr

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/ECN/INIT\_WAIT**

This leaf node represents the minimum waiting time (ms) before up-switch is attempted in the initial phase of the session.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/ECN/INIT\_UPSWITCH\_WAIT**

This leaf node represents the waiting time (ms) at each step during up-switch in the beginning of the session.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/ECN/CONGESTION\_WAIT**

This leaf node represents the minimum interval (ms) between detection of ECN-CE and up-switch from the reduced rate.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/ECN/CONGESTION\_UPSWITCH\_WAIT**

This leaf node represents the waiting time (ms) at each step during up-switch after a congestion event, except for the initial up-switch which uses the ECN/CONGESTION\_WAIT time.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/ECN/MIN\_RATE**

This interior node is used to allow a reference to a list of parameters related to the minimum bit rate during ECN-based adaptation.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/ECN/MIN\_RATE/ABSOLUTE**

This leaf node represents the minimum bit rate (kbps, excluding IP, UDP, RTP and payload overhead) that video encoder should use during ECN-based adaptation.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/ECN/MIN\_RATE/RELATIVE**

This leaf node represents the minimum bit rate (proportion of the bit rate negotiated for the video session) that video encoder should use during ECN-based adaptation.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

**/<X>/Video/*<X>*/RTP\_GAP**

This leaf node represents the maximum interval between packets (proportion of the estimated frame period) tolerated, before the receiver declares bursty packet loss or severe congestion condition.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

**/*<X>*/Video/INC\_FBACK\_MIN\_INTERVAL**

This leaf node represents the minimum interval (ms) at which rate adaptation feedback such as TMMBR should be sent from the receiver to the sender, when the bit rate is being increased.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/DEC\_FBACK\_MIN\_INTERVAL**

This leaf node represents the minimum interval (ms) at which rate adaptation feedback such as TMMBR should be sent from the receiver to the sender, when the bit rate is being decreased.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/TP\_DURATION\_HI**

This leaf node represents the duration (ms) of sliding window over which the interval between packet arrival and playout is observed. The computed value is compared with TARGET\_PLAYOUT\_MARGIN\_HI.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/TP\_DURATION\_MIN**

This leaf node represents the duration (ms) of sliding window over which the interval between packet arrival and playout is observed. The computed value is compared with TARGET\_PLAYOUT\_MARGIN\_MIN.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/TARGET\_PLAYOUT\_MARGIN\_HI**

This leaf node represents the upper threshold of the interval (ms) between packet arrival and its properly scheduled playout.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/TARGET\_PLAYOUT\_MARGIN\_MIN**

This leaf node represents the lower threshold of the interval (ms) between packet arrival and its properly scheduled playout.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/RAMP\_UP\_RATE**

This leaf node represents the rate (kbps/s) at which video encoder should increase its maximum bit rate from current value to the value indicated in the most recently received TMMBR message.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/RAMP\_DOWN\_RATE**

This leaf node represents the rate (kbps/s) at which video encoder should decrease its maximum bit rate from current value to the value indicated in the most recently received TMMBR message.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/DECONGEST\_TIME**

This leaf node represents the time (ms) the receiver should command the sender to spend in decongesting the transmission path, before attempting to transmit at the sustainable rate of the path.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

**/*<X>*/Video/*<X>*/HOLD\_DROP\_END**

This leaf node represents a tri-valued parameter that controls how the sender should behave in case video quality cannot meet the requirements set in BIT\_RATE, FRAME\_RATE, or QP.

- Occurrence: ZeroOrOne

- Format: int

- Minimum Access Types: Get

- Values: 0, 1, 2

**/*<X>*/Video/*<X>*/INITIAL\_CODEC\_RATE**

This leaf node represents the initial bit rate (proportion of the bit rate negotiated for the video session) that the sender should begin encoding video at.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

- Values: 0 ~ 100 %

**/*<X>*/Video/*<X>*/X\_PERCENTILE**

This leaf node represents the percentile point of packet arrival distribution used with the TARGET\_PLAYOUT\_MARGIN parameters.

- Occurrence: ZeroOrOne

- Format: float

- Minimum Access Types: Get

- Values: 0 ~ 100 %

**/*<X>*/Video/*<X>*/Ext**

The Ext is an interior node where the vendor specific information can be placed (vendor meaning application vendor, device vendor etc.). Usually the vendor extension is identified by vendor specific name under the ext node. The tree structure under the vendor identified is not defined and can therefore include one or more un-standardized sub-trees.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

**/*<X>*/Ext**

The Ext is an interior node where the vendor specific information can be placed (vendor meaning application vendor, device vendor etc.). Usually the vendor extension is identified by vendor specific name under the ext node. The tree structure under the vendor identified is not defined and can therefore include one or more un-standardized sub-trees.

- Occurrence: ZeroOrOne

- Format: node

- Minimum Access Types: Get

Table 17.1: Speech adaptation parameters of 3GPP MTSIMA MO

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter (Unit) | Usage | | | |
| PLR/MAX (%) | Packet loss rate (PLR) above this threshold, when redundancy is not used, indicates that performance is not satisfactory. Adaptation state machine at the receiver should signal the sender to attempt adaptation that reduces PLR or operate at modes more robust to packet loss. When using the example adaptation state machines of Annex C, this parameter corresponds to PLR\_1. | | | |
| PLR/LOW (%) | PLR below this threshold indicates that conditions are favorable and better quality can be supported. Adaptation state machine at the receiver should signal the sender to probe for higher bit rate, increase the packet rate, reduce redundancy, or perform other procedures that could improve speech quality under such favorable conditions. When in the probing state, if PLR falls below this threshold, then the sender should adapt to a higher bit rate. When using the example adaptation state machines of Annex C, this parameter corresponds to PLR\_2. | | | |
| PLR/STATE\_REVERSION (%) | PLR above this threshold, after adaptation state machine has taken actions based on PLR lower than LOW, indicates that the actions taken to improve speech quality were not successful. Adaptation state machine at the receiver should signal the sender to return to the previous state where it stayed before attempting to improve speech quality. When using the example adaptation state machines of Annex C, this parameter corresponds to PLR\_3. | | | |
| PLR/RED\_INEFFECTIVE (%) | PLR above this threshold, after adaptation state machine has taken actions to increase redundancy, indicates that situation was not improved but degraded. Adaptation state machine at the receiver should signal the sender to use a lower bit rate and no redundancy. When using the example adaptation state machines of Annex C, this parameter corresponds to PLR\_4. | | | |
| PLR/DURATION\_MAX (ms) | Duration of sliding window over which PLR is observed and computed. The computed value is compared with the MAX threshold. | | | |
| PLR/DURATION\_LOW (ms) | Duration of sliding window over which PLR is observed and computed. The computed value is compared with the LOW threshold. | | | |
| PLR/DURATION\_STATE\_REVERSION (ms) | Duration of sliding window over which PLR is observed and computed. The computed value is compared with the STATE\_REVERSION threshold. | | | |
| PLR/DURATION\_RED\_INEFFECTIVE (ms) | Duration of sliding window over which PLR is observed and computed. The computed value is compared with the RED\_INEFFECTIVE threshold. | | | |
| PLR/DURATION (ms) | Duration of sliding window over which PLR is observed and computed. The computed value is compared with the PLR thresholds. This applies as the default duration in case no specific DURATION is specified. | | | |
| PLB/LOST\_PACKET (integer) | When loss of LOST\_PACKET or more packets is detected in the latest period of PLB/DURATION, this event is categorized as a packet loss burst (PLB) and adaptation state machine should take appropriate actions to reduce the impact on speech quality. | | | |
| PLB/DURATION (ms) | Duration of sliding window over which lost packets are counted. | | | |
| ECN/USAGE (Boolean) | Switch to enable or disable ECN-based adaptation. This parameter should be translated as follows: "0" = OFF, "1" = ON. | | | |
| ECN/MIN\_RATE (bps) | Lower boundary for the media bit-rate adaptation in response to ECN-CE marking. The media bit-rate shall not be reduced below this value as a reaction to the received ECN-CE. The value of this parameter is assigned to the ECN\_min\_rate parameter defined in Clause 10.2.0.  The ECN\_min\_rate should be selected to maintain an acceptable service quality while reducing the resource utilization.  Default value: Same as ICM/INITIAL\_CODEC\_RATE if defined, otherwise same as Initial Codec Mode (ICM), see Clause 7.5.2.1.6. | | | |
| ECN/STEPWISE\_DOWNSWITCH (Boolean) | Switch to select down-switch method. This parameter should be translated as follows: "0" = direct down-switch to ECN/MIN\_RATE; "1" = stepwise down-switch according to ECN/RATE\_LIST (one step per congestion event). | | | |
| ECN/RATE\_LIST (character set) | List of bit rates (e.g. codec modes) to use during stepwise down-switch. This parameter is only applicable when stepwise down-switch is used. If the codec does not support exactly the rate which is indicated then the highest rate supported by the codec below the indicated value should be used. Depending on the codec, the values can be understood as either the highest rate or the average rate.  The entries in the list may either be generic, i.e. usable for any codec, but can also be codec-specific.  The default usage is the generic list where the bit rates [in bps] are included, e.g. (5000, 6000, 7500, 12500).  A codec-specific list may indicate desired modes, e.g. for AMR the list could be (0,2,4,7).  The use of certain rates in this list may be prevented by the results of session negotiation involving SDP attributes such as the "mode-set" parameter. The SDP parameter "mode-change-neighbor" may lead to using intermediate modes when transitioning between rates in this list.  If this parameter is not defined or contains bit rates not negotiated in the session, then the mode-set included in SDP is used. If no mode-set is defined in SDP, then "4750, 5900, 7400, 12200" is used for AMR, which corresponds to the "0, 2, 4, 7" modes. | | | |
| ECN/INIT\_WAIT (ms) | The waiting time before the first up-switch is attempted in the beginning of the session, to avoid premature up-switch.  This parameter shall be used instead of the ICM/INIT\_WAIT parameter if ECN is used in the session.  Default value is defined in Clause 7.5.2.1.6. | | | |
| ECN/INIT\_UPSWITCH\_WAIT (ms) | This parameter is used in up-switches in the beginning of the session. Note that the first up-switch in the beginning of the session uses the ECN/INIT\_WAIT time. Only the subsequent up-switches use the ECN/INIT\_UPSWITCH\_WAIT time.  This parameter shall be used instead of the ICM/INIT\_UPSWITCH\_WAIT parameter if ECN is used in the session.  Default value: is defined in Clause 7.5.2.1.6. | | | |
| ECN/CONGESTION\_WAIT (ms) | The waiting time after an ECN-CE marking for which an up-switch shall not be attempted. The value of this parameter is assigned to the ECN\_congestion\_wait parameter defined in Clause 10.2.0.  A negative value indicates an infinite waiting time, i.e. to prevent up-switch for the whole remaining session.  Default value: Same as the ECN\_congestion\_wait parameter defined in Clause 10.2.0. | | | |
| ECN/CONGESTION\_UPSWITCH\_ WAIT (ms) | This parameter is used in up-switches after a congestion event. Note that the first up-switch after a congestion event uses the ECN/CONGESTION\_WAIT time. Only the subsequent up-switches use the ECN/CONGESTION\_UPSWITCH\_WAIT time.  Default value is 5000 ms. | | | |
| ICM/INITIAL\_CODEC\_RATE (bps) | The bit rate that the speech encoder should use for the encoding of the speech at the start of the RTP stream. | | | |
| ICM/INITIAL\_CODEC\_BANDWIDTH (character set) | The audio bandwidth that the EVS speech encoder in EVS Primary mode should use for the encoding of the speech at the start of the RTP stream. | | | |
| ICM/INITIAL\_CODEC\_BANDWIDTH\_IVAS (character set) | The audio bandwidth that the IVAS encoder should use for the encoding of the speech at the start of the RTP stream. | | | |
| ICM/INIT\_WAIT (ms) | To avoid premature up-switch when ECN is not used in the session, this parameter defines the waiting time before the first up-switch is attempted in the beginning of the session.  Default value: Same as Initial Waiting Time as defined in Clause 7.5.2.1.6. | | | |
| ICM/INIT\_UPSWITCH\_WAIT (ms) | When ECN is not used in the session, this parameter is used in up-switches in the beginning of the session until the first down-switch occurs. Note that the first up-switch in the beginning uses the INIT\_WAIT time. Only the subsequent up-switches use the INIT\_UPSWITCH\_WAIT time.  Default value: Same as Initial Upswitch Waiting Time as defined in Clause 7.5.2.1.6. | | | |
| ICM/INIT\_PARTIAL\_REDUNDANCY\_OFFSET\_SEND (integer) | The initial partial redundancy offset (-1, 0, 2, 3, 5, or 7) that the EVS speech encoder should use when starting the encoding in the beginning of the session that uses channel aware mode, unless asked otherwise by the far-end MTSI client in terminal with the ch-aw-recv parameter. | | | |
| ICM/INIT\_PARTIAL\_REDUNDANCY\_OFFSET\_RECV (integer) | The initial partial redundancy offset (-1, 0, 2, 3, 5, or 7) that the MTSI client in terminal should ask the far-end MTSI client in terminal to use with the ch-aw-recv parameter when starting the encoding in the beginning of the session that uses channel aware mode. | | | |
| N\_INHIBIT (integer) | If adaptation state machine transitions from one state to another then back to the original state, adaptation state machine should not return to the other state in less than N\_INHIBIT speech frames, to avoid the ping-pong effects. | | | |
| N\_HOLD (integer) | N\_HOLD x PLR/DURATION can be used as the period for which PLR is observed and computed. For example, the computed value can be compared with the LOW threshold when DURATION\_LOW is not defined. | | | |
| T\_RESPONSE (ms) | If the receiver does not detect expected responses from the sender within a period of T\_RESPONSE after having sent a request, the receiver should consider this request as not fulfilled and take appropriate actions. | | | |
| CODEC\_ID (character set) | MIME Type of the codec for which the media robustness adaptation PLR thresholds are configured. | | | |
| CFG\_BIT\_RATE\_LIST (character set) | List of bit rates (or codec modes) describing the codec configurations to use during media robustness adaptation. The entries are listed in order of the bit rate of the least robust configuration first to the bit rate of the most robust configuration listed last. If there are multiple codec configurations with the same bit rate but different loss robustness (e.g., EVS 13.2 channel aware and non-channel aware modes, or a codec mode with different levels of application layer redundancy), the same bit rate is listed multiple times in the list.  If the codec does not support exactly the rate which is indicated, then the highest rate supported by the codec below the indicated value should be used. Depending on the codec, the values can be understood as either the highest rate or the average rate.  The entries in the list may either be generic, i.e. usable for any codec, but can also be codec-specific.  The default usage is the generic list where the bit rates [in bps] are included, e.g. (5000, 6000, 7500, 12500).  A codec-specific list may indicate desired modes, e.g. for AMR the list could be (0,2,4,7).  The use of certain rates in this list may be prevented by the results of session negotiation involving SDP attributes such as the "mode-set" parameter or “b=AS” attribute. The SDP parameter "mode-change-neighbor" may lead to using intermediate modes when transitioning between rates in this list.  If this parameter is not defined or contains bit rates not negotiated in the session, then the rates or mode-set included in SDP is used. | | | |
| CFG\_RED\_LIST (character set) | List of redundancy levels describing the codec configurations to use during media robustness adaptation. The redundancy levels are listed in order to correspond to respective CFG\_BIT\_RATE\_LIST entries and describe the redundancy levels from the least robust configuration first to the most robust last. The redundancy level is described using one of the values below: | | | |
|  |  | Value | Description |  |
|  |  | **0** | **No redundancy** |  |
|  |  | **P** | **Partial Redundancy** |  |
|  |  | **1** | **100% repetition application layer redundancy** |  |
|  |  | **2** | **200% repetition application layer redundancy** |  |
|  |  | **3** | **300% repetition application layer redundancy** |  |
|  | Commas are used to separate redundancy levels of each codec configuration in the list.  If the codec configuration does not support the redundancy level, then the codec configuration shall not be requested by the media receiver for media robustness adaptation. | | | |
| HIGH\_PLR\_THRESH\_LIST (character set) | List of high PLR thresholds for each codec configuration in the order described for the CFG\_BIT\_RATE\_LIST with the exception of not having a high PLR threshold for the most robust codec configuration, i.e., the last entry in the HIGH\_PLR\_THRESH\_LIST corresponds to the threshold for requesting the most robust configuration when using the second most, or a less, robust configuration.  When the estimated PLR exceeds a PLR threshold in this list corresponding to a given codec configuration, the media receiver shall request the next more robust codec configuration. E.g., if the first high PLR threshold in the list, which corresponds to the least robust codec configuration is exceeded, then the media receiver requests the second least robust codec configuration.  The PLR values are represented as a percent (e.g., 2.5 is 2.5% PLR) and separated by commas for each codec configuration. | | | |
| LOW\_PLR\_THRESH\_LIST (character set) | List of low PLR thresholds for each codec configuration in the order described for the CFG\_BIT\_RATE\_LIST with the exception of not having a low PLR threshold for the least robust codec configuration, i.e., the first entry in the LOW\_PLR\_THRESH\_LIST corresponds to the threshold for requesting the least robust configuration when using the second least, or a more, robust configuration.  When the estimated PLR drops below a PLR threshold in this list corresponding to a given codec configuration, the media receiver shall request the next less robust codec configuration. E.g., if the estimated PLR drops below the last low PLR threshold in the list, which corresponding to the most robust codec configuration, then the media receiver requests the second most robust codec configuration.  The PLR values are represented as a percent (e.g., 2.5 is 2.5% PLR) and separated by commas for each codec configuration. | | | |
| DJB\_PLR (Boolean) |  | | | |
|  |  | Value | Description |  |
|  |  | **0** | **Measure PLR pre-DJB** |  |
|  |  | **1** | **Measure PLR post-DJB** |  |
|  |  | | | |
| PLR\_AVG\_WINDOW (ms) | Indicates the duration of the sliding window (in ms) over which the PLR is observed and computed. | | | |

Table 17.2: Video adaptation parameters of 3GPP MTSIMA MO

|  |  |
| --- | --- |
| Parameter (Unit) | Usage |
| PLR/MAX (%) | Upper threshold of PLR above which adaptation state machine at the receiver should signal the sender to reduce the bit rate. PLR is measured per RTP packet and in addition to packets that do not arrive at the receiver ever, packets that arrive but do not make it in time for their properly scheduled playout are considered as lost. |
| PLR/LOW (%) | Lower threshold of PLR below which adaptation state machine at the receiver may signal the sender to increase the bit rate. |
| PLR/DURATION\_MAX (ms) | Duration of sliding window over which PLR is observed and computed. The computed value is compared with the MAX threshold. |
| PLR/DURATION\_LOW (ms) | Duration of sliding window over which PLR is observed and computed. The computed value is compared with the LOW threshold. |
| PLB/LOST\_PACKET (integer) | When loss of LOST\_PACKET or more packets is detected in the last period of PLB/DURATION, this event is categorized as a packet loss burst (PLB) and adaptation state machine should take appropriate actions to reduce the impact on video quality. |
| PLB/DURATION (ms) | Duration of sliding window over which lost packets are counted. |
| MIN\_QUALITY/BIT\_RATE  /ABSOLUTE (kbps) | Minimum bit rate that video encoder should use. If the MTSI client in terminal is unable to maintain this minimum bit rate, it should drop the video stream component or put it on hold. If both MIN\_QUALITY/BIT\_RATE/ABSOLUTE and MIN\_QUALITY/BIT\_RATE/RELATIVE are set, the larger of these two shall be used as the minimum bit rate. |
| MIN\_QUALITY/BIT\_RATE  /RELATIVE (%) | Minimum bit rate (as a proportion of the bit rate negotiated for the video session) that the video encoder should use. If the MTSI client in terminal is unable to maintain this minimum bit rate, it should drop the video stream component or put it on hold. If both MIN\_QUALITY/BIT\_RATE/ABSOLUTE and MIN\_QUALITY/BIT\_RATE/RELATIVE are set, the larger of these two shall be used as the minimum bit rate. |
| MIN\_QUALITY/FRAME\_RATE  /ABSOLUTE (fps) | Minimum frame rate that video encoder should use. If the MTSI client in terminal is unable to maintain this minimum frame rate, it should drop the video stream component or put it on hold. The minimum frame rate is considered unmet if the interval between encoding times of video frames is larger than the reciprocal of the minimum frame rate. If both MIN\_QUALITY/FRAME\_RATE/ABSOLUTE and MIN\_QUALITY/FRAME\_RATE/RELATIVE are set, the larger of these two shall be used as the minimum frame rate. |
| MIN\_QUALITY/FRAME\_RATE  /RELATIVE (%) | Minimum frame rate (as a proportion of the maximum frame rate supported as specified by the video codec profile/level negotiated for the session) that video encoder should use. If the MTSI client in terminal is unable to maintain this minimum frame rate, it should drop the video stream component or put it on hold. The minimum frame rate is considered unmet if the interval between encoding times of video frames is larger than the reciprocal of the minimum frame rate. If both MIN\_QUALITY/FRAME\_RATE/ABSOLUTE and MIN\_QUALITY/FRAME\_RATE/RELATIVE are set, the larger of these two shall be used as the minimum frame rate. |
| MIN\_QUALITY/QP/H264 (integer) | Maximum value of QPY that video encoder should use if H.264 is negotiated for the video session. The encoder should generate video stream such that QPY does not exceed H264. If the MTSI client in terminal is unable to maintain this maximum QPY value, it should drop the video stream component or put it on hold. |
| ECN/STEP\_UP (%) | When an up-switch is requested by the receiver, this parameter defines the proportion of the session media bandwidth (b=AS) that is used to increment the requested maximum encoding rate over the currently used rate. The receiver estimates the currently used rate over an implementation dependent time period. Default value: 10. |
| ECN/STEP\_DOWN (character set) | List of proportions (%) by which video receiver requests that the encoder rate be reduced relative to the currently used rate in response to each congestion event. The receiver estimates the currently used rate over an implementation dependent time period. The receiver uses the first value in the list for the first congestion event, the second value for the second congestion event etc. The list may consist of only one value.  If there are more congestion events than there are values in the list, then the last value is used for each additional congestion event.  The receiver resets to use the first value in the list after an up-switch has started i.e. after the CONGESTION\_WAIT time. Default Value: "30, 20, 10". |
| ECN/INIT\_WAIT (ms) | The waiting time before the first up-switch is attempted in the initial phase of the session, to avoid premature up-switch. Default value is 500 ms. The initial phase starts at the beginning of the session and ends when the first congestion event is detected. |
| ECN/INIT\_UPSWITCH\_WAIT (ms) | This parameter is the waiting time used before attempting up-switches in the initial phase of the session. Note that the first up-switch in the initial phase uses the INIT\_WAIT time. Only the subsequent up-switches use the INIT\_UPSWITCH\_WAIT time. Default value: 500 ms. |
| ECN/CONGESTION\_WAIT (ms) | The waiting time after an ECN-CE marking for which an up-switch shall not be attempted. A negative value indicates an infinite waiting time, i.e. to prevent up-switch for the whole remaining session. Default value: 5000 ms. |
| ECN/CONGESTION\_UPSWITCH\_ WAIT (ms) | This parameter is the waiting time used before attempting up-switches after a congestion event. Note that the first up-switch after a congestion event uses the CONGESTION\_WAIT time. Only the subsequent up-switches use the CONGESTION\_UPSWITCH\_WAIT time. Default value is 5000 ms. |
| ECN/MIN\_RATE/ABSOLUTE (kbps) | Lower boundary for the media bit-rate adaptation in response to ECN-CE marking. The media bit-rate shall not be reduced below this value as a reaction to the received ECN-CE. The ECN/MIN\_RATE/ABSOLUTE should be selected to maintain an acceptable service quality while reducing the resource utilization. If the GBR is known to the client to be lower than the ECN/MIN\_RATE then the GBR value shall be used instead of the ECN/MIN\_RATE value. Default value: 48 kbps. If both ECN/MIN\_RATE/ABSOLUTE and ECN/MIN\_RATE/RELATIVE are set, the larger of these two shall be used as the lower boundary for the media bit-rate adaptation in response to ECN-CE marking. |
| ECN/MIN\_RATE/RELATIVE (%) | Lower boundary (as a proportion of the bit rate negotiated for the video session) for the media bit-rate adaptation in response to ECN-CE marking. The media bit-rate shall not be reduced below this value as a reaction to the received ECN-CE. The ECN/MIN\_RATE/RELATIVE should be selected to maintain an acceptable service quality while reducing the resource utilization. If the GBR is known to the client to be lower than the ECN/MIN\_RATE then the GBR value shall be used instead of the ECN/MIN\_RATE value. Default value: Same as INITIAL\_CODEC\_RATE for video. If both ECN/MIN\_RATE/ABSOLUTE and ECN/MIN\_RATE/RELATIVE are set, the larger of these two shall be used as the lower boundary for the media bit-rate adaptation in response to ECN-CE marking. |
| RTP\_GAP (float) | If no RTP packets are received for longer than this period (proportion of the estimated frame period), the receiver should declare bursty packet loss or severe congestion condition. Packet loss gap can be detected as follows: based on the reception history of video packets and their time-stamps, the receiver keeps a running estimate of the frame period, T\_FRAME\_EST. If the receiver does not receive any RTP packets for a duration of RTP\_GAP x T\_FRAME\_EST, then it should react accordingly. Typical RTP\_GAP values can range from 0.5 to 5.0. |
| INC\_FBACK\_MIN\_INTERVAL (ms) | Minimum interval between transmitting TMMBR messages that increase the maximum rate limit. |
| DEC\_FBACK\_MIN\_INTERVAL (ms) | Minimum interval between transmitting TMMBR messages that decrease the maximum rate limit. |
| TP\_DURATION\_HI (ms) | Duration of sliding window over which the interval between packet arrival and playout is observed and computed. The computed value is compared with the TARGET\_PLAYOUT\_MARGIN\_HI threshold. |
| TP\_DURATION\_MIN (ms) | Duration of sliding window over which the interval between packet arrival and playout is observed and computed. The computed value is compared with the TARGET\_PLAYOUT\_MARGIN\_MIN threshold. |
| TARGET\_PLAYOUT\_MARGIN\_HI (ms) | Upper threshold of the interval between packet arrival and its properly scheduled playout. The interval is measured from playout time to the X percentile point (X\_PERCENTILE) of the packet arrival distribution. When this upper threshold is exceeded, the receiver may signal the sender to increase the bit rate. |
| TARGET\_PLAYOUT\_MARGIN\_MIN (ms) | Lower threshold of the interval between packet arrival and its properly scheduled playout. The interval is measured from playout time to the X percentile point (X\_PERCENTILE) of the packet arrival distribution. When this lower threshold is exceeded, the receiver should signal the sender to decrease the bit rate. |
| RAMP\_UP\_RATE (kbps/s) | Rate at which video encoder should increase its target bit rate to a higher max rate limit. |
| RAMP\_DOWN\_RATE (kbps/s) | Rate at which video encoder should decrease its target bit rate to a lower max rate limit. |
| DECONGEST\_TIME (ms) | Minimum time the receiver should command the sender to spend in decongesting the transmission path, before attempting to transmit at the sustainable rate of the path. The receiver can achieve decongestion by first sending a TMMBR message with a value below the sustainable rate of the path. Once the receiver concludes that congestion has been cleared, it can send a TMMBR message with a value closer to the sustainable rate of the path. If the receiver concludes that congestion has not been cleared yet, it may attempt to clear the remaining congestion for another period of DECONGEST\_TIME. A short DECONGEST\_TIME results in a quick and aggressive decongestion by reducing the bit rate radically while a long DECONGEST\_TIME results in a long and conservative decongestion. A value of 0 indicates that the receiver should not attempt to perform any decongestion at all. |
| HOLD\_DROP\_END (integer) | Tri-valued parameter that controls how the sender should behave in case video quality cannot meet the requirements set in BIT\_RATE, FRAME\_RATE, or QP. This parameter indicates whether the sender should put the video stream on hold while maintaining QoS reservations, drop the video stream and release QoS reservations, or end the session. Allowed values of this parameter are defined as follows: "0" = HOLD, "1" = DROP, "2" = END. |
| INITIAL\_CODEC\_RATE (%) | Initial bit rate (proportion of the bit rate negotiated for the video session) that the sender should begin encoding video at. |
| X\_PERCENTILE (%) | X percentile point of the packet arrival distribution used with TARGET\_PLAYOUT\_MARGIN parameters. |

### 17.3.1 Management of speech adaptation

3GPP MTSIMA MO contains a set of parameters which can be used in the construction of adaptation state machines. If available, information on the expected behavior of the network, such as the scheduling strategy applied to eNodeB, can assist the design and calibration process. Basically the receiver estimates the encoding and payload packetization status of the sender, and transmits appropriate RTCP-APP messages when the state of adaptation state machine needs to be switched.

Each PLR in table 17.1 is used to specify the conditions, usually as a threshold, to enter or exit a state. MAX, LOW, STATE\_REVERSION, and RED\_INEFFECTIVE correspond to PLR\_1, PLR\_2, PLR\_3, and PLR\_4 in Annex C respectively. Once the measured PLR exceeds or falls below the thresholds, while meeting certain conditions, adaptation state machine triggers the programmed transitions. A subset of PLRs can be used to construct adaptation state machines with fewer states. For example, the two-state adaptation state machine in Annex C can be built with MAX and LOW. DURATION\_MAX, DURATION\_LOW, DURATION\_STATE\_REVERSION, and DURATION\_RED\_INEFFECTIVE can be used to specify the duration of sliding window over which MAX, LOW, STATE\_REVERSION, and RED\_INEFFECTIVE PLR are observed and computed. DURATION is reserved for the case when it is not necessary to separately specify the durations. N\_HOLD allows setting of the duration as an integer multiple of DURATION.

With each pair of a PLR and a DURATION, the observation period of each PLR can be controlled and the sensitivity of each transition path can be tailored to meet the requirements. For example, larger DURATION values are likely to smooth out the impact of bursty loss of packets and reduce the likelihood of frequent transitions between states, i.e., the ping-pong effects, but can delay the reaction to events that require immediate repairing actions. In general, transitions to states designed for better transmission conditions need to be taken more conservately than transitions to states for worse transmission conditions. Other requirements can be combined with PLR to refine the conditions for transitions.

Packet loss burst (PLB) refers to a davastating event in which a large number of packets are lost during a limited period. Immediate measures, such as changing the bit rate or payload packetization are required to reduce the impact on the perceived speech quality. As PLR and PLR/DURATION enable detailed specification of PLR, PLB can be described efficiently with PLB/LOST\_PACKET and PLB/DURATION.

The parameters ICM/INITIAL\_CODEC\_RATE, ICM/INIT\_WAIT and ICM/INIT\_UPSWITCH\_WAIT can be used to control the rate adaptation during the beginning of the session. ICM/INITIAL\_CODEC\_RATE is used to define what codec mode should be used when starting the encoding for the RTP stream. In EVS Primary mode and IVAS, ICM/INITIAL\_CODEC\_BANDWIDTH and ICM/INITIAL\_CODEC\_BANDWIDTH\_IVAS is used to define which audio bandwidth should be used when starting the encoding for the RTP stream. ICM/INIT\_WAIT defines the period over which the sending MTSI client in terminal should use the Initial Codec Mode when ECN is not used. If no codec mode request or other feedback information is received within this period then the sender is allowed to adapt to a higher rate. Since it is unknown in the beginning of the RTP stream whether the transmission path can support higher rates, the adaptation to higher bit rates needs to be conservative. It is therefore recommended that when adapting to a higher rate the sender increases the rate only to the next higher rate in the list of codec modes allowed in the session. It is also recommended that the sender waits for a while in-between consecutive up-switches, to give the receiver a chance to evaluate whether the new rate can be sustained. This waiting period in-between consecutive up-switches can be controlled with the ICM/INIT\_UPSWITCH\_WAIT parameter when ECN is not used. For the channel aware mode of EVS Primary, ICM/INIT\_PARTIAL\_REDUNDANCY\_OFFSET\_SEND and INIT\_PARTIAL\_REDUNDANCY\_OFFSET\_RECV can be used to configure the initial redundancy offset for the send and the receive directions respectively.

When ECN is used in the session, the ECN/INIT\_WAIT and ECN/INIT\_UPSWITCH\_WAIT parameters are used instead of the ICM/INIT\_WAIT and ICM/INIT\_UPSWITCH\_WAIT parameters, respectively.

N\_INHIBIT can be used to limit the earliest time for the next transition, after transition is temporarily disabled due to frequent transitions among a limited number of states. Use of N\_INHIBIT is suggested as a measure to avoid unnecessary transtions during rapid fluctuations of transmission conditions. It is left as the discretion of the implementation to handle RTCP-APP messages received before the sender is allowed to transition again.

T\_RESPONSE refers to the maximum period the receiver can tolerate, before declaring that either the transmitted RTCP-APP message was lost or its execution was denied by the sender. After the timer expires, the receiver may retransmit the request or transmit a new request, or choose to be satisfied with current status.

Adaptation state machines using above parameters collect the information on transmission path by analysing the packet reception process. Another, more direct source of information can be provided by network nodes, such as eNodeB, in the form of Explicit Congestion Notification (ECN) to IP. A key benefit of ECN is more refined initiation of adaptation in which the receiver can be aware of incoming deterioration of transmission conditions even before any packets are dropped by network node, i.e., as an early-warning scheme for congestion.

STEPWISE\_DOWNSWITCH can be used to control the path of bit-rate reduction, i.e., whether to directly down-switch to ECN/MIN\_RATE or to gradually down-switch via several intermediate bit-rates specified in ECN/RATE\_LIST. The former path may be preferred when rapid reduction of the bit-rate is required while the latter path may be employed for more graceful degradation of speech quality.

To avoid premature up-switch before the congestion has been cleared, waiting periods during which the sender is not allowed to increase the bit-rate can be defined with ECN/CONGESTION\_WAIT parameter. The ECN/CONGESTION\_UPSWITCH\_WAIT parameter is used to prevent congestion from re-occurring during the upswitch after the ECN/CONGESTION\_WAIT period.

To align speech adaptation of the MTSI client in terminal with the purpose of quality control or network management, not only the terminals, which might be managed by different service providers, but also the behaviour, such as scheduling strategy or ECN-marking policy, of network nodes should be considered in the construction of adaptation state machines. It is also possible to program the terminals to adapt differently, as a means of differentiating the quality of service.

With 3GPP MTSIMA MO, it is possible to shape a rough trajectory of the bit rate over time-varying transmission conditions but the maximum and minimum bit rates of speech codec are determined during session setup with mode-set, which can be managed with RateSet leaf of 3GPP MTSINP MO (see clause 15).

Adaptation state machines designed to recover the once reduced bit or packet rate at an earliest opportunity might be considered as an adaptation policy oriented to service quality. However, such an aggressive up-switch before the transmission conditions fully recover takes the risk of degrading the quality or even backward transitions, i.e., the ping-pong effects. Such an optimistic adaptation strategy might not necessarily result in higher quality but can influence the service quality of other terminals sharing the same link. On the other hand, adaptation state machines that increase the once reduced bit or packet rate more conservatively are likely to avoid such situations but might be late in the recovery of speech quality after the transmission conditions are restored.

Even at similar total bit rates, bit stream consisting of a smaller number of larger packets can be at a disadvantage during transmission over packet networks or shared links, when the link quality deteriorates or the link becomes congested, than bit stream consisting of a larger number of smaller packets, since many types of schedulers installed in the network nodes base their decisions on the size of packets such that lower priorities are assigned to larger packets. RTCP\_APP\_REQ\_RED, RTCP\_APP\_REQ\_AGG, and RTCP\_APP\_CMR specify detailed request for the bit rate and packetization. Bit-fields of RTCP\_APP\_REQ\_RED and RTCP\_APP\_REQ\_AGG are restricted by parameters, such as max-red and maxptime, which are negotiated during session setup.

End of changes