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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS
Infrastructure of audiovisual services – Communication
procedures

Extended video procedures and control signals for
ITU-T H.300-series terminals

**Amendment 1: Support for Constrained High,
Scalable Constrained Baseline and Scalable
Constrained High ITU-T H.264 profiles**

Recommendation ITU-T H.241 (2012) – Amendment 1



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Recommendation ITU-T H.241

Extended video procedures and control signals for ITU-T H.300-series terminals

Amendment 1

Support for Constrained High, Scalable Constrained Baseline and Scalable Constrained High ITU-T H.264 profiles

Summary

Recommendation ITU-T H.241 defines the use of advanced video codecs, including those based on Recommendation ITU-T H.264, in ITU-T H.300-series terminals, including ITU-T H.310, ITU-T H.320, ITU-T H.321, ITU-T H.322, ITU-T H.323 and ITU-T H.324 terminals. It also defines generic extended signalling for use with all video codecs in the ITU-T H.300-series terminals.

This revised version introduces a number of enhancements and clarifications to the previous version. Clarification concerns primarily the description on the signalling for ITU-T H.264 Annex G Scalable Baseline and Scalable High Profiles, a procedure for selecting the operating point of a scalable video coding (SVC) video stream, and the Capability Class of ITU-T H.241 capabilities. This version incorporates clause 6.2.5 introduced in ITU-T H.241 (2006) Amd. 1 (2008), allowing for the negotiation of particular video submodes of ITU-T H.264 encoding. It also incorporates clause 8.3.2.14, defining a new optional ITU-T H.264 capability parameter (MaxFPS), and Appendix II which contains non-normative examples describing the use of clause 6.2.5. Clause 8.3.2.14 and Appendix II were both introduced in ITU-T H.241 (2006) Amd. 2 (2009).

Amendment 1 to this Recommendation extends the AdditionalModesSupported parameter of the ITU-T H.264 capability specified in clause 8.3.2.12, to include support for the Constrained High, Scalable Constrained Baseline, and Scalable Constrained High ITU-T H.264 profiles.

History

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FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

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Recommendation ITU-T H.241

Extended video procedures and control signals for ITU-T H.300-series terminals

Amendment 1

Support for Constrained High, Scalable Constrained Baseline and Scalable Constrained High ITU-T H.264 profiles

1 Scope

This Recommendation defines the procedures for use of advanced video codecs, including those based on [ITU-T H.264], in ITU-T H.300-series terminals, including ITU-T H.310, ITU-T H.320, ITU-T H.321, ITU-T H.322, ITU-T H.323 and ITU-T H.324 terminals. Such procedures include control, indication, capability exchange, and transport mechanisms.

Additionally, this Recommendation defines generic extended video control, indication, and capability signalling, applicable for use with all video codecs used in ITU-T H.300-series multimedia terminals.

Annex A specifies ITU-T H.264 transport for ITU-T H.323 systems, including Annex G of [ITU-T H.264] (Scalable Video Coding).

Annex B specifies a reduced-complexity decoding process to be applied to ITU-T H.264 Baseline profile bitstreams when such use has been negotiated using [ITU-T H.241].

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T H.221] Recommendation ITU-T H.221 (2009), *Frame structure for a 64 to 1 920 kbit/s channel in audiovisual teleservices*.
- [ITU-T H.230] Recommendation ITU-T H.230 (2009), *Frame-synchronous control and indication signals for audiovisual systems*.
- [ITU-T H.239] Recommendation ITU-T H.239 (2005), *Role management and additional media channels for H.300-series terminals*.
- [ITU-T H.242] Recommendation ITU-T H.242 (2009), *System for establishing communication between audiovisual terminals using digital channels up to 2 Mbit/s*.
- [ITU-T H.243] Recommendation ITU-T H.243 (2005), *Procedures for establishing communication between three or more audiovisual terminals using digital channels up to 1 920 kbit/s*.
- [ITU-T H.245] Recommendation ITU-T H.245 (2011), *Control protocol for multimedia communication*.

- [ITU-T H.261] Recommendation ITU-T H.261 (1993), *Video codec for audiovisual services at $p \times 64$ kbit/s.*
- [ITU-T H.262] Recommendation ITU-T H.262 (2000), *Information technology – Generic coding of moving pictures and associated audio information: Video.*
- [ITU-T H.263] Recommendation ITU-T H.263 (2005), *Video coding for low bit rate communication.*
- [ITU-T H.264] Recommendation ITU-T H.264 (2012⁺), *Advanced video coding for generic audiovisual services.*
- [ITU-T H.310] Recommendation ITU-T H.310 (1998), *Broadband audiovisual communication systems and terminals.*
- [ITU-T H.320] Recommendation ITU-T H.320 (2004), *Narrow-band visual telephone systems and terminal equipment.*
- [ITU-T H.323] Recommendation ITU-T H.323 (2009), *Packet-based multimedia communications systems.*
- [ITU-T H.324] Recommendation ITU-T H.324 (2009), *Terminal for low bit-rate multimedia communication.*
- [IETF RFC 3550] IETF RFC 3550 (2003), *RTP: A Transport Protocol for Real-Time Applications.*
- [IETF RFC 6184] IETF RFC 6184 (2011), *RTP Payload Format for H.264 Video.*
- [IETF RFC 6190] IETF RFC 6190 (2011), *RTP Payload Format for Scalable Video Coding.*

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 picture aspect ratio: The ratio between the intended horizontal width and the intended vertical height of a displayed picture. Picture aspect ratio is expressed as $h:v$, where h is horizontal width and v is vertical height (in arbitrary units of spatial distance). For the purposes of this definition, a picture is the complete displayed image (including both fields in the case of interlaced-scan video). For example, the picture aspect ratio for a common intermediate format (CIF) picture according to [ITU-T H.263] is 4:3.

3.2.2 sample aspect ratio: The ratio between the intended horizontal distance between the columns and the intended vertical distance between the rows of the luma sample array in a frame. Sample aspect ratio is expressed as $h:v$, where h is horizontal width and v is vertical height (in arbitrary units of spatial distance). For the purposes of this definition, a sample is an individual luma picture element (pixel) making up the complete displayed image (including both fields in the case of interlaced-scan video). For example, the sample aspect ratio for a CIF picture according to [ITU-T H.263] is 12:11.

3.2.3 terminal: A terminal is any end point and may be a user's terminal or some other communication system such as a multipoint control unit (MCU) or an information server.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

4CIF	4x Common Intermediate Format
4SIF	4x Standard Interchange Format
AL-SDU	Adaptation Layer Service Data Unit
ASN.1	Abstract Syntax Notation One
BAS	Bit-rate Allocation Signal
C&I	Control and Indication
CIF	Common Intermediate Format
IDR	Instantaneous Decoding Refresh
MBE	Multiple Byte Extension
MCU	Multipoint Control Unit
OID	Object Identifier
PAR	Picture Aspect Ratio
QCIF	Quarter Common Intermediate Format
QVGA	Quarter VGA
RCDO	Reduced Complexity Decoding Operation
RTP	Real-time Transport Protocol
SAR	Sample Aspect Ratio
SEI	Supplemental Enhancement Information
SIF	Standard Interchange Format
SVC	Scalable Video Coding
VUI	Video Usability Information

5 Conventions

5.1 System terminology

In order to simplify references, this Recommendation refers to two classes of signalling systems for ITU-T H.300-series terminals:

- "BAS-based systems" refers to those systems that use signalling in the ITU-T H.221 bit-rate allocation system (BAS) channel; these include ITU-T H.320, ITU-T H.321 and ITU-T H.322 systems.
- "ITU-T H.245-based systems" refers to those systems that use signalling according to [ITU-T H.245]; these include ITU-T H.310, ITU-T H.323 and ITU-T H.324 systems.

5.2 Message names

In this Recommendation, signalling messages which are common to both ITU-T H.245 and BAS signalling systems are referred to by their names, as given in Annex A of [ITU-T H.245], except in cases where their use in the unique BAS signalling environment is described. Message names are presented in **bold font** to distinguish them from the other text of this Recommendation.

Table 5-1 provides a reference for corresponding ITU-T H.245 and ITU-T H.242/ITU-T H.230 messages mentioned in this Recommendation.

Table 5-1 – Corresponding ITU-T H.245 and BAS video signals

ITU-T H.245 name	ITU-T H.230 mnemonic
h263Options.customPictureClockFrequency	ØCPCF
h263Options.customPictureFormat	ØCSFMT
h263Options.customPictureFormat	ØCPAR
h263VideoCapability.enhancementLayerInfo	ØSCLPREF
lostPartialPicture	lostPartialPicture
lostPicture	lostPicture
recoveryReferencePicture	recoveryReferencePicture
videoBadMBs	VBMBC
videoFastUpdateGOB	videoFastUpdateGOB
videoFastUpdateMB	videoFastUpdateMB
videoFastUpdatePicture	VCU
videoFreezePicture	VCF
videoNotDecodedMBs	videoNotDecodedMBs
videoSendSyncEveryGOB	ØGHOP
videoSendSyncEveryGOBCancel	Øcancel-GHOP

5.3 Requirement terminology

In this Recommendation the following conventions are used:

- "shall" indicates a mandatory requirement
- "should" indicates a suggested but optional course of action
- "may" indicates an optional course of action rather than a recommendation that something take place.

6 Commands and indications

6.1 Control and indication (C&I) applicable to all video codecs

For further study.

6.2 C&I for use with ITU-T H.264

The following C&I signals shall not be used with regard to any channel operating according to [ITU-T H.264]:

- BAS signals ØCPCF, ØCSFMT, ØCPAR, ØSCLPREF
- lostPartialPicture
- lostPicture
- recoveryReferencePicture
- videoBadMBs
- videoFastUpdateGOB
- videoFastUpdateMB

- videoNotDecodedMBs
- videoSendSyncEveryGOB
- videoSendSyncEveryGOBCancel.

NOTE 1 – The above signals are either specific to [ITU-T H.263] or have parameters which do not correspond to ITU-T H.264 structures or value ranges. Replacement signals which could be used either with [ITU-T H.264] or in a generic form for any video codec are for further study.

All other C&I not mentioned in this clause shall be used as specified elsewhere.

NOTE 2 – For example, the use of **videoIndicateReadyToActivate** and corresponding BAS signal **VIR** is not affected by this Recommendation.

6.2.1 videoFreezePicture command in ITU-T H.264

When a video decoder according to [ITU-T H.264] receives a **videoFreezePicture** command, it shall freeze its displayed picture until one of the following events occurs:

- a) a recovery point signalled in a recovery point service end interface (SEI) message (see clause D.2.7 of [ITU-T H.264]) is reached
- b) reception of an instantaneous decoding refresh (IDR) picture
- c) A timeout period of at least six seconds has elapsed since the **videoFreezePicture** command was received.

6.2.2 videoFastUpdatePicture command in ITU-T H.264

When a video encoder according to [ITU-T H.264] receives a **videoFastUpdatePicture** command, the encoder shall enter the fast update mode by using one of the procedures specified in clause 6.2.2.1 or 6.2.2.2 below. The procedure in 6.2.2.1 is the preferred response in a lossless transmission environment. Both procedures satisfy the requirement to enter the fast update mode for ITU-T H.264 video encoding.

NOTE 1 – The procedures re-initialize an ITU-T H.264 decoder completely so that valid video frames will be decoded. Such re-initialization is effective regardless of whether or not the decoder was previously decoding any video stream from any end point.

The procedure should be accomplished as quickly as possible, but the re-initialization video stream shall be completely transmitted within three seconds of receiving the **videoFastUpdatePicture** command.

NOTE 2 – The 3-second requirement is needed to avoid timeout of the six-second timer associated with the **videoFreezePicture** command, taking into account network and system latencies and possible cascaded MCUs. The **videoFreezePicture** command is used by multipoint control units (MCUs) as part of the video switching procedure (see clause 6.1.1 of [ITU-T H.243]).

6.2.2.1 IDR procedure to respond to videoFastUpdatePicture

This clause gives one possible way to respond to **videoFastUpdatePicture**.

The encoder shall, in the order presented here:

- 1) immediately prepare to send an IDR picture (see clause 3 of [ITU-T H.264])
- 2) send a ITU-T H.264 sequence parameter set corresponding to the IDR picture to be sent. The encoder may optionally also send other parameter sets
- 3) send a ITU-T H.264 picture parameter set corresponding to the IDR picture to be sent. The encoder may optionally also send other parameter sets
- 4) send the IDR picture

- 5) from this point forward in time, send or re-send any other sequence or picture parameter sets, not sent in this procedure, prior to their reference by any ITU-T H.264 slice, regardless of whether such parameter sets were previously sent prior to receiving the **videoFastUpdatePicture** command. Such parameter sets may be sent all at once (within the limits of [ITU-T H.264]), one at a time as needed, or in any combination of these methods. Parameter sets may be re-sent at any time for redundancy.

6.2.2.2 Gradual recovery procedure to respond to videoFastUpdatePicture

This clause gives one possible way to respond to **videoFastUpdatePicture**.

The encoder shall, in the order presented here:

- 1) send a recovery point (supplemental enhancement information (SEI) message (see clause D.2.7 of [ITU-T H.264])).
- 2) repeat any sequence and picture parameter sets that were sent before the recovery point SEI message, prior to their reference in a ITU-T H.264 slice.

The encoder shall ensure that the decoder has access to all reference pictures, in output order, for inter prediction of pictures at or after the recovery point. For example, the encoder may mark all reference pictures as "unused for reference" by issuing a `memory_management_control_operation` equal to 5 (see clause 8.2.5 of [ITU-T H.264]).

The value of the `recovery_frame_cnt` syntax element in the recovery point SEI message shall be such that the time between reception of the **videoFastUpdatePicture** command and completing the transmission of the access unit, including the recovery point as specified in clause D.2.7 of [ITU-T H.264], is less than or equal to three seconds.

Re-sending of parameter sets may be done all at once (within the limits of [ITU-T H.264]), one at a time as needed, or in any combination of these methods. Parameter sets may be re-sent at any time for redundancy.

6.2.3 Recovery point SEI message

ITU-T H.264 video decoders in ITU-T H.300-series terminals shall support reception of the recovery point SEI message (see clause D.2.7 of [ITU-T H.264]), and identify the signalled recovery point.

Upon reception of a recovery point SEI message, the decoder shall continue to decode until the recovery point regardless of apparent errors in the stream, such as reference to absent pictures, and should not send a **videoFastUpdatePicture** command in response to such apparent error.

If a **videoFreezePicture** is in force, the decoder shall not display the decoded pictures, and shall continue to display the previously frozen picture. If the `broken_link_flag` in the recovery point SEI message is set, the decoder may choose not to display decoded pictures until the recovery point is reached.

If the decoder detects bitstream corruption between the SEI message and the recovery point in decoding order, a **videoFastUpdatePicture** command should be sent.

6.2.4 ITU-T H.264-on BAS command

For BAS-based systems, the ITU-T H.264-on BAS command defined in [ITU-T H.221] shall be used to signal that video according to [ITU-T H.264] is being transmitted. This command shall be used analogously to the BAS command ITU-T H.261-on. Video shall occupy the same capacity as stipulated in [ITU-T H.221] for the case of ITU-T H.261 video. The use of ITU-T H.264 Annex G scalable video coding (SVC) in BAS-based systems is for further study.

6.2.5 Set submode procedure

This clause defines a procedure that may be used by ITU-T H.320 and ITU-T H.245 systems to negotiate the use of a particular ITU-T H.264 video encoding submode. Such a submode may limit the ITU-T H.264 encoding to a specified group of sample aspect ratios (SARs), picture aspect ratios (PARs), and picture heights while it is in force. It may also reduce the MaxMBPS value in Table A.1 of [ITU-T H.264] (or its optional replacement CustomMaxMBPS in Table 8-5) to a lower value. Additionally, it may reduce the MaxStaticMBPS value in Table 8-9 to a lower value.

Some examples illustrating the use of this procedure are given in Appendix II.

6.2.5.1 SetSubmode capability

ITU-T H.320 and ITU-T H.245 systems may optionally support the set submode procedure.

In [ITU-T H.320], this capability shall be signalled as a BAS message <h264SetSubmode> (see clause 3.1 of [ITU-T H.230]). <h264SetSubmode> is a BAS SBE message.

In [ITU-T H.245], this capability shall be signalled in a generic capability message, as shown in Table 6-1.

Table 6-1 – ITU-T H.241 set submode capability identifier

Capability name	ITU-T H.241 set submode capability
Capability identifier type	Standard
Capability Class	Video
Capability identifier value	{itu-t(0) recommendation(0) h(8) h241(241) specificVideoCodecCapabilities(0) h264(0) set-submode(2)}
maxBitRate	This field shall not be included.
collapsing	This field shall not be included.
nonCollapsing	This field shall not be included.
nonCollapsingRaw	This field shall not be included.
transport	This field shall not be included.

6.2.5.2 C&I messages

C&I messages are used in this clause to indicate sets of submodes that are supported by the sender of the ITU-T H.264 encoding for that specific encoding, to request a submode of that sender, and to positively or negatively acknowledge such a request.

The C&I messages defined in this clause shall not be used if video sent on the channel associated with the signalled channelID AMC is not encoded with ITU-T H.264.

All C&I messages defined in this clause shall be carried as follows.

6.2.5.3 Signalling of messages for the set submode procedure

For ITU-T H.245, each message shall consist of a **GenericRequest**, **GenericResponse** or **GenericIndication** according to Table 6-2 containing GenericMessage.messageIdentifier with the set submode capability OID as defined in Table 6-1, and a **subMessageIdentifier**. Each particular **subMessageIdentifier** listed in Table 6-2 has an associated **messageContent** syntax given in the following clauses.

For ITU-T H.320, each set submode message shall be carried by a separate MBE message (see clause 2.2.3 of [ITU-T H.230]) which shall contain the same **subMessageIdentifier** value and parameter sequence as its ITU-T H.245 equivalent, coded according to the procedures in Annex A

of [ITU-T H.239]. This MBE message uses the BAS code <H.264Submode-message> (see Table 2 of [ITU-T H.230]). The MBE contents are in the format:

**{ Start-MBE / N / <H.264Submode-message> / subMessageIdentifier /
zero or more message content bytes }**

ITU-T H.320-ITU-T H.245 gateways that signal the SetSubmode capability shall translate these messages between the ITU-T H.320 and ITU-T H.245 signalling systems as specified in Annex A of [ITU-T H.239].

Except for ITU-T H.320/ITU-T H.245 gateways, devices that receive **MessageContent** containing an unrecognized **parameterIdentifier** shall ignore such **parameterIdentifiers** and any associated **parameterValues**.

6.2.5.4 SetSubmode messages

Table 6-2 lists all messages defined in the SetSubmode procedure.

Table 6-2 – Set submode procedure messages

subMessageIdentifier	Message name	Message type (for ITU-T H.245)
1	setSubmodeRequest	GenericRequest
2	setSubmodeResponse	GenericResponse
3	setSubmodeIndication	GenericIndication
4	cancelSubmodeRequest	GenericRequest
5	cancelSubmodeResponse	GenericResponse

For each message, the clauses below present a table indicating the message content and syntax. The sequence of **GenericParameters** in the **messageContent** shall be transmitted in the order given in each table. The parameter names given in each table correspond to those in Table 6-2 above. Parameters shall be sent as indicated in the "required presence" column of each table.

6.2.5.5 Generic parameters used in SetSubmode messages

Table 6-3 lists the **GenericParameters** used in all **messageContent** sequences in the SetSubmode messages.

Table 6-3 – Set submode message parameters

Parameter identifier	Parameter name	Parameter type	Parameter value
40	channelID	unsignedMin	Integer (0..65535)
1	par	booleanArray	Integer (0..255)
2	parX	unsignedMin	Integer (0..65535)
41	parY	unsignedMin	Integer (0..65535)
3	sar	unsignedMin	Integer (0..255)
4	sarX	unsignedMin	Integer (0..65535)
42	sarY	unsignedMin	Integer (0..65535)
5	submodeMaxMBPS	unsignedMin	Integer (0..65535)
6	submodeMaxStaticMBPS	unsignedMin	Integer (0..65535)
7	height	unsignedMin	Integer (0..65535)
8	maximumHeight	unsignedMin	Integer (0..65535)

Table 6-3 – Set submode message parameters

Parameter identifier	Parameter name	Parameter type	Parameter value
9	minimumHeight	unsignedMin	Integer (0..65535)
128	acknowledge	logical	None
129	reject	logical	None
130	allowAnyHeight	logical	None

6.2.5.5.1 channelID

The channelID parameter shall be the AMC channel ID on ITU-T H.230 systems in Table 9 of [ITU-T H.239]. On ITU-T H.245 systems, it shall be a **logicalChannelNumber**. Intermediary devices such as gateways and MCUs that forward these parameters shall convert the parameter value to the appropriate AMC channel ID or **logicalChannelNumber** for the device to which the message is forwarded.

6.2.5.5.2 par

This value is a Boolean array of picture aspect ratios (PARs). The PAR is the ratio of picture width to picture height, measured in units of distance (not samples).

If bit 2 (value 64) is 1, this indicates a PAR of 4:3.

If bit 3 (value 32) is 1, this indicates a PAR of 16:9.

If bit 4 (value 16) is 1, this indicates a PAR of 5:4.

If bit 5 (value 8) is 1, this indicates a PAR of 16:10.

All other bits are reserved, shall be set to 0, and shall be ignored by receivers.

6.2.5.5.3 parX

The parX parameter is the numerator of a picture aspect ratio (computed as parX/parY). The parX parameter shall be immediately followed by the picture aspect ratio denominator parY. parX is an unsigned integer between 1 and 65535.

6.2.5.5.4 parY

The parY parameter is the denominator of a picture aspect ratio. It is an unsigned integer between 1 and 65535. The values of parX and parY shall be relatively prime.

6.2.5.5.5 sar

The value of this parameter indicates the sample aspect ratio (SAR). The sar is the ratio of sample width to sample height. It shall be the ITU-T H.264 **aspect_ratio_idc** values defined in Table E.1 of [ITU-T H.264], or the value 255.

The value of 255 shall only be used in the setSetmodeIndication message. In that message, it signifies the set of all SARs that may be carried on the video channel.

6.2.5.5.6 sarX

The sarX parameter is the numerator of a sample aspect ratio (computed as sarX/sarY). The sarX parameter shall be immediately followed by the sample aspect ratio denominator sarY. sarX is an unsigned integer between 1 and 65535.

6.2.5.5.7 sarY

The sarY parameter is the denominator of a sample aspect ratio. It is an unsigned integer between 1 and 65535. The values of sarX and sarY shall be relatively prime.

6.2.5.5.8 submodeMaxMBPS

The submodeMaxMBPS parameter is the maximum macroblock processing rate, in units of 500 macroblocks per second.

6.2.5.5.9 submodeMaxStaticMBPS

The submodeMaxStaticMBPS parameter is the static macroblock processing rate, under the assumption that all macroblocks are static macroblocks, in units of 500 macroblocks per second.

6.2.5.5.10 height

This is the height of the picture in samples.

6.2.5.5.11 maximumHeight

This is the largest height of the picture in samples (used in a setSubmodeRequest message).

6.2.5.5.12 minimumHeight

This is the smallest supported picture height in samples (used in a setSubmodeResponse message).

6.2.5.5.13 acknowledge

This parameter, if present, indicates a positive acknowledgment of a request.

6.2.5.5.14 reject

This parameter, if present, indicates a rejection of a request.

6.2.5.5.15 allowAnyHeight

This parameter, if present, indicates that any requested picture height will be positively acknowledged for the specified combination of SARs and PARs.

6.2.5.6 setSubmodeIndication

This message indicates the combinations of SARs and PARs that are available for the ITU-T H.264 video encoding on a specified video channel. These combinations shall be sent as a series of one or more groups, each group comprising a SAR and one or more PARs. The full set of combinations that are available is the union of the combinations of all the groups in the message.

The SAR shall be signalled as either a single sar parameter or as a single sarX, sarY parameter pair. A sar parameter value of 255 in a group shall indicate that all SARs that can be carried on the channel are combined with the PARs for that group.

The PARs shall be signalled as either a single par parameter or as a list of one or more parX, parY parameter pairs. The par parameter may indicate more than one PAR. The omission of par or parX, parY from a group shall indicate that all the SARs in that group are combined with all possible PARs.

The presence of the allowAnyHeight parameter from a group shall indicate that all picture heights that can be carried on the channel are available for each SAR and PAR combination that is included in that group.

The absence of the allowAnyHeight parameter from a group shall indicate that one or more unspecified picture heights are available for each SAR and PAR combination that is included in that group. Those heights may differ for each combination.

When a video channel is opened to a device which signals support for the set submode procedure, the device transmitting the video channel shall send the setSubmodeIndication. The setSubmodeIndication message shall also be sent whenever the available combinations of SARs and PARs change.

On ITU-T H.320 connections, setSubmodeIndication shall be sent periodically.

Table 6-4 – setSubmodeIndication syntax

GenericParameter order	Parameter name	Required presence	
1	channelID	Mandatory	
2	sar	Either one sar or one sarX, sarY shall be present in each group.	This group of parameters may be present multiple times.
	sarX		
	sarY		
3	par	Either one par or multiple parX, parY pairs may be present.	
	parX		
	parY		
4	allowAnyHeight	allowAnyHeight may be present in each group.	

6.2.5.6.1 setSubmodeIndication examples (informative)

This clause does not form an integral part of this Recommendation.

For example:

A setSubmodeIndication contains one group, with sar=255 and allowAnyHeight.

This message indicates that the sender is capable of sending a picture of any size within its capability set with any sample aspect ratio and picture aspect ratio.

For example:

A setSubmodeIndication contains two groups. The first group has sar=1 and allowAnyHeight. The second group has sar=255, par=96.

The first group indicates that the sender is capable of sending pictures with square samples at any PAR and any desired picture height. This is equivalent to saying that the sender is capable of sending pictures with square pixels of any size.

The second group indicates that the sender is capable of sending pictures with any SAR as long as the overall picture aspect ratio is either 4:3 or 16:9. Since allowAnyHeight is not specified, only some picture sizes (perhaps only one size) are available for this group.

A picture with a SAR of 1:1 and an aspect ratio of 4:3 is a member of both groups. Because one of the groups signals allowAnyHeight, such pictures are available at any size.

For example:

A setSubmodeIndication contains 4 groups. The first group has sar=1, par=120 and allowAnyHeight. The second group has sar=2 and par=64. The third group has sar=3 and par=64. The fourth group has sar=7 and par=64.

The first group indicates the ability to send pictures with square samples at picture aspect ratios of 4:3, 16:9, 5:4 or 16:10. These pictures can be sent at any size.

The second group indicates the ability to send pictures with the sample aspect ratio used for PAL with a picture aspect ratio of 4:3. Not all sizes are available, perhaps only QCIF and CIF.

The third group indicates the ability to send pictures with the sample aspect ratio used for NTSC, with a picture aspect ratio of 4:3. Not all sizes are available, perhaps only QSIF and SIF.

The last group indicates the ability to send pictures with the sample aspect ratio used for interlaced NTSC, with a picture aspect ratio of 4:3. Not all sizes are available, perhaps only 352×480.

6.2.5.7 setSubmodeRequest

This message requests that the video encoding on the specified channel be changed to one of the submodes specified in the request.

setSubmodeRequest shall include at least one of the following: SAR, PAR or picture height. It shall include at most one SAR, and at most one PAR, and at most one maximumHeight. It shall not include both maximumHeight and height.

SAR, if present, shall be specified using either the sar parameter or a sarX, sarY pair. The sar parameter shall not signal the value of 255.

PAR, if present, shall be specified using either the par parameter or a parX, parY pair. The par parameter shall only signal one PAR.

The maximumHeight parameter, if present, shall specify that the set of submodes includes all picture heights less than or equal to the value carried by the parameter.

One or more height parameters, if present, shall specify that the set of submodes includes the specific list of picture heights. The picture heights shall be listed in preference order, with the most desired height first.

The submodeMaxMBPS parameter, if present, shall specify that the set of submodes is limited to modes in which the macroblock rate is less than or equal to the maximum number of macroblocks per second carried in the parameter value.

The submodeStaticMaxMBPS parameter, if present, shall specify that the subset of submodes is limited to modes in which the static macroblock rate is less than or equal to the maximum number of static macroblocks per second carried in the parameter value.

Table 6-5 – setSubmodeRequest syntax

GenericParameter order	Parameter name	Required presence
1	channelID	Mandatory
2	sar	Optional Either sar or sarX, sarY may be present.
	sarX	
	sarY	
3	par	Optional Either par or parX, parY may be present.
	parX	
	parY	
4	height	Optional Either one or more height parameters or at most one maximumHeight may be present.
	maximumHeight	
5	submodeMaxMBPS	Optional
6	submodeMaxStaticMBPS	Optional