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**ISO/IEC 14496-2**

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**AMENDMENT 1**
2004-06-01

# Information technology — Coding of audio-visual objects —

## Part 2: **Visual**

## AMENDMENT 1: Error resilient simple scalable profile

*Technologies de l'information — Codage des objets audiovisuels —*

*Partie 2: Codage visuel*

*AMENDEMENT 1: Profil d'escalade simple résilient d'erreur*

Reference number
ISO/IEC 14496-2:2004/Amd.1:2004(E)

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# Foreword

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The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Amendment 1 to ISO/IEC 14496-2:2004 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

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# Introduction

In ISO/IEC 14496-2:2004, the bitstream syntax of the Simple Scalable Profile does not allow the use of the error resilience tools. As the enhancement layer can only be decoded if it is received error-free this limits the use of scalable video to error-free communication environments. This would exclude mobile communications, a significant future market for MPEG-4 SSP.

Scalable video can be quite useful in many other applications. For instance, matching different or varying network bandwidths, video multicast to heterogeneous end systems and more importantly, providing different subjective quality of video content to subscribers of a given video service depending on their network tariffs and viewing preferences.

As such, ISO/IEC has defined the addition of an MPEG-4 Error Resilient Simple Scalable Profile. This Amendment describes the technical changes for this profile.

In addition, the new Level 0b is added to the MPEG-4 Simple Visual Profile and the amendments are described in this Amendment.




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# Information technology — Coding of audio-visual objects —

# Part 2: Visual

## AMENDMENT 1: Error resilient simple scalable profile

*In 6.2.5, replace:*

| | | |
|---|---|---|
| if (video_object_layer_shape != “binary only”) { | | |
| **vop_quant** | 3-9 | uimsbf |
| if(video_object_layer_shape==”grayscale”) | | |
| for(i=0; i<aux_comp_count; i++) | | |
| **vop_alpha_quant[i]** | 6 | uimsbf |
| if (vop_coding_type != “I”) | | |
| **vop_fcode_forward** | 3 | uimsbf |
| if (vop_coding_type == “B”) | | |
| **vop_fcode_backward** | 3 | uimsbf |
| if (!scalability) { | | |
| if (video_object_layer_shape != “rectangular” && vop_coding_type != “I”) | | |
| **vop_shape_coding_type** | 1 | bslbf |
| motion_shape_texture() | | |
| while (nextbits_bytealigned() == resync_marker) { | | |
| video_packet_header() | | |
| motion_shape_texture() | | |
| } | | |
| } | | |
| else { | | |
| if (enhancement_type) { | | |
| **load_backward_shape** | 1 | bslbf |
| if (load_backward_shape) { | | |
| **backward_shape_width** | 13 | uimsbf |
| **marker_bit** | 1 | bslbf |
| **backward_shape_ height** | 13 | uimsbf |
| **marker_bit** | 1 | bslbf |
| **backward_shape_horizontal_mc_spatial_ref** | 13 | simsbf |
| **marker_bit** | 1 | bslbf |
| **backward_shape_vertical_mc_spatial_ref** | 13 | simsbf |
| backward_shape() | | |
| **load_forward_shape** | 1 | bslbf |
| if (load_forward_shape) { | | |

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| | | |
|---|---|---|
| **forward_shape_width** | 13 | uimsbf |
| **marker_bit** | 1 | bslbf |
| **forward_shape_height** | 13 | uimsbf |
| **marker_bit** | 1 | bslbf |
| **forward_shape_horizontal_mc_spatial_ref** | 13 | simsbf |
| **marker_bit** | 1 | bslbf |
| **forward_shape_vertical_mc_spatial_ref** | 13 | simsbf |
| forward_shape() | | |
| } | | |
| } | | |
| } | | |
| **ref_select_code** | 2 | uimsbf |
| combined_motion_shape_texture() | | |
| } | | |
| } | | |

*with:*

| | | |
|---|---|---|
| if (video_object_layer_shape != “binary only”) { | | |
| **vop_quant** | 3-9 | uimsbf |
| if(video_object_layer_shape==”grayscale”) | | |
| for(i=0; i<aux_comp_count; i++) | | |
| **vop_alpha_quant[i]** | 6 | uimsbf |
| if (vop_coding_type != “I”) | | |
| **vop_fcode_forward** | 3 | uimsbf |
| if (vop_coding_type == “B”) | | |
| **vop_fcode_backward** | 3 | uimsbf |
| if (!scalability) { | | |
| if (video_object_layer_shape != “rectangular” && vop_coding_type != “I”) | | |
| **vop_shape_coding_type** | 1 | bslbf |
| } | | |
| else { | | |
| if (enhancement_type) { | | |
| **load_backward_shape** | 1 | bslbf |
| if (load_backward_shape) { | | |
| **backward_shape_width** | 13 | uimsbf |
| **marker_bit** | 1 | bslbf |
| **backward_shape_ height** | 13 | uimsbf |
| **marker_bit** | 1 | bslbf |
| **backward_shape_horizontal_mc_spatial_ref** | 13 | simsbf |
| **marker_bit** | 1 | bslbf |
| **backward_shape_vertical_mc_spatial_ref** | 13 | simsbf |
| backward_shape() | | |
| **load_forward_shape** | 1 | bslbf |
| if (load_forward_shape) { | | |
| **forward_shape_width** | 13 | uimsbf |
| **marker_bit** | 1 | bslbf |

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| | | |
|---|---|---|
| **forward_shape_height** | 13 | uimsbf |
| **marker_bit** | 1 | bslbf |
| **forward_shape_horizontal_mc_spatial_ref** | 13 | simsbf |
| **marker_bit** | 1 | bslbf |
| **forward_shape_vertical_mc_spatial_ref** | 13 | simsbf |
| forward_shape() | | |
| } | | |
| } | | |
| } | | |
| **ref_select_code** | 2 | uimsbf |
| } | | |
| motion_shape_texture() | | |
| while (nextbits_bytealigned() == resync_marker) { | | |
| video_packet_header() | | |
| motion_shape_texture() | | |
| } | | |
| } | | |

*In 6.2.5.2, replace:*

| | | |
|---|---|---|
| if (header_extension_code) { | | |
| do { | | |
| **modulo_time_base** | 1 | bslbf |
| } while (modulo_time_base != '0') | | |
| **marker_bit** | 1 | bslbf |
| **vop_time_increment** | 1-16 | bslbf |
| **marker_bit** | 1 | bslbf |
| **vop_coding_type** | 2 | uimsbf |
| if (video_object_layer_shape != "rectangular") { | | |
| **change_conv_ratio_disable** | 1 | bslbf |
| if (vop_coding_type != "I") | | |
| **vop_shape_coding_type** | 1 | bslbf |
| } | | |
| if (video_object_layer_shape != "binary only") { | | |
| **intra_dc_vlc_thr** | 3 | uimsbf |
| if (sprite_enable == "GMC" && vop_coding_type == "S"<br>&& no_of_sprite_warping_points > 0) | | |
| sprite_trajectory() | | |
| if ((reduced_resolution_vop_enable)<br>&& (video_object_layer_shape == "rectangular")<br>&& ((vop_coding_type == "P") \|\| (vop_coding_type == "I"))) | | |
| **vop_reduced_resolution** | 1 | bslbf |
| if (vop_coding_type != "I") | | |
| **vop_fcode_forward** | 3 | uimsbf |
| if (vop_coding_type == "B") | | |
| **vop_fcode_backward** | 3 | uimsbf |
| } | | |
| } | | |

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*with:*

| | | |
|---|---|---|
| if (header_extension_code) { | | |
| do { | | |
| **modulo_time_base** | 1 | bslbf |
| } while (modulo_time_base != '0') | | |
| **marker_bit** | 1 | bslbf |
| **vop_time_increment** | 1-16 | bslbf |
| **marker_bit** | 1 | bslbf |
| **vop_coding_type** | 2 | uimsbf |
| if (video_object_layer_shape != "rectangular") { | | |
| **change_conv_ratio_disable** | 1 | bslbf |
| if (vop_coding_type != "I") | | |
| **vop_shape_coding_type** | 1 | bslbf |
| } | | |
| if (video_object_layer_shape != "binary only") { | | |
| **intra_dc_vlc_thr** | 3 | uimsbf |
| if (sprite_enable == "GMC" && vop_coding_type == "S" && no_of_sprite_warping_points > 0) | | |
| sprite_trajectory() | | |
| if ((reduced_resolution_vop_enable) && (video_object_layer_shape == "rectangular") && ((vop_coding_type == "P") \|\| (vop_coding_type == "I"))) | | |
| **vop_reduced_resolution** | 1 | bslbf |
| if (vop_coding_type != "I") | | |
| **vop_fcode_forward** | 3 | uimsbf |
| if (vop_coding_type == "B") | | |
| **vop_fcode_backward** | 3 | uimsbf |
| } | | |
| if (scalability) | | |
| **ref_select_code** | 2 | uimsbf |
| } | | |

*In 6.2.5.3, replace:*

| | | |
|---|---|---|
| if (!not_coded) { | | |
| if (sprite_enable == "GMC" && vop_coding_type == "S" && derived_mb_type < 2) | | |
| **mcsel** | 1 | bslbf |
| if ( (!(sprite_enable == "GMC" && vop_coding_type == "S" && mcsel) && derived_mb_type < 2) \|\| derived_mb_type == 2) | | |
| motion_coding("forward", derived_mb_type) | | |
| } | | |
| } | | |
| } while (next_bits() != motion_marker) | | |


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*with:*

| | | |
|---|---|---|
| if (!not_coded) { | | |
| if (sprite_enable == “GMC” && vop_coding_type == “S” && derived_mb_type < 2) | | |
| **mcsel** | 1 | bslbf |
| if ( (!(sprite_enable == “GMC” && vop_coding_type == “S” && mcsel) && derived_mb_type < 2) \|\| (derived_mb_type == 2) && !(scalability && ref_sel_code == 3)) | | |
| motion_coding(“forward”, derived_mb_type) | | |
| } | | |
| } | | |
| } while (next_bits() != motion_marker) | | |

*Replace Table 6-5 with the following table:*

| Visual_object_verid | Meaning |
|---|---|
| 0000 | reserved |
| 0001 | object type listed in Table 9-1 |
| 0010 | object type listed in Table 9-2 |
| 0011 | reserved |
| 0100 | object type listed in Table 9-3 |
| 0101 | object type listed in Table 9-4 |
| 0110 | object type listed in Table AMD1-1 |
| 0111 - 1111 | reserved |

*Replace Table 6-11 with the following table:*

| Video Object Type | Code |
|---|---|
| Reserved | 00000000 |
| Simple Object Type | 00000001 |
| Simple Scalable Object Type | 00000010 |
| Core Object Type | 00000011 |
| Main Object Type | 00000100 |
| N-bit Object Type | 00000101 |
| Basic Anim. 2D Texture | 00000110 |
| Anim. 2D Mesh | 00000111 |
| Simple Face | 00001000 |
| Still Scalable Texture | 00001001 |
| Advanced Real Time Simple | 00001010 |
| Core Scalable | 00001011 |
| Advanced Coding Efficiency | 00001100 |
| Advanced Scalable Texture | 00001101 |
| Simple FBA | 00001110 |

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| | |
|---|---|
| Simple Studio | 00001111 |
| Core Studio | 00010000 |
| Advanced Simple | 00010001 |
| Fine Granularity Scalable | 00010010 |
| Error resilient simple scalable | 00010011 |
| Reserved | 00010100 - 11111111 |

*Add the following table after Table 9-4:*

**Table AMD1-1 — Video Object Types**

| Visual Tools | Visual Object Types |
|---|---|
| | Error resilient simple scalable |
| I-VOP | X |
| P-VOP | X |
| B-VOP | X |
| DC Prediction | X |
| AC Prediction | X |
| 4-MV, Unrestricted MV | X |
| Slice Resynchronization | X |
| Data Partitioning | X |
| Reversible VLC | X |
| Enhancement Layer Slice Resynchronization | X |
| Enhancement Layer Data Partitioning | X |
| Enhancement Layer Reversible VLC | X |
| Short Header | |
| Method 1/Method 2 Quantization | |
| Interlace | |
| Global Motion Compensation | |
| Quarter-pel Motion Compensation | |
| Fine Granularity Scalability | |
| FGS Temporal Scalability | |

*Add the following table after Table 9-8:*

**Table AMD1-2 — Definition of Error Resilient Simple Scalable Profile**

| ID | Object Types<br>Profiles | Simple | Simple Scalable | Simple Scalable<br>Error Resilience |
|---|---|---|---|---|
| SSER | Error resilient simple scalable | X | X | X |


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*Add the following to Annex E:*

## E.4 Enhancement Layer Error Resilience

### E.4.1 Enhancement Layer Slice Resynchronization

The Enhancement Layer Slice Resynchronization tool enables the usage of Slice Resynchronization, as defined in E.1.1, in enhancement layers. As the enhancement layer requires additional information, the HEC includes an additional 2 bits defining the ref_select_code.

The video packet resynchronization approach that can be applied using this tool is the same as the one described in E.1.1.

### E.4.2 Enhancement Layer Data Partitioning

The Enhancement Layer Data Partitioning tool is the same as the Data Partitioning tool defined in E.1.2, with the exception that it now checks for the ref_select_code 3 special case in enhancement layer spatially scaled P-VOPs. There are no motion vectors in the VOP in this case.

### E.4.3 Enhancement Layer Reversible VLC

The Enhancement Layer Reversible VLC tool is the same as the Reversible VLC tool defined in E.1.3.

*In Table G-1, add the following:*

| | |
|---|---|
| Error Resilient Simple Scalable Profile/Level 0 | 00011101 |
| Error Resilient Simple Scalable Profile/Level 1 | 00011110 |
| Error Resilient Simple Scalable Profile/Level 2 | 00011111 |
| Reserved | 00100000 |

*In Table G-1, replace:*

| | |
|---|---|
| Reserved | 00010011 – 00100000 |

*with:*

| | |
|---|---|
| Reserved | 00010011 – 00011100 |

*In Table G-1, replace:*

| | |
|---|---|
| Reserved | 00001001 - 00001111 |

*with:*

| | |
|---|---|
| Simple Profile/Level 0b | 00001001 |
| Reserved | 00001010 - 00001111 |

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*In Table G-2, add the following row below the existing Error Resilience row:*

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Enhancement layer error resilience | ELER | | | | | | × | ✓ | ✓ d) | ✓ e) | ✓ | × | ✓ | × | ✓ | × | × | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | × | × | × | ✓ | × | ✓ d) | × | × |

*In Table G-2, add the following column to the right of the existing Error Resilience column:*

| **E L E R** |
|---|
| ✓ |
| ✓ |
| ✓ |
| ✓ |
| ✓ |
| |
| |
|

*Add the following to Annex H:*

## H.6 Patent statements for ISO/IEC 14496-2:2004/Amd.1

The table summarises the formal patent statements received and indicates the parts of ISO/IEC 14496-2:2004/Amd.1 to which the statement applies (V: visual tools in this amendment, R: ISO/IEC 14496-5:2001). The list includes all organisations that have submitted informal patent statements. However, if no "X" is present, no formal patent statement has yet been received from that organisation.

| | Organisation | V | R |
|---|---|---|---|
| 1. | Motorola | X | |

*In Annex N, replace:*

11 For Simple Profile @ Level L0, the following restrictions apply:

a) The maximum frame rate shall be 15 frames per second;

b) The maximum f_code shall be 1;

c) The intra_dc_vlc_threshold shall be 0;

d) The maximum horizontal luminance pixel resolution shall be 176 pels/line;

e) The maximum vertical luminance pixel resolution shall be 144 pels/VOP;

f) If AC prediction is used, the following restriction applies: QP value shall not be changed within a VOP (or within a video packet if video packets are used in a VOP). If AC prediction is not used, there are no restrictions to changing QP value.

*with:*

11 For Simple Profile @ Level L0 and for Simple Profile @ Level L0b, the following restrictions apply:

a) The maximum frame rate shall be 15 frames per second;

b) The maximum f_code shall be 1;

c) The intra_dc_vlc_threshold shall be 0;

d) The maximum horizontal luminance pixel resolution shall be 176 pels/line;

e) The maximum vertical luminance pixel resolution shall be 144 pels/VOP;

f) If AC prediction is used, the following restriction applies: QP value shall not be changed within a VOP (or within a video packet if video packets are used in a VOP). If AC prediction is not used, there are no restrictions to changing QP value.

*Add the following row to Table N-1 (above the row for Simple Profile/Level0):*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Simple | L0b | QCIF | 1 | 1 x Simple | 1 | 198 | 99 | 1485 | N.A. | 20 | 20 | 2048 | N. A. | N. A. | 128 | N. A. |

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*Add the following rows to the end of the Table N-1:*

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Error resilient simple scalable | L2 | CIF | 4 | 4 x Simple or Simple Scalable | 1 | 3168 | 792 | 23760 | N.A. | 40 | 40 | 4096 | N.A. | N A. | 256 | 1 spatial or temporal enhancement layer |
| Error resilient simple scalable | L1 | CIF | 4 | 4 x Simple or Simple Scalable | 1 | 1782 | 495 | 7425 | N. A. | 40 | 40 | 2048 | N.A. | N.A. | 128 | 1 spatial or temporal enhancement layer |
| Error resilient simple scalable | L0 | QCIF | 1 | 1 x Simple or Simple Scalable | 1 | 446 | 124 | 1856 | N.A. | 10 | 10 | 2048 | N.A. | N.A. | 128 | 1 spatial or temporal enhancement layer |



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