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| *Title:* | **Signaling of long-term reference pictures in the PPS** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

This document proposes to enable the inclusion of candidate long-term reference pictures, as part of the reference picture set signaling in the picture parameter set.

# Introduction

The current long-term reference picture (LTRP) signaling is present only in the slice header. Thus, for any particular LTRP, the POC information used to identify the LTRP must be included in all slice headers, as part of the reference picture set (RPS) information, since the LTRP is firstly identified as a long term reference until the LTRP becomes no longer needed for inter prediction reference. However, a LTRP may stay in the DPB for a long period, thus the current LTRP signaling requires the POC information of the LTRP to be repeated in all slice headers of pictures within the long period.

In many scenarios wherein LTRPs are pre-selected or the bitstream is multi-pass encoded, which reference pictures would be used for LTRPs and would stay in the DPB for long periods are known at the beginning of the bitstream. In these scenarios, signaling of candidate LTRPs in the PPS can save a lot of bits to be transmitted, because in this case, instead of transmitting directly and repeatedly the POC information of the LTRPs in the slice header, only the indices to the candidate LTRPs included in the PPS needs to be transmitted.

Thus we propose to enable the inclusion of candidate long-term reference pictures in the PPS for reference picture set signaling. The proposed syntax and semantics changes are provided in the remainder of this document.

# Proposal

## PPS changes

|  |  |
| --- | --- |
| pic\_parameter\_set\_rbsp( ) { | Descriptor |
| **…** |  |
| **num\_short\_term\_ref\_pic\_sets** | ue(v) |
| for(idx = 0; idx < num\_short\_term\_ref\_pic\_sets; idx++) |  |
| short\_term\_ref\_pic\_set( idx ) |  |
| **long\_term\_ref\_pics\_present\_flag** | u(1) |
| if( long\_term\_ref\_pics\_present\_flag ) { |  |
| **long\_term\_ref\_pic\_poc\_len\_delta** | ue(v) |
| **num\_long\_term\_ref\_pics\_pps** | ue(v) |
| for( i = 0; i < num\_long\_term\_ref\_pics\_pps; i++ ) |  |
| **long\_term\_ref\_pic\_poc\_pps**[ i ] | i(v) |
| } |  |
| **…** |  |
| rbsp\_trailing\_bits( ) |  |
| } |  |

**long\_term\_ref\_pic\_poc\_len\_minus4** plus 4 specifies the length, in bits, of the long\_term\_ref\_pic\_poc\_pps[ i ] syntax element. The value of long\_term\_ref\_pic\_poc\_len\_minus4 shall be in the range of 0 to 28, inclusive. For all picture parameter sets referring to one particular sequence parameter set, the value of long\_term\_ref\_pic\_poc\_len\_minus4 shall be identical.

**num\_long\_term\_ref\_pics\_pps** specifies the number of long-term reference pictures that are specified in the picture parameter set. The value of num\_long\_term\_ref\_pics\_pps shall be in the range of 0 to 32, inclusive.

**long\_term\_ref\_pic\_poc\_pps**[ i ] specifies the picture order count the i-th long-term reference picture that are specified in the picture parameter set. The number of bits used to represent long\_term\_ref\_pic\_poc\_pps[ i ] shall be equal to long\_term\_ref\_pic\_poc\_len\_minus4 + 4.

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## Slice header

|  |  |
| --- | --- |
| slice\_header( ) { | Descriptor |
| **…** |  |
| **short\_term\_ref\_pic\_set\_pps\_flag** | u(1) |
| if( !short\_term\_ref\_pic\_set\_pps\_flag ) |  |
| short\_term\_ref\_pic\_set( num\_short\_term\_ref\_pic\_sets ) |  |
| else |  |
| **short\_term\_ref\_pic\_set\_idx** | u(v) |
| if( long\_term\_ref\_pics\_present\_flag ) { |  |
| **num\_long\_term\_pics\_pps** | ue(v) |
| **num\_long\_term\_pics** | ue(v) |
| for( i = 0; i < num\_long\_term\_pps; i++ ) { |  |
| **long\_term\_ref\_pic\_set\_idx\_pps**[ i ] | ue(v) |
| **used\_by\_curr\_pic\_lt\_flag**[ i ] | u(1) |
| **}** |  |
| for( i = 0; i < num\_long\_term\_pics; i++ ) { |  |
| **delta\_poc\_lsb\_lt\_minus1**[ i ] | ue(v) |
| **used\_by\_curr\_pic\_lt\_flag**[ i ] | u(1) |
| } |  |
| } |  |
| **…** |  |
| } |  |

**num\_long\_term\_pps** specifies the number of long-term reference pictures that are specified in the referred picture parameter set and that are to be included in the long-term reference picture set of the current picture. If num\_long\_term\_pps is not present, the value shall be derived as equal to 0. The value of num\_long\_term\_pps shall be in the range of 0 to max\_num\_ref\_frames, inclusive.

**long\_term\_ref\_pic\_set\_idx\_pps**[ i ] specifies the index, to the list of long-term reference pictures specified in the referred picture parameter set, of the i-th long-term reference picture inherited from the referred picture parameter set to the long-term reference picture set of the current picture. The value of long\_term\_ref\_pic\_set\_idx\_pps[ i ] shall be in the range of 0 to 31, inclusive.

After reference picture list initialisation, in reference picture list X (with X equal to 0 or 1), the num\_long\_term\_pps long-term reference pictures follow the short-term reference pictures and precede the num\_long\_term\_pics long-term reference pictures directly signalled in the slice header.

# Patent rights declaration(s)

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