# Software Usage Description

The software implements TE A2 3.2.1 by InterDigital, based on the “ref\_idx” framework of SMuC software version 0.1.1.

The software includes the following macros:

REF\_IDX\_ILR\_TDEPTH enables inter-layer reference picture placement configuration.

REF\_IDX\_ME\_ZEROMV forces inter-layer reference picture to use zero motion vector.

REF\_IDX\_ME\_UNI\_ONLY forces to not use combined prediction for inter-layer reference picture.

The configuration file contains the following settings, where the newly added settings for inter-layer reference picture placement are highlighted in yellow. For reference, one set of example configuration files is included in the software package at the “exp cfg” directory.

InputFile0 : BasketballDrive\_1280x720\_50\_zerophase\_0.9pi.yuv

FrameRate0 : 50 # Frame Rate per second

SourceWidth0 : 1280 # Input frame width

SourceHeight0 : 720 # Input frame height

IntraPeriod0 : 48 # Period of I-Frame (-1 = only first)

QP0 : 22

InputFile1 : BasketballDrive\_1920x1080\_50.yuv

FrameRate1 : 50 # Frame Rate per second

SourceWidth1 : 1920 # Input frame width

SourceHeight1 : 1080 # Input frame height

IntraPeriod1 : 48 # Period of I-Frame (-1 = only first)

QP1 : 20

List0ILRPosTD0 : -1

List0ILRPosTD1 : -1

List0ILRPosTD2 : -1

List0ILRPosTD3 : -1

List1ILRPosTD0 : -1

List1ILRPosTD1 : -1

List1ILRPosTD2 : -1

List1ILRPosTD3 : -1

HM8.1 simulcast results provided by Qualcomm are used as anchor for BD-rate calculations, therefore the relatively timing results between anchor and test are not meaningful.

Different inter-layer reference picture placement methods with various inter-layer prediction constraints are tested by the software. Please refer to the following for the details of configuration settings and macro definitions of different tests.

**Inter-layer reference picture placement (Setting 1)**

In the first setting, the inter-layer reference picture is placed exactly same as that of “ref\_idx” framework of SMuC 0.1.1, where the inter-layer reference picture is added to the end of list L0 if the enhancement-layer picture is coded as P-Slice, or is added to the end of both lists L0 and L1 if the enhancement-layer picture is coded as B-Slice.

The related macros are defined as:

#define REF\_IDX\_FRAMEWORK 1

#if REF\_IDX\_FRAMEWORK

#define REF\_IDX\_ME\_AROUND\_ZEROMV 0

#define REF\_IDX\_ME\_ZEROMV 0

#define REF\_IDX\_ME\_UNI\_ONLY 0

#define REF\_IDX\_ILR\_TDEPTH 1

#else

#define INTRA\_BL 1

#if !AVC\_BASE

#define SVC\_MVP 0

#define SVC\_BL\_CAND\_INTRA 0

#endif

#endif

The related settings in the configuration file are set as:

List0ILRPosTD0 : -1

List0ILRPosTD1 : -1

List0ILRPosTD2 : -1

List0ILRPosTD3 : -1

List1ILRPosTD0 : -1

List1ILRPosTD1 : -1

List1ILRPosTD2 : -1

List1ILRPosTD3 : -1

The corresponding experimental results are present in the file “TE2-3.2.1 ref\_idx setting 1.xls”.

**Inter-layer reference picture placement (Setting 2)**

In the second setting, the inter-layer reference picture is placed at the same position as the first setting for AI and LD-P coding structure. But, for RA case, the inter-layer reference picture is added into both lists L0 and L1 of the enhancement-layer pictures that are located in the first temporal level, but is only added into the list L0 of the enhancement-layer pictures that are located in the higher temporal levels.

The related macros are defined as:

#define REF\_IDX\_FRAMEWORK 1

#if REF\_IDX\_FRAMEWORK

#define REF\_IDX\_ME\_AROUND\_ZEROMV 0

#define REF\_IDX\_ME\_ZEROMV 0

#define REF\_IDX\_ME\_UNI\_ONLY 0

#define REF\_IDX\_ILR\_TDEPTH 1

#else

#define INTRA\_BL 1

#if !AVC\_BASE

#define SVC\_MVP 0

#define SVC\_BL\_CAND\_INTRA 0

#endif

#endif

The related settings in the configuration file are set as:

List0ILRPosTD0 : -1

List0ILRPosTD1 : -1

List0ILRPosTD2 : -1

List0ILRPosTD3 : -1

List1ILRPosTD0 : -1

List1ILRPosTD1 : -2

List1ILRPosTD2 : -2

List1ILRPosTD3 : -2

The corresponding experimental results are present in the file “TE2-3.2.1 ref\_idx setting 2.xls”.

**Inter-layer reference picture placement (Setting 2) & zero MV (optional data)**

Based on the inter-layer reference picture placement setting 2, this test presents the results when inter-layer reference picture is forced to have zero MV only.

The related macros are defined as:

#define REF\_IDX\_FRAMEWORK 1

#if REF\_IDX\_FRAMEWORK

#define REF\_IDX\_ME\_AROUND\_ZEROMV 0

#define REF\_IDX\_ME\_ZEROMV 1

#define REF\_IDX\_ME\_UNI\_ONLY 0

#define REF\_IDX\_ILR\_TDEPTH 1

#else

#define INTRA\_BL 1

#if !AVC\_BASE

#define SVC\_MVP 0

#define SVC\_BL\_CAND\_INTRA 0

#endif

#endif

The related settings in the configuration file are set as:

List0ILRPosTD0 : -1

List0ILRPosTD1 : -1

List0ILRPosTD2 : -1

List0ILRPosTD3 : -1

List1ILRPosTD0 : -1

List1ILRPosTD1 : -2

List1ILRPosTD2 : -2

List1ILRPosTD3 : -2

The corresponding experimental results are present in the file “TE2-3.2.1 ref\_idx setting 2 & ILR zeroMV.xls”.

**Inter-layer reference picture placement (Setting 2) & uni-prediction only (optional data)**

Based on the inter-layer reference picture placement setting 2, this test presents the results when inter-layer reference picture can only be used in uni-prediction.

The related macros are defined as:

#define REF\_IDX\_FRAMEWORK 1

#if REF\_IDX\_FRAMEWORK

#define REF\_IDX\_ME\_AROUND\_ZEROMV 0

#define REF\_IDX\_ME\_ZEROMV 0

#define REF\_IDX\_ME\_UNI\_ONLY 1

#define REF\_IDX\_ILR\_TDEPTH 1

#else

#define INTRA\_BL 1

#if !AVC\_BASE

#define SVC\_MVP 0

#define SVC\_BL\_CAND\_INTRA 0

#endif

#endif

The related settings in the configuration file are set as:

List0ILRPosTD0 : -1

List0ILRPosTD1 : -1

List0ILRPosTD2 : -1

List0ILRPosTD3 : -1

List1ILRPosTD0 : -1

List1ILRPosTD1 : -2

List1ILRPosTD2 : -2

List1ILRPosTD3 : -2

The corresponding experimental results are present in the file “TE2-3.2.1 ref\_idx setting 2 & ILR uni.xls”.

**Inter-layer reference picture placement (Setting 2) & zeroMV & uni-prediction only (optional data)**

Based on the inter-layer reference picture placement setting 2, this test presents the results when inter-layer reference picture must have zero MV only and be used in uni-prediction only.

The related macros are defined as:

#define REF\_IDX\_FRAMEWORK 1

#if REF\_IDX\_FRAMEWORK

#define REF\_IDX\_ME\_AROUND\_ZEROMV 0

#define REF\_IDX\_ME\_ZEROMV 1

#define REF\_IDX\_ME\_UNI\_ONLY 1

#define REF\_IDX\_ILR\_TDEPTH 1

#else

#define INTRA\_BL 1

#if !AVC\_BASE

#define SVC\_MVP 0

#define SVC\_BL\_CAND\_INTRA 0

#endif

#endif

The related settings in the configuration file are set as:

List0ILRPosTD0 : -1

List0ILRPosTD1 : -1

List0ILRPosTD2 : -1

List0ILRPosTD3 : -1

List1ILRPosTD0 : -1

List1ILRPosTD1 : -2

List1ILRPosTD2 : -2

List1ILRPosTD3 : -2

The corresponding experimental results are present in the file “TE2-3.2.1 ref\_idx setting 2 & ILR zeroMV & ILR uni.xls”.