# Software description

SMuC software version 0.1 is implemented on top of HM8.1. It has ‘IntraBL’ and ’ref\_idx‘ frameworks configurable by macros.

Up-sampling filters are followed K0378 description. After discussion among Ahg11 and K0378 proponent, the up-sampling filters have two implementation versions that provide identical results. Straightforward implementation of the K0378, using 12 phases for luma and chroma 1.5x and 8 phases for the chroma 2.x, requires float operations for filter selection, and to have more efficient implementation, the up-sampling filters were grouped into 16-phase implementation. Since it is just implementation manner, the latter is suggested to be used by default.

For ‘IntraBL’ framework, base layer intra MPM and base layer MVP hooks are provided as it was in K0348 and are switched off by default.

In ‘ref\_idx’ framework up-sampled base layer is inserted as a last reference frame into the reference list. The slice type of the EL picture corresponding to the base layer I-slice is configurable and can be either P or B.

Motion search around Zero MV for ILR (interlayer reference) is also provided for ‘ref\_idx’ framework and it is disabled by default.

It was decided that the software with AVC base syntax support will be provided within two weeks after the first software release.

Software includes the following main macros:

SVC\_EXTENSION enables SVC extension implementation on top of HM8.1

PHASE\_DERIVATION\_IN\_INTEGER provides integer arithmetic for up-sampling filters.

REF\_IDX\_FRAMEWORK is used to switch between IntraBL and “ref\_idx” frameworks.

REF\_IDX\_ME\_AROUND\_ZEROMV is motion search around zero MV for inter-layer reference picture.

INTRA\_BL is CU based inter-layer texture prediction mode.

SVC\_MVP is base layer MVP hook.

SVC\_BL\_CAND\_INTRA implements the hook for adding base layer intra mode as one of the MPM.

Configuration files are located in the software package at cfg directory. To run a test two config files should be used similar to HM, one is the test configuration file and the second one is from the per-sequence-svc directory to specify the sequence parameters.

The software can be executed by the following sample command line:

TAppEncoder -c cfg/encoder\_randomaccess\_main.cfg -c cfg/per-sequence-svc/BasketballDrive-2x.cfg

TAppDecoder -ls 2 -b BasketballDrive.bin

Where –ls 2 indicates that two layers are going to be decoded.

Config files have following settings for each layer:

InputFile0 : O:/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 : O:/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

Alternatively, the parameters can be specified by the command line similar to HM but with the layer number at the end

IntraPeriod0 corresponds to –ip0

IntraPeriod1 corresponds to –ip1

QP0 corresponds to –qp0

QP1 corresponds to –qp1

-o0 yuv output for the first layer

-o1 yuv output for the second layer layer

-use-rap-b command can be used to switch between P and B slices for corresponding base layer I-slice in ‘ref\_idx’ framework.

## Using AVC metadata file

In order to use already coded base layer as an input, the following parameters can be specified:

-ibl – reconstructed base layer YUV file

-ibs – metadata file with syntax elements in the certain format.

Additionally, the base layer picture size has to be specified for decoder:

-wdt – base l ayer picture width

-hgt – base layer picture height

Metadata file format contains motion related information for every 4x4 block, and the following parameters have to be present in the metadata file.

[RefIdxL0(1byte), RefIdxL1(1byte), MVxL0(2bytes), MVyL0(2bytes), MVxL1(2bytes), MVyL1(2bytes)]

Extractor for this information based on JSVM software can be downloaded from <https://hevc.hhi.fraunhofer.de/svn/svn_SHVCMetadataExtractor/>

Example of the commands:

TAppEncoder.exe -c cfg/encoder\_randomaccess\_main.cfg -c cfg/per-sequence-svc/BasketballDrive-1.5x.cfg -b BasketballDrive.bin -ibl BasketballDriveBL\_rec.yuv -ibs BasketballDriveBL\_syntax.bin

TAppDecoder.exe -b BasketballDrive.bin -ls 2 -ibl BasketballDriveBL\_rec.yuv -ibs BasketballDriveBL\_syntax.bin -wdt 1280 -hgt 720