**Veloce Emulation Plan for Sirius**

For Artosyn project Sirius, Veloce Emulation flow is to run ***real use case*** for verification.

To use Veloce resources efficiently, we propose to deliver Veloce images in 4 different types, targeting different scenarios.

From Build 1 to Build 4 the included designs become more and more. One of the target is to keep image small enough for Veloce limited AVBs and concurrent usage.

**BASIC BUILD:**

**Build 1**: Minimal System

For SW team to develop SW.

For IP owners as a prototype.

Include:

A7(4cores), M7+M7\_peripheral, DDR+TZC, NOC\_main+CCI, DMAC,

Security Subsystem, USB, GMAC, Type-C,

CoreSight, SPI Debug

Veloce Preparation:

1. External SPI FLASH / EMMC Device / SD Card (CFG\_PIN test)
2. External USB device / USB host, support 2.0 / 3.0.
   1. For both Cadence & Synopsys
3. DDR4 / DDR3 / LPDDR3
   1. HBM / QBM / FBM (DDR BUS width 16/32/64bit)
   2. Inline ECC
4. OTP model
5. GMAC model (1000M)
6. PCIE model

Use Cases:

1. Software development - uboot, Linux kernel, etc.
2. Security Boot - emulate the secure boot process defined in sec\_subsystem spec.
3. CFG\_PIN: Boot from ROM / SPI Flash / EMMC
4. M7 (communicate with A7)
5. M7 peripherals: I2C(DMA mode), SPI(DMA mode), UART(DMA mode), timer, watch dog, CAN, etc.
6. GMAC SW development
7. USB SW development
8. PCIe SW development
9. CoreSight
10. SPI Debug – debug tool
11. Benchmark test in Linux env

**Build 2**: A7 plus CEVA

CEVA with SMMU and CCI would enable coherency tests and System MMU test.

Include:

A7 (1core)(2core4core L2cache), CEVA (2cores), DDR+TZC,

NOC\_main+NOC\_ceva+CCI, SMMU\_CEVA, DMAC



Use Case:

1. SMMU-CEVA function - initialize SMMU, test VA-PA translation functions.
2. Coherency between A7 and CEVA (through CCI) - test coherency transaction listed in AMBA ACE-lite specification.
3. DVM between CCI and SMMU-CEVA - invalidate page table entries correctly.
4. TrustZone function - for DDRC channel 0, 1, 2, 3
5. Exclusive / atomic access of DDR (unique ID for different DDRC channel)
6. A7 access DMAC ceva
7. Protection feature (to be defined)
   * 1. Memory boundary protection
8. Use case of CEVA subsystem
   1. (use cases from CEVA team)

**Build 3**: Video Codec and ISP

Video codec, ISP and other video high speed IO interfaces.

Include:

A7(1 core)(2core L2cache), DDR+TZC

NOC\_main+NOC\_vision+CCI, SMMU\_Video, DMAC,

ISP, Display Engine

MIPI RX or HDMI, Video\_interface,

MIPI TX or DP

Veloce Preparation (VTL or VLAB):

1. Input interface: MIPI / HDMI
2. Output interface: Display Port / MIPI

Use Case of video codec:



1. SMMU-Video function - initialize SMMU, test VA-PA translation.
2. DVM between CCI and SMMU-Video - invalidate page table entries correctly.
3. TrustZone function - for DDRC channel 4, 5
4. Video input from MIPI / HDMI / DVP to DDR - with various format (YUV, RGB, RAW)
5. Video encoding / decoding using HEVC / H264 / JPEG codec
6. Video output to MIPI / DVP / Display Port
7. Audio datapath and audio sync with video (I2S with DMA mode)
8. Performance with DDR bus width 16/32/64 + Inline ECC
9. OS based (performance testcase)
10. Visit SRAM\_TOP in ISP & H264
11. ISP function: from Bayer RAW to YUV / RGB format, write to DDR
12. Display function: read from DDR, re-size, OSD overlay, and output to DP / MIPI TX

**~~Build 4:~~** ~~ISP & CEVA~~

~~Include:~~

~~A7(1 core), CEVA(? core), DDR+TZC~~

~~NOC\_main+NOC\_vision+CCI, SMMU\_Video, DMAC,~~

~~ISP, Display Engine~~

~~MIPI RX or HDMI, Video\_interface,~~

~~MIPI TX or DP~~

Use Case of ISP:



**Build 5**: Wireless Tx/Rx

Instantiate up to 5 sirius\_top with baseband included, and concatenate them by baseband.

Due to limited resources, these 5 instances are different in complexity.

The minimal sirius\_top with baseband on is:

A7(1core), DDR+TZC, NOC\_Main+CCI, Baseband

A7 and M7

The sirius\_top with full-function in BB Tx/Rx is the same as build 3 with baseband on.

Use Case:

1. Video codec system works as in **Build 3**
2. Output encoded video of high resolution to SD card or EMMC, and in the mean time transmit video of low resolution to baseband TX.

