

# **SC2000 Smart Kit Selection Checklist**

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Socionext Europe GmbH

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Revision History

Date	Revision	Description
26.07.2018	0.1	Initial version
30.07.2018	0.2	Wording improvements
13.08.2018	0.3	Fixed Use-case 8, corrected wrong capabilities

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## 1. Introduction

The "SC2000 Smart Kit" is a reference camera design kit which enables rapid development of mobile cameras (e.g. flying cameras, action cameras, wearable camera, web cam) and Digital Still Cameras (DSCs) with advanced features and high image quality.

The "SC2000 Smart Kit" SDK will enable easy code development for above applications and consists of three parts:

- Cortex-M0 FreeRTOS based: Initializes SOC. Handles power management. Loads CA7 bootstrap code.
- Cortex-A7 T-kernel based: Controls ISP and loader for MILB\_SDK and Linux. Supplied as binary only / cannot be changed.
- Cortex-A7 Linux based: Interacts with ISP via MILB\_SDK interface. For user-specific functionality.

Build environment:

All components are built under Linux using a pre-installed environment. The pre-installed environment runs as an Oracle VirtualBox virtual machine.

The "SC2000 Smart Kit" is a reference design product on its own which offers a sub-set of features of the included SC2000 ISP from Socionext. Due to the high complexity of the SC2000 ISP the amount of accessible functions had to be restricted to typical use-cases. Therefore, certain parts of the included SDK are delivered in binary form only.

The purpose of this checklist is to make sure the "SC2000 Smart Kit" matches your needs.

## 2. SC2000 Smart Kit Features / Content

The SC2000 Smart Kit includes:

### Reference camera

consisting of four stacked boards (70mm x 70mm):

- Sensor board with Sony IMX477 sensor and M12 lens holder, lens
- Main processing board with SC2000 SOC including 2GB POP memory, 4Gb NAND flash, micro SD card slot, USB 3 connector, HDMI connector  
The mounted SC2000 ES3 SOC has 2GB of RAM mounted as POP.
- IO board with audio codec, micro SD card slot, audio line in and out, Ethernet connector, USB 2 connector (Type A and Micro, only use one at a time)
- Debug board with 3 micro USB 2 serial ports (FX230), boot mode selector, ICE connectors,

### SDK

- Running in Oracle VirtualBox VM. Runs on many host operating systems.
- Client operating system is Ubuntu 14.04
- Software for SC2000 Smart Kit consists of two parts
  - o RTOS side for controlling ISP part of SC2000 SOC. Supplied as binary. Fixed functionality.
  - o Linux side for implementing customer specific functionality. Interfaces with RTOS side. Supplied as source code including example applications.
- Build scripts allowing single point building of firmware image.

### Documentation

- Schematics, Gerber for reference camera design.
- Extensive documents describing
  - o software interface
  - o hardware design guidance

## 3. Checklist

Please check if the supported feature fulfills your requirements.

### 3.1. Supported sensors

- Sony IMX477 (12MP still, 3840 x 2160 video, MIPI-D, DOL)
- Sony IMX377 (12MP still, 3840 x 2160 video, MIPI-D)
- Sony IMX277 (12MP still, 3840 x 2160 video, SLVS-EC, DOL)

### 3.2. Modes of Operation

#### Legend

##### SD

writing to SD card under RTOS control, no Linux access to this SD card, name is done automatically by RTOS with fixed scheme (consecutive numbering, new subfolder every 1000 files)

##### Net

streaming over network, either Ethernet or WiFi, under Linux control

##### HDMI

live preview under RTOS control

##### UVC

streaming over USB under Linux control

The use-case ID numbers are not continuous. They reflect a historical numbering scheme kept for continuity to other versions of the SDK.

Only one mode can be active at a time. Modes can be changed programmatically from Linux side.

In a use case all operations (SD, Net, HDMI, UVC) run concurrently.

#### One sensor operation

##### Use-case ID 1

- SD 3840x2160@60 HEVC
- Net 1280x720@60 H.264
- Net 640x480@60 H.264
- HDMI 1920x1080@60

##### Use-case ID 2

- SD 3840x2160@30 HEVC
- Net 1280x720@30 H.264
- Net 640x480@30 H.264
- HDMI 1920x1080@60

##### Use-case ID 4

- SD 3840x2160@60 HEVC
- SD 640x360@30 H.264
- Net 1920x1080@30 H.264
- HDMI 1920x1080@60

❑ **Use-case ID 5**

- SD 1920x1080@(120, 60, 30) HEVC
- SD 640x360@30 H.264
- Net 1920x1080@30 H.264
- HDMI 1920x1080@60

❑ **Use-case ID 6**

- SD 1280x720@(240, 120, 60) HEVC
- SD 640x360@30 H.264
- Net 1280x720@30 H.264
- HDMI 1920x1080@60

❑ **Use-case ID 8**

- UVC 3840x2160@30 H.264, JPEG
- HDMI 1920x1080@60

❑ **Use-case ID 9**

- SD 3840x2160@60 HEVC
- HDMI 3840x2160@60

**Two sensor operation**

❑ **Use-case ID 10**

- SD 3840x1920@30 HEVC
- SD 960x480@30 H.264
- HDMI 1920x1080@60

❑ **Use-case ID 11**

- SD 1920x960@30 HEVC
- SD 960x480@30 H.264
- HDMI 1920x1080@60



### 3.3. Operations

All operations can be started and stopped from the Linux side

Still picture recording (4000 x 3000 or 3840 x 2160 to SD card under RTOS control)

- Normal
- HDR

Video recording (to SD card under RTOS control)

- Normal
- Still picture during video recording (only current video size)

Video streaming

- Over Ethernet or WiFi under Linux control

HDMI preview

## 3.4. Settings

### 3.4.1. Image

Can be set in idle, preview or video recording mode

- EV compensation (-3EV - +3EV steps of 1/3)
- White balance (auto, variable (12000K-2500K), manual)
- Color Correction Matrix (for manual white balance)
- Sharpness / Edge (both separately)
- ISO (Auto, 100 – 6400)
- Exposure Time (1/2s – 1/8000s)
- AE Metering (center, spot, custom pattern 0-4)

### 3.4.2. JPEG

Can be set in idle mode (no preview or recording in progress)

- Quality (low, middle, high)

### 3.4.3. H.264 / HEVC (H.265) Settings

Can be set in idle mode (no preview or recording in progress)

- Bitrate (CBR / VBR mode, and rate)
- File Format (.MOV / .MP4)
- Sub-stream enable
- GOP is fixed to IPPP for HEVC/H.265 and selectable IPPP/IBBP for H.264  
GOP number is hard-coded dependent on frame-rate