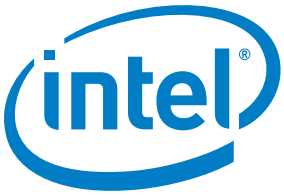

# Intel® Atom™ E3900 SoC Family BSP for Yocto Project*

## Release Notes

*Gold Release*

*August 2016*

Document Number: 333732-001US

# Contents






August 2016
Document Number: 333732-001US



# Figures



# Tables

# Revision History

| Date | Revision | Description |
|---|---|---|
| August 2016 | 001 | Initial Release (Gold) |

§

# 1.0 Introduction

## 1.1 Terminology

**Table 1. Terminology**

| Term | Description |
|---|---|
| BSP | Board Support Package |
| CRB | Customer Reference Board |
| DRM | Direct Rendering Manager |
| DDX | Device Dependent X |
| EDID | Extended Display Information Data |
| eMMC* | Embedded Multi-Media Card |
| GUI | Graphical User Interface |
| HDCP* | High-bandwidth Digital Content Protection |
| HID | Human Interface Device |
| IIO | Industrial I/O |
| LPE | Low Power Engine |
| LTS | Long-Term Support |
| OS | Operating System |
| POR | Plan of Record |
| RAM | Random Access Memory |
| SoC | System-on-Chip |
| SSH | Secure Shell |
| xDCI | Extensible Device Controller Interface |

## 1.2 Intended Audience

This release note is intended for customers who want to use BSP for Yocto* Project* based Linux for Intel® Atom™ E3900 SoC Family.

## 1.3 Customer Support

Contact your Intel representative for support or submit an issue to http://premier.intel.com. §

# 2.0 BSP Release Notes

Intel® Atom™ E3900 SoC Family BSP for Yocto Project* contains the following essential components for building a custom embedded Linux* image:

- One-click setup script for setting up the build environment from scratch
- Meta-intel layer for Linux kernel configurations
- Meta-intel-middleware layer for user-space packages and configurations
- Template of local.conf for building core-image-sato image

The following are the minimum host system configurations for the BSP build for Yocto Project:

- Intel® Core™ i7 processor (4 cores)
- Linux OS of choice for Yocto Project build is Ubuntu* 14.04 LTS OS
- 4 GB RAM and at least 500 GB disk space
- High-speed network connectivity

IMPORTANT: To enable the BSP build for Yocto Project, set up and enable SSH keys on your host machine. See the Setting Up Guide for more details.

## 2.1 Getting Started with BSP for Yocto Project*

Download the BSP for Yocto Project* from Github to your host machine via:

- SSH using following command (release_version, e.g. gold) or

  *git clone https://github.com/01org/bsp-apollolake-i -b <release_version>*

- HTTPS directly from https://github.com/01org/bsp-apollolake-i by selecting the appropriate branch/ release version, e.g. gold, from the top left menu.

### 2.1.1 Default Configuration Set for core-image-sato Image in this BSP

- Meta-intel contains an i915 graphics driver. However, they are dependent on gstreamer plugins. These plugins require license flags set to "commercial" in order to be included in the build. You will find LICENSE_FLAGS_WHITELIST = "commercial" already set by the template in the local.conf for your build.
- To enable full graphics video and display in the image, we have included a package group tailored to showcase the graphics capability on this platform. You will find the packagegroup-core-graphics-essential in meta-intel-middleware. This packagegroup is set to build into core-image-sato by default in this BSP.
- To execute 64-bit standalone applications, you need to enable a multilib environment in your image. The following lines in local.conf are commented out by default. To enable multilib support, remove the “#” in front of these lines.

```
require conf/multilib.conf
DEFAULTTUNE = "corei7-64"
MULTILIBS = "multilib:lib32"
DEFAULTTUNE_virtclass-multilib-lib32 = "corei7-32"
```

In this Gold Release, an additional work around is required:

- Add the following line into mraa_0.10.1.bbappend that located at yocto_build/meta-intel-middleware/recipes-devtools/mraa/

  ```
  SRC_URI += ''file://0001-mraa-point-to-correct-install-paths.patch''
  ```

- To enable 32-bit libraries into final bootable image, you need to add the following settings in local.conf.

  ```
  IMAGE_INSTALL_append = '' lib32-glib-2.0 lib32-gcc''
  ```

- The BSP supports FreeGLUT library. However, it is not enabled by default. To enable FreeGLUT library support, you need to add the following line in build/conf/local.conf.

  ```
  IMAGE_INSTALL_append = '' freeglut''
  ```

### 2.1.2 Your First Build

1. If this is your first build, run the setup.sh script from your bsp-apollolake-i/ directory:

   **$./setup.sh**

2. The setup.sh script will prompt you with a menu for choice of audio machine driver. There are 3 MACHINE types supported by this BSP meta layer for Yocto Project. The machine settings in local.conf will be updated whenever you select features in setup.sh.

**Figure 1. Machine Driver Options**

```
Select an option:

1. Build kernel image with CAVS HD Audio driver (Default)

2. Build kernel image with CAVS SSP Audio driver

3. Build kernel image with legacy HD Audio driver

Default option is build kernel image with CAVS HD Audio
driver. If no input is received within 20 secs, default will
be used.
```

3. Once the machine driver has been selected, the script will prompt you with another menu for choice of build. By default, the core-image-sato-sdk will be selected. Otherwise, you may key in the numerical selection for core-image-sato or linux-kernel as the bzImage, or set up a custom build.

**Figure 2. Build Options**

```
Select an option:

1. core-image-sato-sdk (Default)

2. core-image-sato

3. linux-kernel

4. custom

Default build target is core-image-sato-sdk. If no input is
received within 20 secs, default target will be built.
```

4. Setup.sh performs the following tasks prior to building the BSP image for Yocto Project:

    a. Checks the host machine build environment for the following:
        - Linux distribution on host machine
        - Required software dependencies (this is only performed for Ubuntu 14.04 OS)
        - Version of installed Python* programming language, network connectivity, git config settings, and git proxy settings

    b. Prepares the sources:
        - Downloads Linux Kernel v4.1.27 from Yocto Project.org
        - Applies IOTG Intel® Atom™ E3900 SoC Family kernel patches
        - Combo layer downloads poky Jethro v2.0.2 and other meta layers based on setup/combolayer.conf

- Applies patches to BSP recipes for Yocto Project
- Sets up the path to local kernel source in Linux kernel recipe
- Sets up bblayers for BitBake build
- Sets up local.conf for BitBake build
- Prepares the environment for BitBake build
- Starts the BitBake image, builds automatically based on selection

5. This process will create a build folder named "yocto_build" at the same level of directory as your bsp-apollolake-i/ directory. The BitBake component of Yocto Project will be running at this directory: /yocto_build/build/. For setup.sh to run completely, this process may take up to 5 hours depending on the performance of your build machine. When the build process is completed, you may browse for the image from the following path:
**<path>/yocto_build/build/tmp/deploy/images/intel-corei7-64-<machine-drivers>/**

- HDDIMG image file name: core-image-sato-sdk-intel-corei7-64-<machine-drivers>-<build-date-time>.hddimg
- ISO image file name: core-image-sato-sdk-intel-corei7-64-<machine-drivers>-<build-date-time>.iso

**Note:**

- <machine-drivers> is cavs-hda, or cavs-ssp, or empty, depending on the machine driver selected.
- <build-date-time> are numbers that denote the date and time when the file is generated.

### 2.1.3 For Subsequent Build

1. If you need to modify the recipes or configurations, make your customization in the yocto_build folder after running the ./setup script on your host machine.
2. For audio machine driver, set the MACHINE type in yocto_build/build/conf/local.conf. Different MACHINE types are tied to different kernel features supported. Only set the MACHINE type from one of the following options.

```
MACHINE ??= "intel-corei7-64-cavs-hda"
MACHINE ??= "intel-corei7-64-cavs-ssp"
MACHINE ??= "intel-corei7-64"
```

Default setting:
MACHINE ??= "intel-corei7-64-cavs-hda"

- The Linux kernel source code is patched with the kernel tarball that contains audio code base with CAVS Audio support.

- Kernel configurations are set to compile CAVS HD-Audio.

Additional settings:
MACHINE ??= "intel-corei7-64-cavs-ssp"

- The Linux kernel source code is patched with the kernel tarball that contains audio code base with CAVS Audio support.
- Kernel configurations are set to compile LPE Audio (SSP).

MACHINE ??= "intel-corei7-64"

- The Linux kernel source code is patched with kernel tarball that contains audio code base with legacy audio support.
- Kernel configurations are set to compile legacy HD-Audio.

3. When you are ready to rebuild, go to the yocto_build folder to run the following command:
   **$ cd <path to directory>/yocto_build**

```
# When you source in your yocto_build directory, you will be
automatically be routed to the build/ directory
$ source oe-init-build-env

# For core-image-sato
$ bitbake core-image-sato

# For core-image-sato-sdk
$ bitbake core-image-sato-sdk

# For linux-kernel bzIMage only
$ bitbake linux-yocto
```

### 2.1.4 Install Image into On-Board eMMC*

**NOTE**: You need a live bootable USB drive or hard disk to install the image into the on-board eMMC*. These instructions assume installation into a USB drive.

1. Copy the image into the USB drive using the "dd" command.
2. Assuming the USB drive is mounted as /dev/sdc on the Linux host machine, change to the directory where the image is stored and type the following command in the terminal:

   *$ dd if=core-image-sato-intel-corei7-64.hddimg of=/dev/sdc && sync*
3. Plug the USB drive into the Intel® Atom™ E3900 SoC Family platform and choose to boot off the USB drive.

4. Choose the "Install" option in the Grub menu. Then, choose the correct partition to install your image from the command line interface.

***Note:*** eMMC should be detected as /dev/mmcblk0.

5. After the installation is complete, remove your USB drive and press "ENTER" to reboot.

### 2.1.5 Optional Configuration

For this released image, log in as root without password on the command line interface.

If you want to use the GUI, follow these steps:

**# change directory to /home/root**

```
$ cd /home/root
```

**# edit the .xinitrc file as follows:**

```
$ vi .xinitrc
```

**# Comment out the "exec xterm" line and uncomment the "exec matchbox-session" line as follows:**

```
#exec xterm

exec matchbox-session
```

**# Save and close. Type the “startx” command in the command line interface.**

```
$ startx
```

### 2.1.6 Known Issues (General and BSP for Yocto Project*)

- The HDDIMG image file checksum (MD5SUM) changes after being installed in the USB drive using mkefidisk.sh.

Background:
The change in the image file checksum is expected because when the image file was mounted and un-mounted, some filesystem-related (ext4 in this case) information (e.g. number of times the image was referenced and the last date and time the image was mounted) were updated into the image, which resulted in a different MD5SUM checksum after the image was flashed.

Solution:
No fix is required. There will be no functional change in the image. The image file checksum is just for reference to ensure the image is not corrupted during the download process.

# 3.0 Component Release Notes

## 3.1 IO/Kernel

### 3.1.1 Introduction

This section contains general release information for Linux* Support Package on Intel® Atom™ E3900 SoC Family platforms for the Yocto Project*.

### 3.1.2 New Features

- S0ix power management – Enabled the sleep model s0ix (see Section 3.1.6, "Known Issues").
- S0ix telemetry driver – This driver provide insight to IOSS and PSS IPs power status and s0ix residency for debug purpose.
- USB dual role HW detection – With platform HW support, the detection of USB host or device connected is switch automatically.
- USB dual role default mode – Driver module parameter to enable default to host or device configuration during boot up.
- LPSS SPI PIO/DMA transfer threshold configuration – The threshold to use PIO or DMA can be configured through board file.
- LPSS I2C timeout setting configuration - Added new IOCTL interface for $I^2C$ controller timeout configuration.
- LPSS I2C speed mode configuration – The speed mode configuration is now done through BIOS. This timing parameter for different speed mode is also control by BIOS which was previously hard coded in driver.
- LPSS HSUART full duplex support – Verified driver full duplex support.

### 3.1.3 Product Features

Supported IO/Kernel features.

- Storage: SPI NOR, eMMC*, SD* card, SATA*, USB 2/3 host, USB device
- System: RTC, thermal, HPET, 8253 timer, watchdog
- LPSS: UART/HS-UART, I2C*, SPI
- Memory: ECC
- Power Management: S3, S4, S5, Intel P-state driver, S0ix
- Connectivity: Gigabit Ethernet

- Miscellaneous: LPC, PCIe*, SMBus, GPIO, SDIO*, PWM, IOSF-SB

### 3.1.4 Changes to Existing Features

None.

### 3.1.5 Unsupported Features

None.

### 3.1.6 Known Issues

**Table 2. IO/Kernel – Known Issues**

| Reference Number | Issue |
|---|---|
| 1504085168 | Run Time Power Management doesn't work for xDCI driver |
| 1504118795 | UART Baud Rate 50 and Baud Rate 3M-4M with Software Flow Control Failed to receive data |
| 1804236847 | I2C-desigware id allocation issue |
| 1504232605 | [Intel® Atom™ E3900 SoC Family]: Frequent "mmc0: Got data interrupt 0x00000002 even though no data operation was in progress" messages observed for micro-SD |
| 1504294197 | High wake up rate 40 per second due to apps and kernel scheduler for autonomous s0ix |
| 1504294212 | PCIE Ethernet device I210 driver support RTD3 for autonomous s0ix |
| 1504310725 | [Intel® Atom™ E3900 SoC Family]:Ethernet packet respond in less than 500ms during S0ix wake |
| 1504261722 | I2C Arbitration Loss when transmitting numerical values |
| 1504317092 | Kernel panic when copy 1GB file from one partition to another partition more than one time in mi... |
| 1504324515 | Fail to wakes up system from  for S0ix |
| 1504299796 | eMMC extcsd recommended settings |
| 1504294197 | [Intel® Atom™ E3900 SoC Family] : 8GB micro-sd file content is harmed after removal during read operation |
| 1504295033 | S0ix blocked by USB device not power gated |

### 3.1.7 Fixed Issues

**Table 3. IO/Kernel – Fixed Issues**

| Reference Number | Issue | Status |
|---|---|---|
| 1504156428 | Unable to verify DMA support for GBE | Not Fixed |
| 1504156499 | Unable to verify GBE transmit and receive at various flow control settings | Not Fixed |
| 1404721301 | Intermittent USB Keyboard & Mouse Support in iLab | Not Fixed |
| 1504178526 | [Intel® Atom™ E3900 SoC Family]: The USB FunctionFS driver shall support alternative settings of interfaces | Completed |
| 1504178565 | [Intel® Atom™ E3900 SoC Family]: CDC-NCM shall support datagrams up to 32KB and 16-bit NCM transfer block. | Completed |
| 1504190733 | PWM Power Management Active all the time | Completed |
| 1504192990 | [Intel® Atom™ E3900 SoC Family]: The USB FunctionFS driver shall support a buffer size of up to 32KB | Completed |
| 1804268675 | usbboot doesn't survive S3 cycle | Not defect |
| 1504229714 | [Intel® Atom™ E3900 SoC Family]: The USB Stack shall support USB low-speed (LS) rate of 1.5 Mbits/s, full-speed (FS) rate of 12 Mbits/s or at the USB 2.0 high-speed (HS) rate of 480 Mbits/s. | Not defect |
| 1504229753 | [Intel® Atom™ E3900 SoC Family]: The USB stack shall support audio peripheral driver. (xDCI) | Not defect |
| 1604157269 | [Oxbow Hill] SD card fail to detect | Completed |
| 1504248023 | [Intel® Atom™ E3900 SoC Family]: Kernel Panic during storage test for USB 3.0 Pendrive through USB 1.x Hub using USB 2.0 port | Not defect |
| 1604170364 | [Intel® Atom™ E3900 SoC Family]: Uart fail for "Baud Rate: 4000000, Bite Size:8, Stop Bits: 1, Parity: Even, Flow Control: None" | Not defect |

## 3.2 Graphics

### 3.2.1 Introduction

This section contains general release information for the Intel® IoT Graphics and Media Driver on Intel® Atom™ E3900 SoC Family platforms for Yocto Project. Graphics for the Intel® Atom™ E3900 SoC Family are derived from open source i915 DRM and i965 DRM together with some proprietary components in RPM (tar ball) format, e.g. IPU driver components which will be distributed as needed. Current graphics focus for this release is for Fab A/B Leaf Hill CRB.

### 3.2.2 New Features

- MIPI-DSI
- Atomic non-blocking nuclear pageflip
- Render buffer compression (RBC)
- Nano UFO (Intel® Unified 3D library)
- DRM_FORMAT_YUYV in EGL_EXT_image_dma_buf_import extension
- Offline shader compiler
- S0ix
- GST-MSDK encode plugins
- GPU Field Weaving
- Bug fixes

### 3.2.3 Product Features

- GLES 3.1 through Intel® Unified 3D library DRI. With this, MESA library usage will not be a POR for broad market.
- i915 atomic interface support.
- i915 atomic: Non-blocking nuclear pageflip.
- Fastboot modeset timing. E.g. i915 driver shall complete full mode set within 20ms in single display, 35ms within dual displays and 55ms or less for triple displays configuration.
- Gamma through i915 driver DRM plane property support.
- DisplayPort* brightness API interface.
- Splash Screen support with capabilities e.g. image data, image quality, scaling, multiple displays, config displays, config destination size, minimize time to display the splash screen, request_firmware interface and no format conversion on splash screen image.
- Hibernation and resume including during 3D and Video.
- Standby and resume including during 3D and Video.
- Prioritized GPU task scheduler.
- Media/ Video:
    a. Intel® Media SDK support. Please refer to Intel® Media SDK release note for more detail.
        i. HEVC/H.265 8-bit encode (Intel® Media SDK)
        ii. VP8 2160p decode (Intel® Media SDK)
        iii. X11 DRI3/Present Extension (Intel® Media SDK)

iv. Advance deinterlacing (OTC and Intel® Media SDK)
v. Gstreamer decode plugin (Intel® Media SDK)
vi. Gstreamer sink plugin (Intel® Media SDK)
vii. Gstreamer VPP plugin (Intel® Media SDK)

b. Open source technology video acceleration:
i. HEVC/H.265 10-bit decode
ii. Skin tone detection
iii. Sharpening
iv. Up/Down scaling
v. Denoise
vi. PRIME buffer sharing

- Updated i915, i965, DRM, and DDX drivers
- Display – single HDMI*, DisplayPort*, eDP*
- Display - Multi displays, rotation, scaling, centering
- Display – plane color key, blending
- DPMS, ACPI
- 3D – OpenGL* 3.3, OpenGL ES 3.0
- Decode - H264, MPEG2, VC1, JPEG2, VP8, HEVC 8bit, [M]JPEG
- Encode – H264, [M]JPEG
- Video processing, color conversion
- RC6*, Turbo, DRRS, PSR
- HDCP* 1.4
- Gstreamer plugin (decode and sink)
- eDP1.3

vii. Advance Deinterlacing

### 3.2.4 Changes to Existing Features

- None.

### 3.2.5 Unsupported or Discontinued Features

- Text Tuning
- MPEG2 encode
- Shared Virtual Memory
- Display Configuration - genlock

- Gen-Lock multi-pipe
- Display detection override
- CRTC list

### 3.2.6 Known Issues

**Table 4. Graphics – Known Issues**

| Reference Number | Description |
|---|---|
| 1504207130 | Segmentation Observed during video playback for resolution that are non divisible by 16 in X11 using GSTVaapi plugin |
| 1504229313 | Gstreamer VAAPI sharpen element error with minimum and maximum range of value |
| 1504229597 | Video upscaling seen in X11 matchbox when Gstreamer VAAPI rotation 90 and 270 with force aspect ratio |
| 1504233919 | Stuck in subtest fbc-modesetfrombusy in kms_frontbuffer_tracking in IGT(Intel tools. |
| 1504237918 | Failure in subtest small-gtt-forwards and stuck in gem_pwrite in IGT tools. |
| 1504241233 | MIPI (JDI Panel) requires multi reboot in order to boot up with display |
| 1504254560 | Low FPS when encoding 4k with down scaling on certain resolution |
| 1504288031 | Multi decoding returns abnormal FPS spike when running 16 simultaneous video |
| 1504290865 | CPU pipe a FIFO underrun messages observed irregularly |
| 1504296858 | Hot-plug in not detected intermittently when connected through a repeater on HDMI1 |
| 1504298618 | DRM mode video wall flickering seen with MSDK |
| 1504298664 | DRM mode video wall dual display issue with MSDK |
| 1504299750 | Display Corruption for Gstreamer VAAPI vaapipostproc hue=-180 |
| 1504300124 | X11 Matchbox & Weston compositor Freeze when apply VT Switching during 3D apps running |
| 1504301406 | Rollback found in sample_decode DRM mode |

| Reference Number | Description |
|---|---|
| 1504306947 | Display with smaller resolution during multiple displays flicker intermittently or blink on off |
| 1504307416 | Subtests fail while running kms_fbc_crc in IGT tools. |
| 1504308096 | Low values of PSNR for 6 VPP composition cases. |
| 1504309687 | Subtests fail while running kms_plane in IGT tools. |
| 1504309982 | Atomic update failure on pipe A on dmesg while running 72 hours stress test |
| 1504310000 | CL_INVALID_WORK_GROUP_SIZE when work dimension exceeds 16. |
| 1504312051 | Unable to install UFO RPM without force install |
| 1804338136 | DRM does not expose all universal planes - It only exposes cursor plane instead |
| 1504074120 | No Display on DP MST (multi-stream transport) display |
| 1504086462 | IGT (Intel-gpu-tools) Plane Support Rotation tested fail |

### 3.2.7 Fixed Issues

**Table 5. Graphics – Fixed Issues**

| Reference Number | Description | Status |
|---|---|---|
| 1208448036 | The output pattern of DMABuffer Gstreamer YUY2/RGB888/RGB565 576P are incorrect. | Fixed |
| 1504189107 | Decode in GStreamer VAAPI encoded video shown minor distortion for MJPEG & H264 | Fixed |
| 1504192435 | Gstreamer fails to play VC1 elementary stream | Fixed |
| 1504196038 | 37.5MBPS_60fps_High@L5.2 rendering lag in beginning using GST on MSDK Plugins | Fixed |
| 1504200102 | Decoding MJPEG with Chroma Subsampling 444 shows green corruption | Fixed |
| 1504206592 | Color misalign on color conversion - YUY2 -> NV12 / RGB32 | Fixed |
| 1504206779 | Once in 4 times H264 Encoding Output Filesize is different | Fixed |
| 1504217442 | 6 HEVC encode run2run cases failed without error message | Fixed |

| Reference Number | Description | Status |
|---|---|---|
| 1504220774 | Dual HDMI2.0 without HDCP2.2 thru LSPCon feasibility on Intel® Celeron® processor N3350 and Intel® Pentium® processor | Fixed |
| 1504222076 | Source Alpha Blending setting failed to blend primary plane with background color | Fixed |
| 1504228700 | Gstreamer VAAPI Advance Deinterlace video jerking observed | Fixed |
| 1504228951 | Timestamping problem on Gstreamer VAAPI when the level of denoise value is 1 | Fixed |
| 1504229008 | Display Corruption on Gstreamer VAAPI when the level of denoise value is 1 | Fixed |
| 1504229051 | Display Corruption for Gstreamer VAAPI vaapipostproc brightness ,contrast ,saturation,hue,Skin Tone Detection/Enhancement element with the minimum and maximum value | Fixed |
| 1504229103 | Segmentation Fault occurs while executing Basemark ES3.0 | Fixed |
| 1504240779 | Failure in pm_rc6_residency in IGT tools. | Fixed |
| 1504243778 | Using Gstreamer to decode MPEG-TS with Main at High profile 30/60 fps video caps at 25 fps | Fixed |
| 1504246272 | Gstreamer downscaling to 800x600 show interlace when decoded with vaapidecode and vaapisink. | Fixed |
| 1504246720 | Gstreamer is not able to hardware decode H265 video using vaapidecode and fakesink. | Fixed |
| 1504254062 | RGB4 and RGB4_FCR (Full range mode) MSDK option failing | Fixed |
| 1504254937 | There are 4 AVC Enc R2R cases failing with "ERROR :FileCmp1: Difference found in NALUnit #3 on Reference input and #3 on Test input" | Fixed |
| 1504259817 | Failure to encode JPEG with downscaling | Fixed |
| 1504262471 | Failure in gem_pread_after_blit's result in IGT tools | Fixed |
| 1504166785 | IGT (Intel-gpu-tools) Failure in gem_concurrent_all subtests' result in IGT tools | Fixed |
| 1504167615 | Unigine Heaven/Valley and GpuTest X11 apps cannot run using run_app of Intel GPA tool | Fixed |
| 1504103501 | IGT (Intel-gpu-tools) igt/kms_plane_scaling fail on three displays | Fixed |

| Reference Number | Description | Status |
|---|---|---|
| 1504133431 | Invalid fpsdisplay sink framerate data with vaapisink | Fixed |
| 1604042919 | Fail to decode MPEG2-PS container format video using Gstreamer vaapi | Fixed |

## 3.3 Audio

### 3.3.1 Introduction

This section contains general release information for audio on Intel® Atom™ E3900 SoC Family platforms for the Yocto Project.

### 3.3.2 Product Features

**Table 6. Audio – Product Features**

| I/O Component | Summary of Feature | Feature Availability |
|---|---|---|
| HD Audio | 48kHz, Stereo HD Audio playback through onboard HD Audio Codec | Yes |
| | 48kHz, Stereo HD Audio capture through onboard HD Audio Codec | Yes |
| | HDMI Audio Playback | Yes |
| | HTML5 Audio Playback | Yes |
| | DisplayPort Audio Playback | Yes |
| | 1 HDMI and 1 DisplayPort Audio Playback | Yes |
| | 2 HDMI Audio Playback | Yes |
| | 2 DisplayPort Audio Playback | Yes |
| | Power management for HDMI Audio, DisplayPort Audio, HDA Codec | Yes |
| I2S* Audio | I2S, 48kHz, Master Mode Stereo Playback with Dummy Codec | Yes |
| | I2S, 48kHz, Master Mode Stereo Capture with Dummy Codec | Yes |
| | I2S, 48kHz, Master Mode Stereo Playback with WM8731 Codec | Yes |
| | I2S, 48kHz, Master Mode Stereo Capture with WM8731 Codec | Yes |

| | | |
|---|---|---|
| | I2S, 48kHz, Master Mode Mono and Stereo Playback with TLV320AIC3107 Codec | Yes |
| | I2S, 48kHz, Master Mode Stereo Capture with TLV320AIC3107 Codec | Yes |
| | I2S, 48kHz, Slave Mode Mono and Stereo Playback with TLV320AIC3107 Codec | Yes |
| | I2S, 48kHz, Slave Mode Stereo Capture with TLV320AIC3107 Codec | Yes |
| | Power management | Yes |
| | ACPI NHLT Table | Yes |
| | Ease use for customer feature | Yes |

### 3.3.3 New Features

None.

### 3.3.4 Mandatory BIOS Settings

1. **Mandatory BIOS settings for HD Audio**

*DEVICE MANAGER > SYSTEM SETUP > SOUTH CLUSTER CONFIGURATION > HD AUDIO CONFIGURATION > HD-AUDIO I/O BUFFER OWNERSHIP= HD Audio Link owns all the I/O buffers*

2. **Mandatory BIOS settings for I2S**

*DEVICE MANAGER > SYSTEM SETUP > SOUTH CLUSTER CONFIGURATION > HD AUDIO CONFIGURATION > HD-AUDIO I/O BUFFER OWNERSHIP=I2S port owns all the I/O buffers*

### 3.3.5 Known Issues

**Table 7. Audio – Known Issues**

| Reference Number | Issue |
|---|---|
| 1504169268 | [HDA] Audio record overrun |

### 3.3.6 Fixed Issues

**Table 8. Audio – Fixed Issues**

| Reference Number | Issue | Status |
|---|---|---|
| 1504173712 | [HDA] Underrun detected in concurrent play and record loopback | Completed |
| 1604169471 | [LPE Audio] Overrun detected in S32_LE audio recording | Completed |
| 1504253140 | [LPE] [Dummy] Mute/unmute not working on dummy codec machine driver | Completed |
| 1504253695 | [LPE] Audio format S24_LE was not supported natively | Completed |
| 1504257465 | [HDA] Error message occurred during audio playback upon S0/S3 entry/exit | Not defect |
| 1504173712 | [HDA] Underrun detected in concurrent play and record loopback | Completed |
| 1604169471 | [LPE Audio] Overrun detected in S32_LE audio recording | Completed |
| 1504253140 | [LPE] [Dummy] Mute/unmute not working on dummy codec machine driver | Completed |

### 3.3.7 Limitation

- For SoC revision A0 Stepping, rework is needed to enable HD Audio. Refer to the audio user guide for more details.
- For TLV320AIC3107 codec to work in LPE Audio, rework is needed. Refer to the audio user guide for more details.
- HD Audio and SSP cannot co-exist in one bzimage.

## 3.4 Intel® Integrated Sensor Solution

### 3.4.1 Introduction

This document contains general release information for Intel® Sensor Solution on Intel® Atom™ E3900 SoC Family Platforms for the Yocto Project.

### 3.4.2 Product Features

**Table 9. Intel® Sensor Solution – Product Features**

| I/O Component | Summary of Feature |
|---|---|
| Intel® Sensor Solution | 1. Supports accelerometer 3d sensor for Bosch* BMC150 accelerometer & BMA255 acceleration sensors, barometer sensor for Bosch BMP280 barometric pressure sensor, ambient light |

| I/O Component | Summary of Feature |
|---|---|
| | sensor for Lite-On* AL3010 digital ambient light sensor, and gyrometer sensor for Bosch BMG160 gyroscopes through the IIO interface:<br>a. Read raw<br>b. IIO triggered buffer<br>c. Supports polling mode<br>2. Supports interrupt mode through IIO interface for accelerometer 3d sensor for Bosch BMC150 accelerometer and ambient light sensor for Lite-On AL3010 digital ambient light sensor.<br>3. ISH drivers support S3 state:<br>a. Able to enter S3 suspend mode<br>b. Able to resume after suspended<br>c. Sensors functionalities are restored after resuming from S3.<br>4. ISH drivers are in loadable modules:<br>a. Able to unload and reload all ISH modules. |

### 3.4.3 Known Issues

**Table 10. Intel® Sensor Solution – Known Issues**

| ID | Issue |
|---|---|
| 1504309966 | With AIC standstill, after power up, first buffer data not match compare to subsequent buffer data |
| 1504294361 | BXT-P B1: Unable to run S0ix in uncertain power cycle after enabling ISH in BIOS setting |
| 1504290462 | B1: Enabling ISH in BIOS menu will cause the S0ix Counter to double up |

### 3.4.4 Fixed Issues

**Table 11. Intel® Sensor Solutions – Fixed Issues**

| ID | Issue | Status |
|---|---|---|
| 1504249219 | Interrupt continue occurs when als continue in zero lux | Completed |
| 1504246931 | Not able to read ISH raw data after S3 mode | Completed |
| 1504169453 | iio:deviceX sampling frequency/hysteresis not match with the value set | Not defect |
| 1504074657 | modprobe on ISH driver failed on second time and above | Completed |
| 1504175211 | Ambient Light first and second buffer data is zero | Completed |
| 1504176936 | Not all value that echo to sampling frequency will be set | Not Defect |

## 3.4.5 Limitation

### 3.4.5.1 Sampling Frequency

The IIO Linux sysfs interface allows users to read and write the sampling frequency of each IIO device.

The unit used for IIO device sampling frequency is Hertz. In the Intel® Sensor Solution Firmware, the sampling frequency is equivalent to the HID Report Interval property. From the HID specifications, the Report Interval value is a 32-bit unsigned integer represented in milliseconds. Hence, during the conversion from Hertz to milliseconds in the IIO driver, the precision of the value is up to milliseconds.

Example 1: User writes 11 Hertz for sampling frequency

User inputs: **11 Hertz** → 90.9090 milliseconds = 90 milliseconds

User reads back: 90 milliseconds → 11.11111 Hertz = **11.1 Hertz** (not 11 Hertz) with the ***precision of 1 decimal number***.

**Figure 3. Sampling Frequency Example 1**

```
root@intel-corei7-64:~# echo 11 > /sys/bus/iio/devices/iio:device4/in_accel_sampling_frequency
root@intel-corei7-64:~# cat /sys/bus/iio/devices/iio:device4/in_accel_sampling_frequency
11.100000
```

Example 2: User writes 48 Hertz for sampling frequency

User inputs: **48 Hertz** → 20.833 milliseconds = 20 milliseconds

User reads back: 20 milliseconds → **50 Hertz**

**Figure 4. Sampling Frequency Example 2**

```
root@intel-corei7-64:/sys/bus/iio/devices/iio:device0# echo 48 > in_intensity_sampling_frequency
root@intel-corei7-64:/sys/bus/iio/devices/iio:device0# cat in_intensity_sampling_frequency
50.000000
```

Hence, due to this precision limitation, the sampling frequency value entered by user may not be very accurate.

## 3.4.6 Related Documentation

1. HID Specification
   - USB HID: http://www.usb.org/developers/hidpage/Hut1_12v2.pdf
   - HID for Windows* OS: https://msdn.microsoft.com/en-us/library/windows/hardware/dn613934(v=vs.85).aspx



2. HID Sensor Custom
   - http://lxr.free-electrons.com/source/Documentation/hid/hid-sensor.txt
   - http://lxr.free-electrons.com/source/drivers/staging/iio/Documentation/
3. IIO Sensor
   - http://lxr.free-electrons.com/source/drivers/staging/iio/Documentation/
   - http://lxr.free-electrons.com/source/tools/iio/
4. IIO Generic Buffer App for Accelerometer
   - http://lxr.free-electrons.com/source/tools/iio/

# 4.0 Where to Find the Release

A copy of this release note is available at the GitHub repository of the Intel® Atom™ E3900 SoC Family.