Intel Atom® SoC E3900 Family/ Intel® Celeron® Processor N3350/ Intel® Pentium® Processor N4200 Board Support Package for Yocto Project*

Release Notes

MR2 Release

February 2017

Contents

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Revision History

Date	Revision	Description
February 2017	003	Maintenance Release 2 (MR2)
December 2016	002	Maintenance Release 1 (MR1)
August 2016	001	Initial Release (Gold)

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1.0 Introduction

The Intel Board Support Packages (BSPs), also known as Intel-common BSPs, provide a few carefully selected tune options and generic hardware support to cover most current Intel CPUs and devices. Intel is providing their Yocto Project*-based BSP for the Intel Atom® SoC E3900 Family/ Intel® Celeron® Processor N3350/ Intel® Pentium® Processor N4200 for testing/evaluation and project-based software development.

1.1 Terminology

Table 1. Terminology

Term	Description
API	Application Programming Interface
BSP	Board Support Package
CRB	Customer Reference Board
DDX	Device Dependent X
DDX	Device Dependent X
DMA	Direct Memory Access
DPMS	Display Power Management System
DRI	Dynamic Range Increase
DRM	Direct Rendering Manager
DRRS	Display Refresh Rate Switching
DSI	Display Serial Interface
ECC	Error Checking and Correction
EDID	Extended Display Information Data
eDP*	embedded Display Port*
eMMC*	Embedded Multi-Media Card
GPIO	General-purpose input/output
GUI	Graphical User Interface
HDCP*	High-bandwidth Digital Content Protection
HDMI*	High Definition Multimedia Interface*
HID	Human Interface Device
HPET	High-Performance Event Timer
I^{2}C*	Inter-Integrated Circuit
IIO	Industrial Input/ Output

Term	Description
IO	Input Output
IOCTL	Input/ Output Control
IoT	Internet of Things
LPC	Low Pin Count
LPE	Low-Power Engine
LPSS	Low-Power subsystem
LTS	Long-Term Support
MIPI	Mobile Industry Processor Interface
NOR	Notice of Revision
OS	Operating System
OTC	Over the Counter
PCIe*	Peripheral Component Interconnect express*
PIO	Programmed Input/ Output
POR	Plan of Record
PSR	Panel Self-Refresh
PWM	Pulse Width Modulation
RAM	Random Access Memory
RTC	Real Time Clock
SDIO*	Secure Digital Input Output*
SMBus	System Management Bus
SoC	System-on-Chip
SPI	Serial Peripheral Interface
SSH	Secure Shell
UART	Universal asynchronous receiver/transmitter
UFO	Intel® Unified 3D library
USB	Universal Serial Bus
VPP	Video Post Processing
xDCI	Extensible Device Controller Interface

1.2 Intended Audience

This release note is intended for customers who want to use BSP for Yocto* Project* for Intel Atom® SoC E3900 Family /Intel® Celeron® Processor N3350/ Intel® Pentium® Processor N4200.

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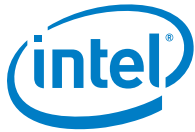
1.3 Customer Support

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

1.4 Reference Documents

Table 2. Reference Documents

Document	Document No./Location
Overrun and Underrun Issue in USB2.0	570645

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2.0 *BSP Release Notes*

2.1 Hardware and Software Compatibility

Hardware

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Software

BSP MR2 Release, Kernel v4.1.27

Jethro* v2.0.1

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3.0 Component Release Notes

3.1 Input Output (IO)/Kernel

3.1.1 Introduction

This section contains general release information for I/O and kernel components for the Yocto Project*.

3.1.2 New Features

None

3.1.3 Product Features

Supported IO/Kernel features.

- Storage: Serial Peripheral Interface (SPI) NOR Flash, Embedded Multi-Media Card (eMMC*), SD* card, SATA*, USB 2/3 host, USB device

- System: Real Time Clock (RTC), thermal, High Performance Event Timer (HPET), 8253 timer, watchdog

- Low Power Sub-System (LPSS): Universal asynchronous receiver/transmitter (UART)/High Speed-UART (HS-UART), Inter-Integrated Circuit (I^{2}C*), SPI

- Memory: Error Checking and Correction (ECC)

- Power Management: S3, S4, S5, Intel P-state driver, S0ix

- Connectivity: Gigabit Ethernet

- Miscellaneous: Low Pin Count (LPC), Peripheral Component Interconnect express* (PCIe*), System Management Bus (SMBus), general-purpose input/output (GPIO), Secure Digital Input Output (SDIO*), Pulse Width Modulation (PWM), IOSF-SB

- S0ix power management – Enabled the sleep model s0ix (Refer to 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.

- Universal Serial Bus (USB) dual role HW detection – With platform HW support, the detection of USB host or device connected is switched automatically.

- USB dual role default mode – Driver module parameter to enable default to host or device configuration during boot up.

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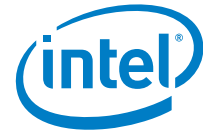Intel® Pentium® Processor N4200 BSP for Yocto Project*
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- LPSS SPI Programed Input/Output (PIO)/Direct Memory Access (DMA) transfer threshold configuration – The threshold to use PIO or DMA can be configured through board file.

- LPSS I^{2}C* timeout setting configuration - Added new Input/Output Control (IOCTL) interface for I²C controller timeout configuration.

- LPSS I^{2}C 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.

3.1.4 Changes to Existing Features

None.

3.1.5 Unsupported Features

None.

3.1.6 Known Issues

Table 3. IO/Kernel – Known Issues

Reference Number	Issue
1504295033	S0ix blocked by USB device not power gated
1504408940	IP not available when using the on board network port
1405644921	SATA drive constantly spins up/down
1504394551	[Power_Management] LEDs on the board still on for few minutes after execute sleep and freeze commands in the background process

3.1.7 Fixed Issues

Table 4. IO/Kernel – Fixed Issues

Reference Number	Issue
1504085168	Run Time Power Management doesn't work for xDCI driver
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

Reference Number	Issue
1504294197	[Intel Atom® E3900 SoC Family]: 8GB micro-sd file content is harmed after removal during read operation
1504104559	SDHC Power Management - Not suspended all time
1504339468	[[Apl-i]: USB gadget mass storage device disconnects from the host when attempted to SSH to the device (SUT)
1504338095	eMMC CRC errors not following JEDEC specification

3.1.8 Workarounds

Table 5.   IO/Kernel – Workarounds

Reference Number	Issue	Workaround
[1504282315]	Fail to resume from S4 (hibernate) using eMMC and USB	• For OS booted using eMMC, append resume=/dev/mmcblk0p3 resumedelay=1 to /boot/EFI/BOOT/grub.cfg • For OS booted with USB, append resume=/dev/sda3 resumedelay=3 to/boot/EFI/BOOT/grub.cfg
[1504339522]	Unable to go into S0ix state when PCIE Ethernet card is connected to the SUT	The driver for PCIE Ethernet card must support S0ix. Check with the PCIE Ethernet card vendor for more details if S0ix feature is required.

3.2 Graphics

3.2.1 Introduction

This section contains general release information for the Internet of Things (IoT) Graphics and Media Driver on Intel Atom® E3900 SoC Family/Intel® Celeron™ Processor N3350/ Intel® Pentium™ Processor N4200 for Yocto Project*. Graphics are derived from open source i915 DRM and i965 DRM together with some proprietary components in the RPM (tar ball) format, for example, Intel® Unified 3D Library, Intel® Media SDK.

3.2.2 New Features

- Bug fixes

- DRM forklift from 4.9+

- HEVC 8-bit encode

- MSDK composition support more than 64 Channel inputs

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- MSDK VPP support 8K resolution
- SFC (Scaler and Format Converter) Enabling

3.2.3   Product Features

- OpenGL ES 3.1 through Intel® Unified 3D library Dynamic Range Increase (DRI). With this, MESA library usage is not POR for broad market.
- i915 atomic interface support.
- i915 atomic: Non-blocking nuclear pageflip.
- Fastboot modeset timing. For example, 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 Application Programming Interface (API) interface.
- Splash Screen support with capabilities; for example, 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. Refer to Intel® Media SDK release note for more detail.
      i. HEVC/H.265 8-bit encode (Intel® Media SDK)

  Note: Refer to [Section 3.2.6 Known Issues](#) for more limitation detail.

      ii. VP8 2160p decode (Intel® Media SDK)
      iii. X11 DRI3/Present Extension (Intel® Media SDK)
      iv. Advance deinterlacing (Over the Counter (OTC) and Intel® Media SDK)
      v. GStreamer decode plug-in (Intel® Media SDK)
      vi. GStreamer sink plug-in (Intel® Media SDK)
      vii. GStreamer Video Post Processing (VPP) plug-in (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
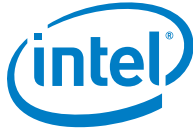
vi.   PRIME buffer sharing

vii.   Advance Deinterlacing

- Updated i915, i965, DRM, and Device Dependent X (DDX) drivers

- Display – single High Definition Multimedia Interface* (HDMI*), DisplayPort*, embedded Display Port* (eDP*)

- Display - Multi displays, rotation, scaling, centering

- Display – plane color key, blending

- Display Power Management System (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, Display Refresh Rate Switching (DRRS), Panel Self-Refresh (PSR)

- HDCP* 1.4

- GStreamer plug-in (decode and sink)

- eDP1.3

- HDCP 1.4

- Several DDX features

- GPU-based XVideo adapters

- Frame Packing Stereoscopic 3D

- Frame Sequential Stereoscopic 3D

- Top-bottom Stereoscopic 3D

- HDCP* daemon support for multiple clients

- Nano libva

- ProcAmp - i965 video driver provides VPP method to adjust ProcAmp values for example, Brightness, Contrast, Saturation, and Hue.

- OTC Video - VP8 encode

- OTC Video - VP9 decode

- Patch for libva stolen memory

3.2.4   Changes to Existing Features

None.

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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 6.   Graphics – Known Issues

Reference Number	Description
1504340500	Rendercheck triangles test fails
1504340562	Rendercheck gradients test fails
1504349846	MIPI DSI(JDI) is able to boot up, But no display after Yocto Project* loading page.
1804660752	Dependencies to X11 from iHD_DRV_video.so need to be removed.
1504349075	System hang seen during stress testing
1504229313	GStreamer VA API sharpen element error with minimum and maximum range of value
1504229597	Video upscaling seen in X11 matchbox when GStreamer VA API 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.
1504290865	CPU pipe a FIFO underrun messages observed irregularly
1504296858	Hot-plug in not detected intermittently when connected through a repeater on HDMI1
1504300124	X11 Matchbox & Weston compositor Freeze when apply VT Switching during 3D apps running
1504310000	CL_INVALID_WORK_GROUP_SIZE when work dimension exceeds 16.

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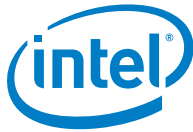
Reference Number	Description
1804338136	DRM does not expose all universal planes - It only exposes cursor plane instead
1504074120	No Display on DP MST (multi-stream transport) display
1504375274	MSDK VBR and CBR bitrate overrun. vbr+cbr no big difference on bitrate
1504375833	No video is shown when using io-mode=5 to capture video stream from camera.
1504381939	Error occurs when decoding video using tee pipeline in dri3 renderer.
1504388716	MJPEG videos stop when performing seeking in X11.
1504390243	Intermittent display when boot up LH with MIPI JDI connected
1504390707	MIPI DSI(JDI) ERROR "Timeout waiting for HS/LP CTRL FIFO !full" on triple display
1504392117	Unable to decode demuxed VP9 video (ivf container).With GST VAAPI
1504392399	Unable to do fps modification on demuxed h264 videos. With GST and MSDK
1504393332	MIPI JDI boots up with no display on it.
1504395700	IGT pm_rpm subtests fail
1504396649	IGT kms_planeblend subtest fails.
1504397843	Hardware acceleration is disabled when perform CSC and scaling for 8K YV12 with MSDK
1504402417	Failure to compile sample_mondello apps in internal MSDK
1604254872	DP1.2 Compliance Test - Link Layer Tests fail (Invalid Training Pattern)
1804687116	VC1 decoding artifacts seen with MSDK
1804687120	Luma-keying with scaling resulting in artifacts with MSDK
1804714217	HDMI display does not work after waking up from suspend

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3.2.7 Fixed Issues

Table 7.   Graphics – Fixed Issues

ID	Title
1304657512	Standalone shader - simple-egl example - shader compiles but at runtime does not look correct
1405307922	8% performance drop is observed on a couple of subtests of GFXBench 4.0 with UFO DRI
1504313229	Decode GStreamer VA API encoded video shown minor distortion for MJPEG
1504326707	Mouse in different positions in clone mode when display is rotated in certain pattern
1504332215	GL42-45 gpu_shader_fp64.varyings causes GPU hang on UFO version 56524
1504335321	Intermittent video freeze on last frame when decoding H264 video with rotation on eMMC
1504335581	UFO nano is not supported on B1 Adopted SKU QKT4
1405395069	eDP blanks after booting up to to Yocto OS
1804660752	Dependencies to X11 from iHD_DRV_video.so need to be removed.
1504237918	Failure in subtest small-gtt-forwards and stuck in gem_pwrite in IGT tools.
1504306947	Display with smaller resolution during multiple displays flicker intermittently or blink on off
1504309982	Atomic update failure on pipe A on dmesg while running 72 hours stress test
1504086462	IGT (Intel-gpu-tools) Plane Support Rotation tested fail

3.3 Audio

3.3.1 Introduction

This section contains general release information for audio. Refer to the Audio User Guide for installation information on HD Audio and I2S Audio.

3.3.2 Product Features

Table 8.   Audio – Product Features

I/O Component	Summary of Feature	Feature Availability
	48kHz, Stereo HD Audio playback through onboard HD Audio Codec	Yes

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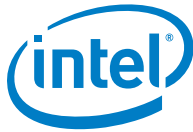
I/O Component	Summary of Feature	Feature Availability
HD Audio	48kHz, Stereo HD Audio capture through onboard HD Audio Codec	Yes
	HDMI Audio Playback	Yes
	HTML5 Audio Playback	Yes
	DisplayPort Audio Playback	Yes
	1 HDMI and 1 DisplayPort Audio Playback	Yes
	2 HDMI Audio Playback	Yes
	2 DisplayPort Audio Playback	Yes
HD Audio	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 9.   Audio – Known Issues

Reference Number	Issue	Status
1504169268	[HDA] Audio record overrun, Refer to Section 3.3.7, Limitation	Not Fixed

3.3.6 Fixed Issues

None

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.

- [1504169268] It is not recommended to run audio play/record on the same USB2.0 USB flash drive that boot up the board. Refer application note titled "Overrun and Underrun Issues in USB2.0.

3.4 Intel® Integrated Sensor Solution

3.4.1 Introduction
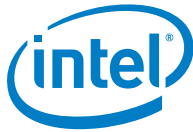
This document contains general release information for Intel® Sensor Solution.

3.4.2 New Features

1. Soletta-dev-app is supported.
2. ISH Calibration Tool, ISH Debug Tool, and ISH Manufacturing Tool are supported.
3. ISH drivers have an additional driver – intel-ishtp-client.ko. This module needs to be loaded when using ISH Calibration Tool, ISH Debug Tool, and/or ISH Manufacturing Tool.

3.4.3 Product Features

Table 10. 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 sensor for Lite-On* AL3010 digital ambient light sensor, and gyrometer sensor for Bosch BMG160 gyroscopes through the IIO interface:
	  a. Read raw
	  b. IIO triggered buffer
	  c. Supports polling mode
	
	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.
	
	3. ISH drivers consist of intel-ish-ipc.ko, intel-ishtp.ko, and intel-ishtp-hid.ko. Guide to unload and reload ISH modules are as below:
	  a. To unload all three ISH drivers at once:
	`$ modprobe -r intel-ish-ipc`
	  b. To reload all three ISH drivers at once:
	`$ modprobe intel-ish-ipc`
	  c. To unload ISH drivers one by one using rmmod:
	`$ rmmod intel-ishtp-hid`
	`$ rmmod intel-ish-ipc`
	`$ rmmod intel-ishtp`
	OR
	`$ rmmod intel-ish-ipc`
	`$ rmmod intel-ishtp-hid`
	`$ rmmod intel-ishtp`
	  d. To reload ISH drivers one by one using insmod:
	`$ cd /lib/modules/4.1.27apollolake/kernel/drivers/hid/intel-ish-hid/`
	`$ insmod intel-ishtp.ko`
	`$ insmod intel-ish-ipc.ko`
	OR
	`$ insmod intel-ishtp.ko`
	`$ insmod intel-ishtp-hid.ko`
	`$ insmod intel-ish-ipc.ko`
	
	4. Supports Soletta framework and sample applications for accelerometer 3D sensor, barometer sensor, ambient light sensor, and gyroscope 3D sensor.
	
	5. ISH drivers support S0iX and S3 state:
	  a. Able to enter S0iX and S3 suspend mode
	  b. Able to resume after being suspended
	  c. Sensor functionalities are restored after resuming from suspend
	
	6. Soletta sensor sample applications:

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I/O Component	Summary of Feature
	a. Accelerometer sensor sample application using flow-based programming (FBP) b. Ambient light sensor sample application using high-level C api programming c. Barometer sensor sample application using flow-based programming with MQTT d. Gyroscope sensor sample application using traditional C programming with MQTT

3.4.4 Known Issues

Table 11. Intel® Sensor Solution – Known Issues

ID	Issue
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 causes the S0ix Counter to double up
1504375463	Unable to read ISH Raw data after S3 mode
1504393119	Unable to modprobe ISH driver modules after unloading
1504405087	Dump stack error appear during Calibrate and Test calibration Sensor
1504403701	ISSU -INFO do not show Ambient Light sensor model AL3010

3.4.5 Fixed Issues

Table 12. Intel® Sensor Solution – Fixed Issues

ID	Issue
1504309966	With AIC standstill, after power up, first buffer data does not match compared to subsequent buffer data
1504336955	Second accel_3d did not occur in /sys/bus/iio/devices/iio:device*/name
1504340819	Dmesg error during unloading and loading ISH driver modules
1504337496	Unable to read ISH Raw data after S3 mode

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3.4.6   Limitation

3.4.6.1   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 1.   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 2.   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 accurate.

3.4.7   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/

5. Soletta GitHub:

   - https://github.com/solettaproject/soletta/tree/v1

6. Soletta Presentation Slides:

   - https://github.com/solettaproject/soletta/wiki/Presentations

7. Soletta Documentations:

   - https://github.com/solettaproject/soletta/wiki/Documentation

8. Soletta `c-api`:

   - http://solettaproject.github.io/docs/c-api/

9. Soletta Flow Node description:

   - http://solettaproject.github.io/docs/nodetypes/

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4.0   *Where to Find the Release*

A copy of this release note is available at the GitHub repository of the Intel Atom® SoC E3900 Family/ Intel® Celeron™ Processor N3350/ Intel® Pentium™ Processor N4200.

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5.0   *Getting Started with Board Support Package*

5.1   Setting up the Host Machine

The following are the minimum host system configurations to build BSP for the 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 500 GB disk space

- High-speed network connectivity

Note: To enable the BSP build for Yocto Project*, set up and enable SSH keys on your host machine. Refer to the Setup Guide for more details.

5.2   Getting Started with BSP for Yocto Project*

Download the BSP for Yocto Project* from GitHub to your host machine

- HTTPS directly from https://github.com/01org/iotg-yocto-bsp-public/tree/e3900/master by selecting the appropriate tag version, for example, E3900-MR2, from the top left menu or

- SSH using the following command: `git clone https://github.com/01org/iotg-yocto-bsp-public.git -b e3900/master`

This git tree is maintained as single product branch. To get code base from the previous release, for example, PV release, checkout to the specific tag.

- For PV release: git checkout E3900-PV.

- For Maintenance Release Version 1: git checkout E3900-MR1

- For Maintenance Release Version 2: git checkout E3900-MR2

5.2.1   Default Configuration Set for core-image-sato Image in This BSP

- Meta-intel contains an i915 graphics driver. However, they depend on GStreamer plug-ins. These plug-ins require license flags set to "commercial" to be included in the build. 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. The packagegroup-core-graphics-essential is 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"
```

- 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"
```

5.2.2 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 prompts 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 are updated whenever you select features in setup.sh.

Figure 3. 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 prompts you with another menu for choice of build. By default, the core-image-sato-sdk is selected.
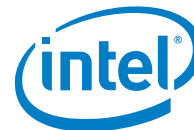
Otherwise, you may key in the numerical selection for core-image-sato or linux-kernel as the bzImage, or set up a custom build.

Figure 4. 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 is 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 gitproxy 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 creates a build folder named "yocto_build" at the same level as your `bsp-apollolake-i/` directory. The BitBake component of Yocto Project is 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

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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

5.2.3 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. The machine settings in local.conf is updated whenever you select features in setup.sh. However, you may change it for your own build testing.

   Default settings:
   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.

   In yocto_build/build/conf/local.conf, you will able to set which MACHINE type and which AUDIO_FEATURES to build.

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
   ```

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

5.2.4 Install Image into On-Board eMMC*

Note: You need a live bootable USB flash drive or hard disk to install the image into the onboard eMMC*. These instructions assume installation into a USB flash drive.

1. Copy the image into the USB flash drive using the "**dd**" command.

2. Assuming the USB flash 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 flash drive into the Intel Atom® SoC E3900 Family platform and choose to boot off the USB flash 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 flash drive and press "**ENTER**" to reboot.

5.2.5 Optional Configuration

For this released image, log on 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
```

5.2.6   Known Issues (General and BSP for Yocto Project*)

- The HDDIMG image file checksum (MD5SUM) changes after being installed in the USB flash 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 (for example, 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 is 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.

- [1504212818] Media player unable to play sound files.

   Background:

   Media player was based on gst-player* that inherit from open source. Since this is 3rd party software, this is low priority to fix by IOTG PED.

   Workaround:

   Invoke command: aplay or gst-play <sound_file> to play sound file from terminal.

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