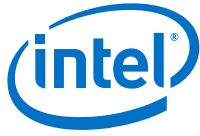


Intel Minipi Lake Platform (Intel[®] Atom[™] Processor E38xx/Intel[®] Celeron[®] N2xx/Bay Trail-M)

Ubuntu 13.10 64-bit Setup Application Note

June 2014



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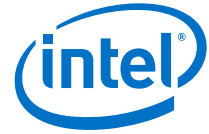
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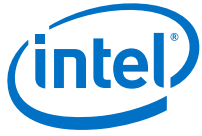
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Revision History

Date	Revision	Description
June 2014	001	Initial release



1.0 Introduction

This document describes the steps required to install Ubuntu 13.10 64-bit into a Minipi Lake platform which is running Bay Trail-M core. This document also describes how to get the entire graphic component accelerated by the hardware, which is a common problem with many Linux distributions.

1.1 Minipi Lake

Minipi Lake is a low cost, single board IA mini desktop system. The platform runs Bay Trail-M core. The majority of the steps described here are also applicable for other platforms that are based on Bay Trail-M core except for WiFi/Bluetooth* (BT) and eMMC modules where the board manufacturer may use a different type of hardware. For more information on the platform, see <http://www.ecs.com.tw/LIVA/index.html>

1.2 Intel® Atom™ Processor E38xx/Intel® Celeron® N2xx (Formerly Bay Trail)

The Intel® Atom™ processor E3800 product family is the first system-on-chip (SoC) designed for intelligent systems, delivering outstanding compute, graphical, and media performance while operating in an extended range of thermal conditions. These SoCs are based on the Silvermont micro architecture, utilizing Intel's industry-leading 22nm process technology with 3-D Tri-Gate transistors, which deliver significant improvements in computational performance and energy efficiency. For more information, visit <http://www.intel.com/content/www/us/en/intelligent-systems/bay-trail/atom-processor-e3800-family-overview.html>

1.3 Ubuntu

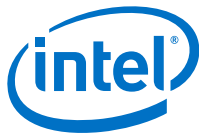
The version of Ubuntu described in this document is 13.10 ("Saucy Salamander") 64-bit edition. The default Linux kernel included in the installation is version 3.11.0-12. Despite the early announcement by Ubuntu, MIR and xMIR are dropped, so that the graphic is running on top of X similar to the previous version of Ubuntu.

Even though we are focusing on Ubuntu 13.10 64 bit, the instructions described in this document may applicable to other flavor of *buntu 64-bit OSes. However, the steps provided in this document may not work on the 32-bit version of Ubuntu because the Minipi Lake firmware does not support a 32-bit boot loader.

2.0 Installing Ubuntu 13.10

The installation consists of the following processes:

- "Preparing USB Installation Media"
- "Setting up the Minipi Lake Board"
- "Partitioning Workaround" (needed only for systems that are pre-installed with Windows* 8)
- "Installing Ubuntu"



2.1 Preparing USB Installation Media

1. Get the installation image:
 - a. Download the Ubuntu 13.10 installation image (*.iso) source from <http://releases.ubuntu.com/releases/13.10/>
For the 64-bit version, the image used is saucy-desktop-amd64.iso.

Note:

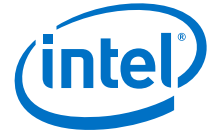
The Minipi Lake board allows only a UEFI bootable image to run and for Ubuntu 13.10, only its 64-bit version (amd64) has UEFI support. Ubuntu 13.10 32-bit does NOT have EFI support.

2. Because Minipi Lake does not have DVD/CD-ROM, make a bootable USB to install the Ubuntu 13.10 OS from an ISO image using one of the options below.
 - **Using Rufus:**
 - i. Make a bootable Ubuntu installation using Rufus. Rufus is available online at <http://rufus.akeo.ie/>.
 - ii. Select correct USB Flash from the “Device” dropdown menu.
 - iii. For “Partition scheme and target system type”, select **GPT partition scheme for UEFI computer**.
This is important because Minipi Lake only accepts a UEFI bootable image.
 - iv. Click “Create a bootable disk using:” and select **ISO Image**.
 - v. Click on the DVD logo next to it and choose the downloaded Ubuntu *.iso. The *.iso bootable image needs to have EFI support for Minipi Lake. Ubuntu 13.10 64-bit has EFI support.
 - vi. Click **Start**.
 - **Using UNetbootin:**
 - i. Download UNetbootin from <http://unetbootin.sourceforge.net/>.
 - ii. After installing, run UNetbootin, select the option **Diskimage** and from the drop-down list, select **ISO** for the type of the installation image, and specify the location of downloaded *.iso image in the text box.
 - iii. From the “Type” drop-down menu, select **USB Drive**. Click **OK** to proceed.

After you complete either of the steps above, you are ready to boot your board with the USB flash drive and start the installation process.

2.2 Setting up the Minipi Lake Board

1. Connect a monitor (either VGA or HDMI), keyboard, mouse, USB installation media (with bootable Ubuntu image) and power supply. Recheck the connection, verify twice that it has connected properly, and then turn the power ON.
2. On the BIOS menu, select **boot order options**, set first priority to “UEFI: USB Storage” device (or something similar), and then save and exit from BIOS.
3. Reboot the system from the USB drive; the display will show Ubuntu “grub menu”.
4. Select **Try Ubuntu** to boot up without installation.
5. If your system came with Windows* 8 installed, you may have a problem installing Ubuntu 13.10 due to the partition setup of Windows 8. To fix the problem, follow the steps in “[Partitioning Workaround](#)”.



2.3 Partitioning Workaround

Note: Steps in this section can be skipped if your system does not come with Windows 8 installed.

1. After Ubuntu booted successfully from the USB media, open a terminal and check the eMMC partitioning using the command below:

sudo fdisk -ls

The list should show a few devices including the internal eMMC storage device and the USB storage device.

Usually the USB storage device is mounted in `/dev/sdb` and the eMMC storage device is mounted at `/dev/mmcblk0`, which may have already been installed with Microsoft Windows 8.

The Minipi Lake board that we are testing has an eMMC device with 16 GB capacity. You need to know this information to determine which one from the partition table represents the eMMC device.

The eMMC device will have a few partitions, which include EFI Boot, System Recovery, and Windows Files. The Windows 8 partitioning system will block the Ubuntu partitioning application from modifying the partition.

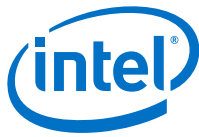
2. After locating the Windows 8 partition as described above, erase the partition prior to installing Ubuntu. Assuming `/dev/mmcblk0` is the device for eMMC, and the capacity is 16GB, use the command below to completely erase the storage:

Warning: This process will completely erase Windows 8 and all data in the eMMC storage. The process of erasing the partition may take around 15 minutes. Windows 8 and its data will be erased without any option to recover.

sudo dd if=/dev/zero of=/dev/mmcblk0 bs=1M count=15758

2.4 Installing Ubuntu

1. After completing the steps above, reboot the machine.
2. When the Ubuntu grub menu appears, select **Install Ubuntu**.
3. Follow the installation instructions as shown on the Ubuntu Wizard screen. The default installation setup works from our test on Minipi Lake. For installation help, refer to <https://help.ubuntu.com/community/Installation>
4. From the Ubuntu installation wizard, select the correct eMMC device. After that, we would recommend user to select "erase and install", which will erase the whole eMMC storage and automatically create partition according to the requirements OS and System.
5. If third-party codecs for mp3 and video are needed, check a box in the wizard for the installation.
6. After the installation is finished, reboot the system and unplug the USB drive.
7. After rebooting, you will see Ubuntu Login screen. Proceed with the login details you have provided during installation.
8. From the test on Minipi Lake, Intel found that most of the devices on the board work fine with default Ubuntu 13.10 installation. Intel verified that Display (Analog + HDMI), Graphic component (2D, 3D, OpenGL), Audio jack, MP3 Playback, USBs and LAN network work with the default installation. Refer to the "Test Results" on [page 13](#).
9. Intel identified a problem with the default Ubuntu setup; the Video playback is not hardware accelerated by default. Below is the step to rectify this problem.



3.0 Installing and Verifying the Graphic Component

This section describes the steps to install and verify all graphic components to ensure users get the best performance of their system.

3.1 Video Component Requirements

The following video components are required for video hardware acceleration:

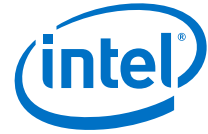
- Libdrm version is 2.4.46 (updated)
- Libva version is 1.2.1 (updated)
- Vaapi intel-driver version is 1.2.0 (updated)
- X driver version is (xf86-video-intel-2.99.902) (updated, recompiled)
- Updated gstreamer-vaapi (from default Ubuntu repository)
- X.Org X server version 1.14.3 RC1 (default in Ubuntu 13:10)

3.2 Configuring the Video Component

1. Get the required packages listed above:
 - a. Open a terminal by selecting the top-left corner and type **terminal** or press **Ctrl + Alt +T**.
 - b. For root (administration) privileges, switch to root using the command **sudo su**.
 - c. Create a new folder named **Drivers** in your home directory:
cd ~
mkdir Drivers
cd Drivers
 - d. Download the following sources from <https://01.org/linuxgraphics/downloads> into `~/Drivers/`

Libdrm - 2.4.46	http://dri.freedesktop.org/libdrm/libdrm-2.4.46.tar.gz
Libva - 1.2.1	http://www.freedesktop.org/software/vaapi/releases/libva/libva-1.2.1.tar.bz2
vaapi intel-driver - 1.2.1	http://www.freedesktop.org/software/vaapi/releases/libva-intel-driver/libva-intel-driver-1.2.1.tar.bz2
xf86-video-intel - 2.99.902	http://xorg.freedesktop.org/archive/individual/driver/xf86-video-intel-2.99.902.tar.gz

2. Install additional dependency packages:
apt-get update (updating the repository)
apt-get install g++
apt-get install libpciaccess-dev libpthread-stubs0-dev automake
apt-get install git xorg-dev
3. Compile and install:
 - a. Extract all of the packages:
tar -xvf libdrm-2.4.46.tar.gz
tar -xvf libva-1.2.1.tar.bz2
tar -xvf libva-intel-driver-1.2.1.tar.bz2
tar -xvf xf86-video-intel-2.99.902.tar.gz



- b. Change directories to the libdrm folder and install:


```
cd libdrm
./configure --prefix=/usr
make
make install
```
- c. Check for errors at each step. If there is any dependency not met after running `./configure`, resolve the issue by installing the required missing package using `apt-get`.
- d. After successfully installing libdrm, install Libva:


```
cd ../libva
./configure --prefix=/usr
make
make install
```
- e. Repeat the steps for the libva-intel-driver (VA-API driver):


```
cd ../libva-intel-driver
./configure --prefix=/usr
make
make install
```
- f. Install xf86-video-intel:


```
cd ../xf86-video-intel
./configure --prefix=/usr
make
make install
```

Make sure there is no error during compilation and installation. The installation must be done in the exact order as describe above.

4. Update the GStreamer component for video playback (note that the third command is actually one long command line):

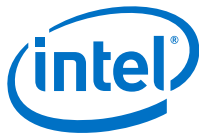

```
add-apt-repository ppa: sander-vangrieken/vaapi
apt-get update

apt-get install gstreamer0.10-vaapi libgstreamer-vaapi0.10 libgstreamer-vaapi0.10-dev python-gi python3-gi gstreamer1.0-tools gir1.2-gstreamer-1.0 gir1.2-gst-plugins-base-1.0 gstreamer1.0-plugins-good gstreamer1.0-plugins-ugly gstreamer1.0-plugins-bad gstreamer1.0-libav
```
5. [Optional] Install MPlayer for video playback:


```
apt-get install mplayer-vaapi
```
6. Verify the video component installation by running `vainfo`:


```
Locate vainfo
```
7. Run `vainfo` or `sudo vainfo`. You should see some information as below:


```
libva info: VA-API version 0.34.0
libva info: va_getDriverName() returns 0
libva info: Trying to open /usr/lib/dri/i965_drv_video.so
libva info: Found init function __vaDriverInit_0_34
libva info: va_openDriver() returns 0
lt-vainfo: VA-API version: 0.34 (libva 1.2.1)
lt-vainfo: Driver version: Intel i965 driver - 1.2.1
```

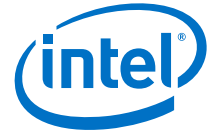


```
lt-vainfo: Supported profile and entrypoints
VAProfileNone                : VAEntrypointVideoProc
VAProfileMPEG2Simple         : VAEntrypointVLD
VAProfileMPEG2Simple         : VAEntrypointEncSlice
VAProfileMPEG2Main          : VAEntrypointVLD
VAProfileMPEG2Main          : VAEntrypointEncSlice
VAProfileH264Baseline       : VAEntrypointVLD
VAProfileH264Baseline       : VAEntrypointEncSlice
VAProfileH264Main           : VAEntrypointVLD
VAProfileH264Main           : VAEntrypointEncSlice
VAProfileH264High           : VAEntrypointVLD
VAProfileH264High           : VAEntrypointEncSlice
VAProfileVC1Simple          : VAEntrypointVLD
VAProfileVC1Main            : VAEntrypointVLD
VAProfileVC1Advanced        : VAEntrypointVLD
VAProfileJPEGBaseline       : VAEntrypointVLD
```

This output verifies that the installations are correct.

8. Test video playback using GStreamer:

- For all video types:
gst-launch-0.10 -v playbin uri=file:///root/tmp/output/test1.mpg
or
gst-launch-1.0 -v playbin uri=file:///root/tmp/output/test1.mpg
- Alternatively for H264 type:
gst-launch-0.10 -v filesrc location=<path/h264 video clip> ! qtdemux ! vaapicode ! vaapisink
- For VC1 type:
gst-launch-0.10 -v filesrc location=<video clip.wmv> ! asfdemux ! vaapicode ! vaapisink
- For MPEG2 (there few different types):
gst-launch-0.10 -v filesrc location=<video clip> ! mpegpsdemux ! queue ! vaapicode ! vaapisink
gst-launch-0.10 -v filesrc location=<video clip> ! mpegtsdemux ! vaapicode ! Vaapisink
gst-launch-0.10 -v filesrc location=<video clip> ! mpegdemux ! vaapicode ! vaapisink
gst-launch-0.10 -v filesrc location=<video clip> ! mpegvideoparse ! vaapicode ! vaapisink



3.3 Verifying the OpenGL Graphic Component

This procedure is optional because Intel already verified that Ubuntu 13.10 has these components working by default on Minipi Lake.

1. Install mesa-utils:
apt-get install mesa-util
2. Run **glxinfo** and search for “direct rendering: Yes” and “OpenGL renderer string:” is “Bay Trail” for Minipi Lake. If both strings are seen, it is confirmed that OpenGL is hardware accelerated by the graphic engine.
3. Run **glxgears** to see that OpenGL is running correctly.

4.0 WiFi and Bluetooth*

The module that is used for WIFI/BT on Minipi Lake is Broadcom BCM43241B0_002.001.013 or BCM43241B3_002.004.006.0096. The Ubuntu image does not include the module driver. It must be installed manually using the steps below.

1. Download the driver to your system from
<http://www.almost.org/2014/01/broadcom-driver-for-linux-kernel-311.html>
2. Unzip the file and copy the files to `/lib/firmware/brcm`
3. Reboot.

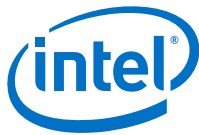
For more detailed steps, refer to
<http://askubuntu.com/questions/55868/how-to-install-broadcom-wireless-drivers-bcm43xx>

You may also compile the driver if necessary. The source code is available at:
<http://wireless.kernel.org/en/users/Drivers/brcm80211>

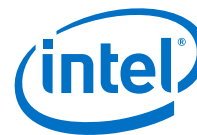
Note: Currently the Bluetooth adapter is not detected on Ubuntu but the log messages can be observed from `dmesg` and `cat /var/log/syslog`. Refer to the details below.

```
root@ubuntu-desktop:~# dmesg | grep -i Blue
[ 7.275717] Bluetooth: Core ver 2.16
[ 7.275806] Bluetooth: HCI device and connection manager
initialized
[ 7.276460] Bluetooth: HCI socket layer initialized
[ 7.276470] Bluetooth: L2CAP socket layer initialized
[ 7.276499] Bluetooth: SCO socket layer initialized
[ 7.283996] Bluetooth: BNEP (Ethernet Emulation) ver 1.3
[ 7.284004] Bluetooth: BNEP filters: protocol multicast
[ 7.284019] Bluetooth: BNEP socket layer initialized
[ 7.412751] Bluetooth: RFCOMM TTY layer initialized
[ 7.412774] Bluetooth: RFCOMM socket layer initialized
[ 7.412778] Bluetooth: RFCOMM ver 1.11

root@ubuntu-desktop:~# dmesg | grep -i tty
[ 5.551919] 80860F0A:00: ttyS4 at MMIO 0xd075f000 (irq = 39)
is a 16550A
[ 7.412751] Bluetooth: RFCOMM TTY layer initialized
```



```
cat /var/log/syslog | grep -i BLUE
Nov 21 21:46:46 ubuntu-desktop kernel: [ 8.168239]
Bluetooth: Core ver 2.16
Nov 21 21:46:46 ubuntu-desktop kernel: [ 8.168356]
Bluetooth: HCI device and connection manager initialized
Nov 21 21:46:46 ubuntu-desktop kernel: [ 8.169181]
Bluetooth: HCI socket layer initialized
Nov 21 21:46:46 ubuntu-desktop kernel: [ 8.169191]
Bluetooth: L2CAP socket layer initialized
Nov 21 21:46:46 ubuntu-desktop kernel: [ 8.169220]
Bluetooth: SCO socket layer initialized
Nov 21 21:46:46 ubuntu-desktop kernel: [ 8.179611]
Bluetooth: BNEP (Ethernet Emulation) ver 1.3
Nov 21 21:46:46 ubuntu-desktop kernel: [ 8.179618]
Bluetooth: BNEP filters: protocol multicast
Nov 21 21:46:46 ubuntu-desktop kernel: [ 8.179635]
Bluetooth: BNEP socket layer initialized
Nov 21 21:46:46 ubuntu-desktop kernel: [ 8.239565]
Bluetooth: RFCOMM TTY layer initialized
Nov 21 21:46:46 ubuntu-desktop kernel: [ 8.239590]
Bluetooth: RFCOMM socket layer initialized
Nov 21 21:46:46 ubuntu-desktop kernel: [ 8.239594]
Bluetooth: RFCOMM ver 1.11
Nov 21 21:47:20 ubuntu-desktop dbus[589]: [system] Activating
service name='org.blueman.Mechanism' (using servicehelper)
Nov 21 21:47:20 ubuntu-desktop blueman-mechanism: Starting
blueman-mechanism
Nov 21 21:47:20 ubuntu-desktop dbus[589]: [system] Successfully
activated service 'org.blueman.Mechanism'
Nov 21 21:47:20 ubuntu-desktop blueman-mechanism: loading Ppp
Nov 21 21:47:20 ubuntu-desktop blueman-mechanism: loading
Config
Nov 21 21:47:20 ubuntu-desktop blueman-mechanism: loading
Network
Nov 21 21:47:20 ubuntu-desktop blueman-mechanism: loading
RfKill
Nov 21 21:47:50 ubuntu-desktop blueman-mechanism: Exiting
hcitool dev
Devices:
```



5.0 Test Results

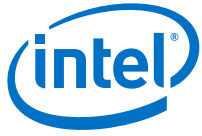
Below are the results of Intel's test with Ubuntu 13.10 64-bit running on Minipi Lake.

Item	Result	Comment
Operating System	Passed	Ubuntu 13.10 64bit & 32bit (Kernel 3.11.0-8-generic, X.Org X server 1.14.3 RC1)
Graphic Driver	Passed	The system is using i915 open source graphic driver from Intel OTC.
Display	Passed	Analog single, HDMI single, HDMI+Analog dual displays are verified to work.
2D Rendering	Passed	The system is running Xserver 1.14 with Intel OTC's intel_drv.so and is hardware accelerated.
3D Rendering	Passed	3D Open GL (glxgears, glxinfo) able to run without problem with hardware rendering.
Video decoding and playback	Passed	We are able to demonstrate that Video decode with hardware acceleration is running on Ubuntu with Minipi Lake. The test is using gstreamer with vaapi.
eMMC storage	Passed	We are able to install Ubuntu 64 bit into the eMMC, and run Ubuntu 64 bit from eMMC.
USB	Passed	We are able to boot from flash drive. USB peripheral such as keyboard and mouse work as expected. However, currently there is an issue with high power downstream devices.
Audio & MP3 decode.	Passed	MP3 playback is available with Ubuntu installation. Users only need to tick a check box to install the feature.
HDMI Audio	Failed	Current setting that we gave failed to output Audio through HDMI cable. Ubuntu may be fixed this issue in its upcoming stable releases.
Local Area Network	Passed	Internet Browser (Firefox*) works as expected, we are able to access Google* and Yahoo*. SSH also works fine.
Power Management	Partially Passed	Shutdown, Hibernate (S4) and Restart is passing. However, our current bios have issue with Suspend (S3). This will be fixed in future BIOS releases.
WIFI	Passed	WIFI able to connect and internet is working properly.
Bluetooth	Failed	Work in progress.

6.0 Conclusion

Intel verified that Minipi Lake, which is using Bay Trail core, is capable of running Ubuntu 13.10 64 bit without any major problems. Intel also verified that the setup only required intermediate familiarity with Linux to get a successful installation.

§ §



Intel® Atom™ E38xx/Celeron® N2xx/Bay Trail-M