Application Notes

Buildroot Openlinux Release Note

Revision 1.6

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Revision History

Revision	Date	Author	Changes
1.0	Dec 25, 2015	Matthew Shyu	Release for 3.14/s905
1.1	Apr 25, 2016	Matthew Shyu	Preparation for s905X
1.2	May 5, 2016	Ao Xu	Update S905X
1.3	Aug 18, 2016	Ao Xu	Update S905X,S905D,S912
1.4	Nov 4, 2016	Ao Xu	Add 32bit userland for S905,S905X,S905D,S912
1.5	Feb 15, 2017	Ao Xu	Merge kernel 3.10&3.14 into one src code
1.6	Mar 10, 2017	Ao Xu	add kernel4.9 support for p212&q200

1. Overview

This document describes the packages and features that are supported in Amlogic Linux platforms.

It includes:

- Chapter 1: Supported Packages
- Chapter 2: Supported Boards
- Chapter 3: Linux Building and Installation Procedures
- Appendix A: Wi-Fi Enabling Procedures
- Appendix B: Libplayer Test Procedures
- Appendix C: Mali and QT5 Test Procedures

2. Chapter 1: Supported Packages

Amlogic adopts Buildroot as package management system. See http://buildroot.uclibc.org/ for more details on how it works.

2.1 List of Supported Package

Package	Version	Description
alsa-lib	1.1.3	ALSA User space library. See http://www.alsa-project.org/
alsa-utils	1.1.3	Command line utilities for the ALSA. See http://www.alsa-project.org/
aml_libs		Amlogic video/audio decoder
aml_nand		Amlogic Nand driver
aml_pmu		Amlogic PMU driver
aml_thermal		Amlogic thermal driver
aml_util	0.1	Utilities
boost	1.61.0	Set of libraries for C++. See http://www.boost.org/
brcmap6xxx		Broadcom wifi driver
busybox	1.26.2	Tiny versions of many common UNIX utilities. See http://www.busybox.net/
bzip2	1.0.6	Bzip compression utility. See http://www.bzip.org/
cairo	1.14.8	2D graphics library. See http://cairographics.org
cjson	58	ANSI-C compliant JSON parser. See http://sourceforge.net/projects/cjson/
dbus	1.10.16	Message bus system. See http://www.freedesktop.org/wiki/Software/dbus/
dhcpcd	6.11.5	DHCP client daemon. See http://roy.marples.name/projects/dhcpcd/wiki
directfb	1.7.7	Graphics library. See http://www.directfb.org/
dnsmasq	2.76	Network utility. See http://www.thekelleys.org.uk/dnsmasq/doc.html
e2fsprogs	1.43.3	Filesystem utilities for use with the ext2/3/4 filesystem. See http://e2fsprogs.sourceforge.net/
expat	2.2.0	Library for parsing XML written in C. See http://expat.sourceforge.net/
fbdump	0.4.2	Tools to captures the contents of framebuffer device. See http://www.rcdrummond.net/fbdump/
fbgrab	1.3	Framebuffer screenshot program. See http://freecode.com/projects/fbgrab
fbset	2.1	Fbset. See http://users.telenet.be/geertu/Linux/fbdev/
fbterm	1.7.0	Framebuffer based terminal emulator. See http://code.google.com/p/fbterm/
fb-test-app	rosetta-1.1.0	Test suite for Linux framebuffer. See https://github.com/prpplague/fb-test-app
fontconfig	2.12.1	Font configuration and customization library. See http://www.freedesktop.org/wiki/Software/fontconfig/
freetype	2.7	Fonts rendering library. See http://www.freetype.org
gdb	7.11.1	GNU debugger. See https://www.gnu.org/software/gdb/

gmp	6.1.1	Library for arbitrary precision arithmetic. See https://gmplib.org/
gnutls	3.4.14	Transport Layer Security Library. See http://www.gnutls.org/.
gpu		Amlogic Mali gpu driver
gst1-plugins-bad	1.10.4	Gstreamer bad set. See http://gstreamer.freedesktop.org/modules/gst-plugins-bad.html
gst1-plugins-base	1.10.4	See http://gstreamer.freedesktop.org/modules/gst-plugins-base.html
gst1-plugins-good	1.10.4	See http://gstreamer.freedesktop.org/modules/gst-plugins-good.html
gst1-plugins-ugly	1.10.4	See http://gstreamer.freedesktop.org/modules/gst-plugins-ugly.html
gst-aml-plugins1	1.0	Gstreamer1 Amlogic plugin
gstreamer1	1.10.4	Gstreamer. See http://gstreamer.freedesktop.org/
harfbuzz	1.4.2	Opentext shaping engine. See http://www.freedesktop.org/wiki/Software/HarfBuzz/
icu	58.2	International Components for Unicode. See http://site.icu-project.org/
iw	4.9	nl80211 based utility for wireless devices. See http://wireless.kernel.org/en/users/Documentation/iw
kmod	23	Kernel module tools. See https://www.kernel.org/pub/linux/utils/kernel/kmod/
libcurl	7.51.0	Multiprotocol file transfer library. See http://c-ares.haxx.se/
liberation	2.00.1	Font. See http://www.fedorahosted.org/releases/l/i/liberation-fonts
libevent	2.1.8	Signaling events. See http://libevent.org/
libffi	3.2.1	Event notification library. See http://libevent.org/
libglib2	2.50	See https://developer.gnome.org/glib/
libid3tag	0.15.1b	See http://sourceforge.net/projects/mad/files/libid3tag/
libjpeg	9b	Jpeg library. See http://libjpeg.sourceforge.net/
libmad	0.15.1b	MPEG audio decoder. See http://sourceforge.net/projects/mad/
libnl	3.2.27	Libraries for netlink protocol. See http://www.infradead.org/~tgr/libnl/doc/api/
libogg	1.3.2	Ogg container. See https://xiph.org/ogg/
libplayer	2.2.0	Amlogic media player library
libpng	1.6.28	PNG reference library. See http://www.libpng.org/pub/png/libpng.html
libsamplerate	0.1.8	Sample rate converter. See http://www.mega-nerd.com/SRC/
libsoup	2.56	HTTP client/server library for GNOME. See https://developer.gnome.org/libsoup/
libsvg	0.1.4	Provides a parser for SVG content. See http://cairographics.org/
libsvg-cairo	0.1.6	Provides the ability to render SVG content. See http://cairographics.org/
libtasn1	4.9	ASN.1 library. See https://www.gnu.org/software/libtasn1/
libxml2	2.9.4	XML toolkit. See http://xmlsoft.org/
libxslt	1.1.29	XSLT support for libxml2. See http://xmlsoft.org/XSLT/
linux-amlogic	4.9.4	Amlogic Linux kernel
mali_examples	2.4.4	Mali OpenGL ES examples. See http://malideveloper.arm.com/cn/develop-for-mali/sdks/opengl-es-sdk-

		for-linux/
ncurses	5.9	New curses library. See http://www.gnu.org/software/ncurses/
nettle	3.3	Crypto library. See http://www.lysator.liu.se/~nisse/nettle/.
openssl	1.0.2j	Cryptography library. See http://www.openssl.org/
pango	1.40.3	Library for layout and rendering of text. See http://www.pango.org/
pcre	8.39	Perl compatible regular expression. See http://www.pcre.org/.
pixman	0.34.0	Low-level pixel manipulation library. See http://www.pixman.org/
qt5base	5.6.2	Cross-platform application and UI framework. See http://qt-project.org/
qt5imageformats	5.8.0	See http://qt-project.org/
qt5multimedia	5.8.0	See http://qt-project.org/
qt5sensors	5.8.0	See http://qt-project.org/
qt5serialport	5.8.0	See http://qt-project.org/
qt5svg	5.8.0	See http://qt-project.org/
qt5xmlpatterns	5.8.0	See http://qt-project.org/
remotecfg	1.0.1	Amlogic remote configuration tool
rtk8188eu		Realtek 8188EU driver
rtk8189es		Realtek 8189ES driver
rtk8723au		Realtek 8723AU driver
rtk8723bs		Realtek 8723AU driver
sqlite	3160200	SQL database engine. See http://www.sqlite.org/
taglib	1.11	Audio tags. See https://taglib.github.io/
tslib	1.5	Abstraction layer for touchscreen panel events. See http://tslib.berlios.de/
uboot	2016	Amlogic uboot
util-linux	2.29.2	Essential utilities for Linux. See https://www.kernel.org/pub/linux/utils/util-linux/
wavpack	5.1.0	Open audio codec. See http://www.wavpack.com/
wpa_supplicant	2.6	See http://hostap.epitest.fi/wpa_supplicant/
wifi-fw		Wifi DSP firmware
zlib	1.2.11	Data compression library. See http://www.zlib.net/

3. Chapter 2: Supported Boards

This chapter lists the reference boards that Amlogic currently supports.

3.1 List of Supported Boards

Amlogic supports the following reference boards for S905X(namely p212), S905D(namely p230), S912(namely q200) with openlinux0930. This section lists the features and peripherals for these boards.

P200:

- Amlogic S905 CPU
- 1GB DDR3
- HDMI out x 1
- TF Card x 1
- Ethernet x 1
- SDIO Wifi/BT (AP6354) x 1
- ADC key x 1
- YPbPr out x 1
- SPDIF(coaxial) x 1
- USB hub x 1
- USB otg x 1

P201:

- Amlogic S905 CPU
- 1GB DDR3
- HDMI out x 1
- TF Card x 1
- Ethernet x 1
- SDIO Wifi/BT (brcm 40183) x 1
- USB hub x 1
- USB otg x 1
- SPI & Nand x 1

P212:

- Amlogic S905X CPU
- 2GB DDR3

- HDMI out x 1
- TF Card x 1
- Ethernet with internal phy x 1
- SDIO Wifi/BT (RTL8189ETV) x 1
- SPDIF x 1
- USB hub x 2
- EMMC x 1

P230:

- Amlogic S905D CPU
- 2GB DDR3
- HDMI out x 1
- TF Card x 1
- Ethernet 100M x 1, 1000M x 1
- SDIO WIFI/BT (AP6356S) x 1
- SPDIF x 1
- USB hub x 2
- USB otg x 1
- EMMC x 1

Q200:

- Amlogic S912 CPU
- 2GB DDR3
- HDMI out x 1
- TF Card x 1
- Ethernet 100M x 1, 1000M x 1
- SDIO WIFI/BT (AP6356S) x 1
- SPDIF x 1
- USB hub x 2
- USB otg x 1
- EMMC x 1

K200-B:

- Amlogic S802 CPU
- 1GB DDR3
- HDMI out x 1
- TF Card x 1
- Ethernet x 1
- USB WIFI/BT (8188eu) x 1
- SPDIF x 1
- CVBS out x 1
- USB hub x 2
- USB otg x 1
- SPI&EMMC x 1

M201:

- Amlogic S805 CPU
- 1GB DDR3
- HDMI out x 1
- TF Card x 1
- Ethernet x 1
- USB WIFI/BT (AP6210) x 1
- USB hub x 2
- EMMC x 1

M200:

- Amlogic S805 CPU
- 1GB DDR3
- HDMI out x 1
- TF Card x 1
- Ethernet x 1
- USB WIFI/BT (AP6210) x 1
- SPDIF x 1
- USB hub x 2
- VGA x 1
- EMMC x 1

N200:

- Amlogic S812 CPU
- 2GB DDR3
- HDMI out x 1
- TF Card x 1
- Ethernet x 1
- USB WIFI/BT (AP6234) x 1
- SPDIF x 1
- CVBS out x 1
- USB hub x 1
- USB otg x 1
- VGA x 1
- EMMC x 1

4. Chapter 3: Linux Compilation and Installation Procedures

4.1 Toolchains

Kernel & applications toolchain:

In this version, there are two sets of kernel&uboot&kernel driver src code. Kernel3.14&uboot-2015-dev are available for P200,P201,P212,P230 and Q200 . Kernel3.10&uboot are available for K200,M201,M200 and N200 boards.

The kernel and uboot cross-compile tool will be pre-installed automatically in the building process. There's one point which needs attention that uboot cross-compile tool for K200,M201,M200,N200 boards depends on the libmpc.so.2. So you should download the tar package and build,install it on your host.

wget -c http://www.multiprecision.org/mpc/download/mpc-0.9.tar.gz

For some build environment, if you get build error info, for example,

MAKEINFO parted.info
/bin/sh: line 9: makeinfo: command not found
make[5]: *** [parted.info] Error 127
make[4]: *** [install-recursive] Error 1
make[3]: *** [install-recursive] Error 1

You should use the following command to install the texinfo package in deb package environmnet.

$ sudo apt-get install texinfo

And in rpm package environment, the command is

$ sudo yum install texinfo

4.2 Compiling the System

Since this version, we use repo tool to manage the source code. Previous tar package are still exsited, but tar package is not a efficient source code management.

Getting the source code:

```
$ repo init -u ssh://git@openlinux.amlogic.com/buildroot/platform/manifest.git
$ repo init -m buildroot-openlinux-20170310.xml
$ repo sync
```

Compilation:

```
$ source buildroot/build/setenv.sh
You're building on Linux
Lunch menu...pick a combo:
```

```
$ . buildroot/build/setenv.sh
You're building on Linux
Lunch menu...pick a combo:
1. mesongxl_p212_32_kernel49_release
2. mesongxl_p212_kernel49_release
3. mesongxm_q200_32_kernel49_release
4. mesongxm_q200_kernel49_release
5. mesongxb_p200_release
6. mesongxb_p200_32_release
7. mesongxb_p201_release
8. mesongxb_p201_32_release
9. mesongxl_p212_release
10. mesongxl_p212_32_release
11. mesongxl_p230_release
12. mesongxl_p230_32_release
13. mesongxm_q200_release
14. mesongxm_q200_32_release
15. meson8_k200_release
16. meson8_k200b_release
17. meson8b_m200_release
18. meson8b_m201_release
19. meson8m2_n200_release

Which would you like? [5]
```

You can choose the target you want to build.
Note: Do not use make -jN here as Buildroot does not support top-level parallel make. This does not mean that Buildroot does not support parallel compilation, but just that it will handle this inside the Buildroot compilation system.

Note: xxxx_kernel49_release is under development , and not completed yet.

4.3 Installing Linux on SD Card

The following steps show how to install the resulting system on your SD card.

Note: You should use an SD card that is **at least 4GB**.

1. Create an SD card with one partition in ext2 format.
2. Copy boot.img, rootfs.tar.gz to this partition

```
$ sudo cp output/images/boot.img /media/sdcard
$ sudo cp output/images/rootfs.tar.gz /media/sdcard
$ sudo sync
```

3. Extract rootfs.tar.gz on SD card

```
$ cd /media/sdcard
$ sudo tar zxvf    rootfs.tar.gz
$ sync
```

4. Write uboot to SD card

```
$ sudo dd if=output/images/u-boot.bin.sd.bin of=/dev/mmcblk0 bs=1 count=442
$ sudo dd if=output/images/u-boot.bin.sd.bin of=/dev/mmcblk0 bs=512 skip=1 seek=1
$ sudo sync
```

5. If there's some old data on the flash, you might wish to erase them all

```
# store init 3
# reset // now the system starts from sd card
```

6. When running into uboot, execute “run bootsdcard” under the prompt:

```
# env default -a
# env save
# run bootsdcard
```

4.4 Installing Linux on EMMC/Nand Flash

Warning! All previous changes will be lost.

1. Create an SD card with one partition in vfat format
2. copy boot.img and root file system to SD card

```
$ cp output/images/u-boot.bin /media/mySD
$ cp output/images/boot.img /media/mySD
$ cp output/images/rootfs.tar.gz /media/mySD
```

Insert SD card into your platform and reboot into uboot.

Replace original uboot with the new one under uboot prompt:

```
# mmcinfo
# fatload mmc 0 ${loadaddr} u-boot.bin
# store rom_write    ${loadaddr} 0 120000
# fatload mmc 0 ${loadaddr} gxl_p212_2g.dtb    // This step writes a valid dtb first
```

```
# store dtb write    ${loadaddr}
# reset
```

3. With new uboot burned on your platform, enter uboot prompt again and execute “run bootupdate”

```
# env default -a
# env save
# run bootupdate
```

4. System will automatically write kernel to boot partition and extract rootfs.tar.gz to system partition.
5. Reboot platform.
6. System will boot up with kernel and root filesystem on EMMC/NAND.

4.5 Installing aml_upgrade_package through usb burnning tool

Warning! All previous changes will be lost.

1. Copy aml_upgrade_package.img to your PC.
2. Install the usb device driver for the board and usb burnning tool on your PC.
3. Connect the USB cable between PC and board.
4. With uboot burned on your platform, under uboot command line mode,execute “update”, then enter usb burnning mode.

```
# update
```

5. When the status shows connection is successful, import the aml_upgrade_package.img.
6. Press the start button, then aml_upgrade_package.img will be flashed on the board.
7. When the status shows flashing is successful, unplug the USB cable and reboot.

System will boot up with kernel and root filesystem on EMMC/NAND.

Appendix A: Wi-Fi Enabling Procedures

The appendix describes procedures for enabling Wi-Fi on Amlogic Linux platform manually:

- Check module existence:

```
# lsmod
Module                  Size  Used by    Not tainted
dhd                   410618  0
```

If not,

```
# modprobe dhd
```

Note: "dhd" is the driver module name for broadcomm WIFI module. This name may vary depends on different WIFI modules equipped on your platform.

- Set up /etc/wpa_supplicant.conf:
  Example:

```
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=0
ap_scan=1

network={
        ssid="myAP"
        pairwise=CCMP TKIP
        group=CCMP TKIP
        proto=WPA RSN
        key_mgmt=WPA-PSK
        priority=5
        psk="my_passwd"
}
```

- Restart wpa_supplicant:

```
# /etc/init.d/S42wifi reload
```

  or enable wpa_supplicant directly:

```
#   wpa_supplicant   -B -Dnl80211 -iwlan0   -c/etc/wpa_supplicant.conf
```

- Enable DHCP client:

```
#   dhcpcd
```

- Put your wpa_supplicant.conf under /board/amlogic/meson_XXX/rootfs/etc/ and regenerate your file system. Next time system will automatically enable Wi-Fi.
  Note: Modify meson_XXX according to your platform.
  For example: meson_g18 --> g18
  meson_k200 --> k200

Appendix B: Libplayer Test Procedures

This appendix demonstrates how to use kplayer to exercise Libplayer. (For non-X platforms only)
Usage: kplayer <file>

0 show main menu
a start play
s get media info
1 Pause play
2 Resume play
3 Stop play
4 Fast forward
5 Fast rewind
6 Seek
7 Set repeat
8 Quit tools

Appendix C: GStreamer1 Test Procedures

This appendix demonstrates how to use gplay to exercise Gstreamer1. (For non-X platforms only)
I. Local file playback

```
gst-play-1.0 movie.mp4
```

gst-play-1.0 can take commands during playback.

space : pause/unpause
q or ESC : quit
> : play next
< : play previous
→ : seek forward
← : seek backward
↑ : volume up
↓ : volume down
+ : increase playback rate
- : decrease playback rate
d : change playback direction
t : enable/disable trick modes
a : change audio track
v : change video track
s : change subtitle track
k : show keyboard shortcuts

Appendix D: Mali and QT5 Test Procedures

Leave Framebuffer sleep mode
```
# echo 0 > /sys/class/graphics/fb0/blank
# echo 1 > /sys/class/graphics/fb1/blank
```

Mali examples: (For non-X platforms only)

There are a couple Mali execution examples under /usr/share/arm/opengles_20
For example,
```
# sh /etc/set_display_mode.sh
# cd /usr/share/arm/opengles_20/cube
# ./cube
```

QT5 examples:

QT5 demos are located under /usr/lib/qt/examples
For example,
```
# sh /etc/set_display_mode.sh
# cd /usr/lib/qt/examples/widgets/animation/animatedtiles
# ./animatedtiles
# cd /usr/lib/qt/examples/gui/openglwindow
# ./openglwindow
```