

Inforce 6309™

Debian Linux Software Release Note V2.8

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1. INTRODUCTION

This document describes the feature set supported on Debian Linux Software Release Version 2.8 running Debian BUSTER 10 on Inforce 6309 Development platform from Inforce Computing. The Inforce 6309 is an SBC that is powered by the 64 bit Qualcomm® Snapdragon™ 410E (APQ8016E) processor.

Test Configuration used for Validation

- SBC – IFC6309-11-P2
- LVDS – ACC-1B10-00-A1

Memory Platform Information

The following has been validated in this release:

- eMMC 8GB
- LPDDR3 1GB

There are dedicated partitions in the on-board eMMC.

Partition	Size	Label
mmcblk0p2	512K	sbl1
mmcblk0p3	512K	rpm
mmcblk0p4	1M	tz
mmcblk0p7	1M	aboot
mmcblk0p8	64M	boot
mmcblk0p10	7.1G	(Userdata) rootfs

It is not recommended to erase or modify any of these partitions except for the partition-labeled boot and (userdata) rootfs. Modifying may cause the board to no longer boot. If the eMMC partitions have been erased or partition table has been corrupted, the system can be recovered by using the instructions provided in the application note called **Inforce_6309_AppNote_Recovery_of_Bricked_Boards_Using_SD_Card_002748_Rev_C** available on Inforce Techweb.

The board comes with fastboot support, which means that the APPSBL implements the fastboot protocol. Fastboot is a special bootloader protocol that allows eMMC partition to be flashed with new images. By default, the APPSBL will load and execute the boot image from the 'boot' partition. To go to fastboot mode, keep the the Vol- button pressed before powering on the Inforce 6309 board. Release the button after the board has powered ON.

Please refer to <https://www.inforcecomputing.com/products/single-board-computers-sbc/qualcomm-snapdragon-410-inforce-6309-micro-sbc> for more information on the Inforce 6309 development platform.

Android and Debian Linux images are inter-changeable on this platform. From fastboot mode, use the scripts available in the Android release package to flash the prebuilt android binaries.

2. SOFTWARE RELEASE INFORMATION

The following instructions assume that you are working from an Ubuntu 14.04 (or later) system. The steps for other systems will be similar, and should be easily discerned from what follows.

2.1 BUILD AND RUN IMAGES

A. Package Description

The binaries and source directories are packaged into the tarball called:

IFC6309_Debian_Linux_BSP_880531_V2.8

Binaries directory:

This package contains the below pre-built binaries:

- LK apps boot-loader image.
- Kernel boot image that includes prebuilt kernel with Inforce's patches applied on 4.14.96 based kernel from Linaro.
- alip rootfs image that includes a minimal desktop environment GUI using LXQt.

These binaries can be flashed directly onto your Inforce 6309 platform using the commands in **Section F**.

Meta-Binaries Directory:

This package contains the meta-binaries from Linaro's 19.01 release.

Source Directory:

This package also contains the kernel sources/patches with the necessary tools to build kernel and to customize the Debian rootfs image.

Users should replace the labels shown below with actual names while executing the different commands in the succeeding sections.

RELEASE DIRECTORY : path to IFC6309_Debian_Linux_BSP_880531_V2.8

ROOTFS : linaro-buster-alip-dragonboard-410c-528

B. Download and Build lk Code

To download and generate the little kernel image, follow the steps below.

```
$cd <RELEASE DIRECTORY>/source/
```

1. Create a directory, use the following command:

```
$mkdir lk_linaro_6309
```

```
$cd lk_linaro_6309
```

2. To download the toolchain, issue the following command:

```
$git clone git://codeaurora.org/platform/prebuilts/gcc/linux-x86/arm/arm-eabi-4.8.git -b LA.BR.1.1.3.c4-01000-8x16.0
```

3. To download the little kernel code, issue the following command:

```
$git clone http://git.linaro.org/landing-teams/working/qualcomm/lk.git -b
dragonboard410c-LA.BR.1.2.7-03810-8x16.0-linaro2
```

4. To build the little kernel image, issue the following command:

```
$git clone https://git.linaro.org/landing-
teams/working/qualcomm/signlk.git

$cd lk

$git am <RELEASE DIRECTORY>/source/lk-patches/0001-lk-msm8916-dsi2lvds-
hdmi-selection-ifc6309.patch

$make -j16 msm8916 EMMC_BOOT=1 TOOLCHAIN_PREFIX=../arm-eabi-4.8/bin/arm-
eabi-

$mv ./build-msm8916/emmc_appsboot.mbn ./build-
msm8916/emmc_appsboot_unsigned.mbn

$../signlk/signlk.sh -i=./build-msm8916/emmc_appsboot_unsigned.mbn -
o=./build-msm8916/emmc_appsboot.mbn -d

$sudo fastboot flash about build-msm8916/emmc_appsboot.mbn
```

C. Fetch Kernel Sources

To build the kernel image, follow the steps listed below from your Ubuntu host machine:

The kernel sources are available within the source folder:

IFC6309_Debian_Linux_BSP_880531_V2.8 package.

```
$cd <RELEASE DIRECTORY>/source/
$tar -xvf gcc-linaro-6.3.1-2017.02-x86_64_aarch64-linux-gnu.tar.xz
```

The scripts required to setup, compile, and package the kernel are bundled into a toolbox called skales.

```
$unzip skales.zip
$sudo apt-get update
$sudo apt-get install device-tree-compiler
$sudo apt-get install libfdt-dev
```

android-tools-fsutils contains the source to pack/unpack the image files.

```
$sudo dpkg -i --force-all android-tools-fsutils_4.2.2+git20130218-
3ubuntu41+linaro1_amd64.deb
```

Kernel source can be fetched using either of the below two methods.

Method 1:

```
$git clone debian-19.01-ifc6309_v2.8.bundle -b debian-19.01-ifc6309_v2.8
```

Then follow **Section D** to perform build and **Section F** to modify rootfs (userdata) if needed.



NOTE

This procedure doesn't require an internet connection since the bundle is part of the release package.

Method 2:

```
$git clone -n http://git.linaro.org/landing-teams/working/qualcomm/kernel.git
$cd kernel
$git checkout -b kernel-19.01 debian-qcom-dragonboard410c-19.01
$git am <RELEASE DIRECTORY>/source/kernel-patches/*.patch
```

Then follow **Section D** to perform build and **Section F** to modify rootfs (userdata) if needed.

D. Perform Kernel Build

To generate the image, dtb, and modules, issue the following commands:

**NOTE**

Before performing the build ensure that you are in the kernel directory.

```
$export ARCH=arm64
$export CROSS_COMPILE=../gcc-linaro-6.3.1-2017.02-x86_64_aarch64-linux-
gnu/bin/aarch64-linux-gnu-
$make defconfig distro.config
$make -j4 Image.gz dtbs KERNELRELEASE=4.14.96-qcomlt-ifc6309-arm64
$make -j4 modules KERNELRELEASE=4.14.96-qcomlt-ifc6309-arm64
$make modules_install KERNELRELEASE=4.14.96-qcomlt-ifc6309-arm64
INSTALL_MOD_STRIP=1 INSTALL_MOD_PATH=../
$cat arch/arm64/boot/Image.gz arch/arm64/boot/dts/qcom/apq8016-sbc.dtb
arch/arm64/boot/dts/qcom/apq8016-sbc-lvds.dtb > Image.gz+dtb
```

E. Pack the Kernel Boot Image

```
$ tar -cvf ../lib/modules/4.14.96-qcomlt-ifc6309-arm64.tar
../lib/modules/4.14.96-qcomlt-ifc6309-arm64
$../skales/mkbootimg --kernel Image.gz+dtb \
--ramdisk ../initrd.img \
--output boot-ifc6309-1901-v2.8.img \
--pagesize 4096 \
--base 0x80000000 \
--cmdline "root=/dev/disk/by-partlabel/rootfs rw rootwait
console=ttyMSM0,115200n8 log_buf_len=4M"
```

F. Userdata Modification**Adding Modules**

```
$cd <RELEASE DIRECTORY>/binaries/
$gunzip <ROOTFS>.img.gz
$simg2img <ROOTFS>.img <ROOTFS>.img.raw
$sudo su
$mkdir rootfs
```



```
$mount -o loop <ROOTFS>.img.raw rootfs/  
$tar -xf ../lib/modules/4.14.96-qcomlt-ifc6309-arm64.tar -C rootfs  
$make_ext4fs -o -L rootfs -l 5G -s <ROOTFS>.img rootfs/  
$umount rootfs
```

G. Flashing the Images

From fastboot mode, enter the following commands:

```
$cd <RELEASE DIRECTORY>/meta-binaries  
$sudo ./flashall  
$cd <RELEASE DIRECTORY>/binaries/  
$sudo fastboot flash about emmc_appsboot.mbn  
$sudo fastboot flash boot boot-ifc6309-1901-v2.8.img  
$sudo fastboot flash rootfs <ROOTFS>.img
```



NOTE 1

If the rootfs is from default binaries folder then ensure to extract before flashing.

```
$gunzip <ROOTFS>.img.gz  
$sudo fastboot reboot
```

The platform shall reboot into Linaro. The LXQt-based image is expected to provide a desktop-like experience, as such it is recommended to use an HDMI monitor, USB, Keyboard, and Mouse.



NOTE 2

Run the below commands on the LXQt terminal to update the system.

```
$sudo apt update  
$sudo apt-get update  
$sudo apt-get install v4l-utils  
$sudo apt-get install gstreamer1.0-gl  
$sudo apt-get install gstreamer1.0-plugins
```

3. FEATURES OF THE RELEASE

This section describes the features and capabilities of Linux BSP Software Release Version v2.8

1. **Operating System:** This release is based on Linaro's 19.01 Debian based Build that provides developers with a desktop like environment using Debian and the LXQt desktop.

- **Linux Kernel:** 4.14.96

- **Debian Linux:** 10 (BUSTER)

2. **HDMI :** This release supports HDMI out interface.

- **Display:** This release supports HDMI display up to and including 1080@60 fps full-screen resolution.



NOTE

HDMI display is selected based on a hardware switch of SW4 on 6309 board. This switch should be set before booting the board.

- **Audio:** This release has been validated for HDMI audio.
 - Select HDMI audio output source
 - Menu → Sound and Video → Pulse Audio Volume Control-> Configuration-> HDMI output
- **LVDS:** This release is validated for 1366 × 768 resolution using the ACC-1B10 accessory.



NOTE

The Inforce 6309 platform needs to be booted with SW4 Position 4 OFF for LVDS display.

- **LVDS Display Connected:**

Open the terminal and issue the following commands for playing audio through combo jack. Please note that AHJ/CTIA interface is supported on the combo jack.

```
$sudo su
```

Backup the old ucm HiFi file

```
#cp /usr/share/alsa/ucm/DB410c/HiFi /home/linaro
```

Modify the Hi-Fi configuration.

```
#vim /usr/share/alsa/ucm/DB410c/HiFi
```

Modify as shown below:

From

```
# ALSA PCM
```

```
Value {
```

```
# ALSA PCM device for HiFi
```

```
PlaybackPCM "plughw:0,1"
```

```

CapturePCM "plughw:0,2"
}

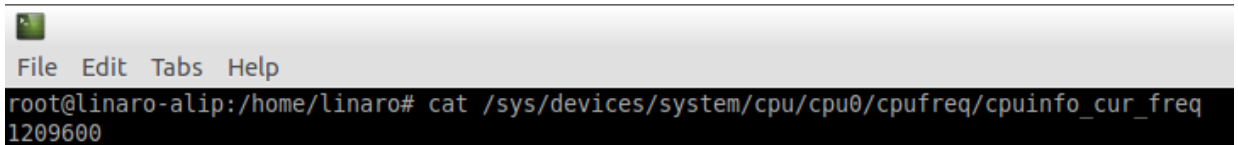
To

# ALSA PCM
Value {
# ALSA PCM device for HiFi
PlaybackPCM "plughw:0,0"
CapturePCM "plughw:0,1"
}

```

Save the file and reboot.

3. **CPU Frequency:** This release supports 1.2GHz on all cores.



```

File Edit Tabs Help
root@linaro-alip:/home/linaro# cat /sys/devices/system/cpu/cpu0/cpufreq/cpuinfo_cur_freq
1209600

```

4. **USB :** This release is validated for the below USB classes.

- **USB 2.0:** Inforce 6309 will work either in USB host mode or device mode. If the device micro USB cable is connected, it will work in the device mode (for fastboot).
- **HID:** This release is validated for USB based input devices (i.e keyboard, mouse).
- **Mass Storage:** This release is validated for USB pen drive (Auto mount).
- **Camera:** This release is validated for USB camera preview.



NOTE

*Please connect the USB camera after the system has booted. Please ensure that the gstreamer packages are installed (using commands from the **NOTE 2** in **Section 0**). To enable preview from the USB camera, issue the command:*

```
gst-launch-1.0 v4l2src device=/dev/video0 ! glimagesink
```

To capture an image in JPG format, use the command:

```
gst-launch-1.0 v4l2src device=/dev/video0 num-buffers=1 ! 'video/x-raw,width=1280,height=800' ! jpegenc ! filesink location=usb01.jpg
```

To capture a video in H264 compression, use the command:

```
gst-launch-1.0 -e v4l2src device=/dev/video0 ! video/x-raw,width=1280,height=800,framerate=10/1 ! videoconvert ! v4l2h264enc ! h264parse ! mp4mux ! filesink location=/home/linaro/video.mp4
```

The supported resolutions are 1280x800, 1280x720, 960x544, 800x600, 800x448 and 640x480.

To play the recorded video, use the command:

```
gst-launch-1.0 playbin uri=file:///home/linaro/video.mp4
```

The video node could be different. Check the video node using the command:

```
v4l2-ctl --list-devices
```

And change accordingly in the `gst-launch-1.0` commands above.

The USB camera can work concurrently with the MIPI-CSI camera.

5. **Gigabit Ethernet:** This release supports Gigabit Ethernet.
6. **Ethernet MAC Address programming:** This release supports ethernet MAC address programming.

- To perform the MAC address programming, open a terminal as shown below:
Open terminal (Start->System Tools->QTerminal)

- Issue the following commands on the terminal:

```
$sudo su
#cd /lib/firmware
#vim smsc75xx/ethmacaddr0
xx:xx:xx:xx:xx:xx
```



NOTE

<mac address pasted on the board (G) xx:xx:xx:xx:xx:xx>

- Then reboot the board.
 - Hard reset the board.
- Verify the programmed MAC address by using the below command:

```
$sudo ifconfig
```

7. **Wi-Fi:** This release is validated for Wi-Fi 2.4GHz client functionality.
8. **Wi-Fi MAC Address Programming:** This release supports Wi-Fi MAC address programming.

- To perform the MAC address programming, open a terminal as shown below:

Menu → Other → Lx Terminal

- Issue the following commands on the terminal:

```
$sudo su
#cd /lib/firmware
#vim wlan/macaddr0
xx:xx:xx:xx:xx:xx
```



NOTE

<mac address pasted on the board (G) xx:xx:xx:xx:xx:xx>

- Then reboot the board.
 - Hard reset the board.
- Verify the programmed mac address by issuing the below command:

```
$sudo ifconfig wlan0
```

9. **Bluetooth:** This release is validated for Bluetooth functionality. To test Bluetooth open the terminal and enter `bluedevil-wizard` followed by `bluedevil-sendfile`, only A2DP is validated.
10. **µSD Card Interface:** This release supports µSD card storage media with a maximum validated storage size of 64GB.

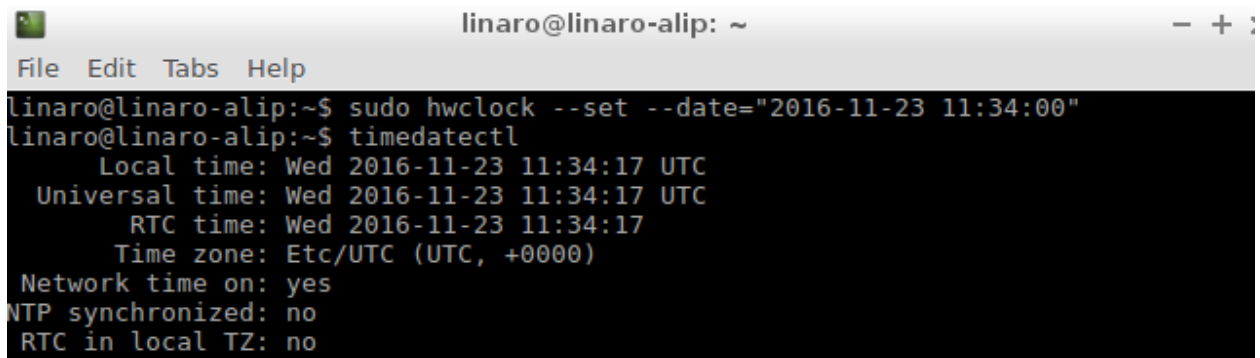
11. **Fastboot Support:** This release supports fastboot. To go to fastboot mode press Vol- button and powercycle the board.
12. **Serial UART:** This release supports serial UART.
13. **RTC (Real Time Clock):** This release is validated for RTC.

Without Network

- Set the rtc time with the below command:

```
$sudo hwclock --set --date="yyyy-mm-dd hh:mm:ss"
```
- Check the rtc time and system time with the below command:

```
$timedatectl
```



```
linaro@linaro-alip: ~
File Edit Tabs Help
linaro@linaro-alip:~$ sudo hwclock --set --date="2016-11-23 11:34:00"
linaro@linaro-alip:~$ timedatectl
    Local time: Wed 2016-11-23 11:34:17 UTC
    Universal time: Wed 2016-11-23 11:34:17 UTC
    RTC time: Wed 2016-11-23 11:34:17
    Time zone: Etc/UTC (UTC, +0000)
    Network time on: yes
    NTP synchronized: no
    RTC in local TZ: no
```

- Reboot the board or power cycle it again.



NOTE

Reboot the board only after the system time gets updated on the HDMI display.

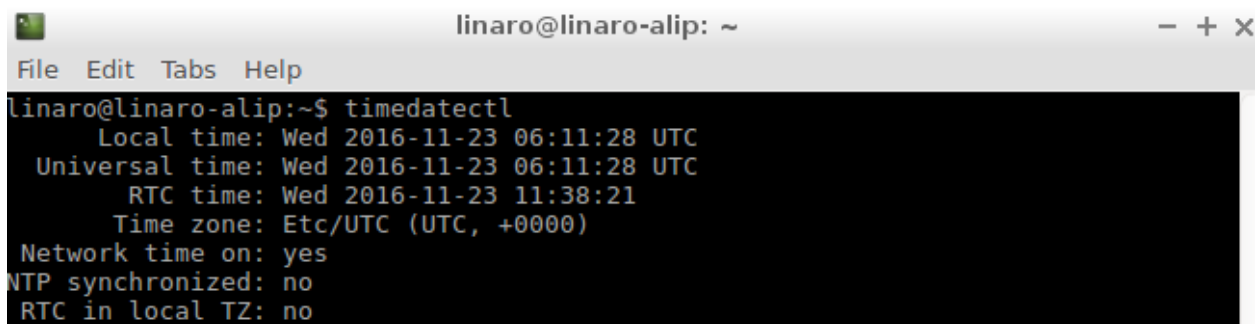
- Again check the rtc and system time with the below command:

```
$timedatectl
```
- Now rtc time and system time should be retained, updated and running with the current time.

With Network

- Connect the network cable and wait for a few seconds.
- Check the rtc time and system time with the below command:

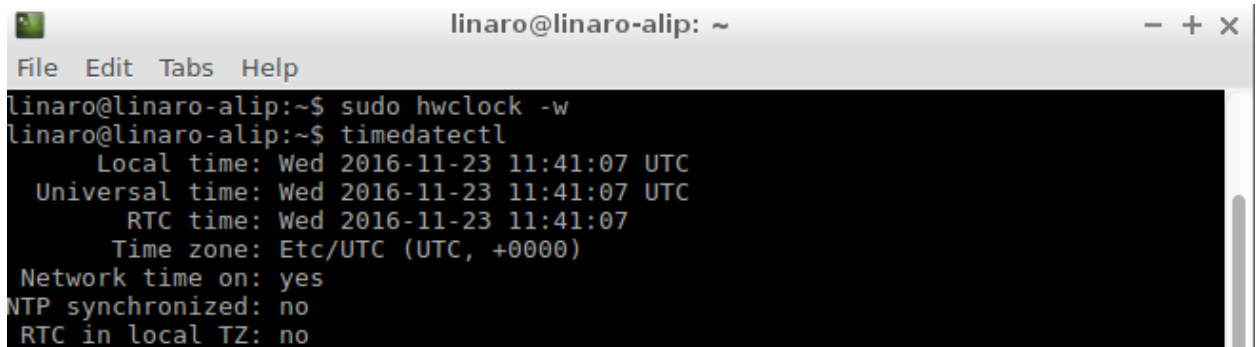
```
$timedatectl
```



```
linaro@linaro-alip: ~
File Edit Tabs Help
linaro@linaro-alip:~$ timedatectl
    Local time: Wed 2016-11-23 06:11:28 UTC
    Universal time: Wed 2016-11-23 06:11:28 UTC
    RTC time: Wed 2016-11-23 11:38:21
    Time zone: Etc/UTC (UTC, +0000)
    Network time on: yes
    NTP synchronized: no
    RTC in local TZ: no
```

- Now system time is synchronized to network time but without any change in rtc time.
- Use the below command for synchronizing rtc time to system time if required:

```
$sudo hwclock -w
```



```
linaro@linaro-alip: ~
File Edit Tabs Help
linaro@linaro-alip:~$ sudo hwclock -w
linaro@linaro-alip:~$ timedatectl
Local time: Wed 2016-11-23 11:41:07 UTC
Universal time: Wed 2016-11-23 11:41:07 UTC
RTC time: Wed 2016-11-23 11:41:07
Time zone: Etc/UTC (UTC, +0000)
Network time on: yes
NTP synchronized: no
RTC in local TZ: no
```



NOTE

1. "hwclock -s" command may not work as expected.
 2. NTP (Network Time Protocol) may not work as expected.
14. **Hardware Accelerated Video Encoder and Decoder:** This feature is tested on gstreamer using video test input (videotestsrc).
- Issue the following command to test the pipeline using gstreamer's video test source

```
$gst-launch-1.0 videotestsrc ! x264enc ! filesink location=test.mp4
```

test.mp4 encoded file will be successfully created.
 - To decode the encoded test.mp4 file run the following commands:

```
$gst-launch-1.0 playbin uri=file:///home/linaro/test.mp4
```
15. **User LEDs:** This release supports the following User LEDs:

Label	LED	Source	GPIO	Activity/Behavior
DS6	LED1	APQ	GPIO_95	EMMC0
DS5	LED2	APQ	GPIO_120	EMMC1
DS1	LED3	PMIC	GPIO_01	HEARTBEAT
DS4	LED4	PMIC	GPIO_02	DEFAULT-ON
DS2	WLAN LED	PMIC	MPP_02	WI-FI
DS3	BT LED	PMIC	MPP_03	BT

16. **Low-speed Peripherals Programming:** This release is validated for Low-speed Peripherals Programming.
17. **GPS :** This release validate for GPS. Issue the below commands

```
$sudo apt update
```

```
$sudo apt-get update
```

```
$sudo systemctl start gpsd
$sudo /usr/sbin/gpsdctl add pds://any
$gpsmon
```

4. LIMITATIONS/BUGS

1. HDMI hot plug is not working.
2. MIPI-CSI is not supported in this release
3. Bluetooth mac programming is not supported.
4. Shut Down option is not displayed if Power button is long pressed.
5. The board does not go to suspend state if Power button is short pressed.
6. At times reboot initiated from the terminal takes longer than a reboot initiated from the HDMI display.
7. Audio recording feature is not working.
8. HDMI video playback from memory does not work for resolutions above 480p.

5. CONTACT INFORMATION

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