

SGX Android OMAP4 Blaze Platform Guide (1.8 DDK)

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Contents

1.	Intro	Introduction			
2.	Term	inology	4		
	2.1.	Command Line Notation	4		
3.		irements			
J .	•				
4.	Prere	quisite Software	5		
5.	Envir	onment Changes	5		
	5.1.	ANDROID_ROOT	5		
	5.2.	DISCIMAGE	5		
	5.3.	KERNELDIR	6		
	5.4.	PATH – \$HOME/bin Directory	6		
	5.5.	PATH – ARM cross compiler	6		
	5.6.	PATH – Android ARM cross compiler	6		
	5.7.	PATH – Oracle JDK 6 (Java)	6		
	5.8.	CROSS_COMPILE	6		
	5.9.	ARCH	6		
	5.10.	Sourcing new .bash_profile	7		
6.	Obta	ning Android	7		
	6.1.	Android System Requirements	7		
	6.2.	Checking Out Android Sources	7		
	6.3.	TI OMAP Kernel	8		
7.	Build	ing Android	8		
	7.1.	Building Android Sources	8		
8.	Build	Driver	9		
	8.1.	Building From Source Packages	9		
	8.1.1	Extract User-mode Source Package	9		
	8.1.2	Build User-mode Sources	9		
	8.1.3	Extract Kernel-mode Source Package	9		
	8.1.4	Build Kernel-mode Sources	9		
	8.1.5	Install Binaries	9		
	8.2.	Build and Install Instructions for the No Hardware Variant of the SGX DDK	10		
	8.2.1	Extract User-mode Source Package	10		
	8.2.2				
	8.2.3				
	8.2.4				
	8.2.5	Install Binaries	11		



9.	Driver	Binary Installation	11
9.1	1	SGX DDK binaries	11
9.2	2. !	SGX DDK kernel module binaries	11
9.3	3.	SGX DDK binaries installation	11
10.	Buildir	ng First and Second Stage Boot-Loaders	11
10	.1.	Compile U-Boot	12
10	.2.	Compile X-Loader	12
11.	Hardw	vare Installation	12
11	.1.	Preparing SD-card and Installing Boot-Loaders	12
11	.2.	Preparing Blaze Device For SD-card + eMMC Boot	13
11	.3.	Install Android to Target	14
Appendix A		Patches to Fix Identified Platform Bugs	17
Α.:	1. (0001-VARIOUS-gcc-4.6-build-fixes.diff	17
Α.2	2. (0002-COMPILE-disable-host-librsloader-test.diff	18
A.3	3. (0003-BUILD-ubuntu-gcc-FORTIFY_SOURCE-workaround.diff	18
Appendix B		Patches To Support Modular SGX Driver	18
B.:	1. (0004-KERNEL-OMAP-drop-dsscomp-PVR_SGX-dependency.diff	18
B.2	2. (0005-KERNEL-OMAP-export-various-ion-and-tiler-functions.diffdiff	19
В.3	3. (0006-KERNEL-OMAP-fix-MUSB-gadget-build-break.diff	22
B.4	4. (0007-KERNEL-OMAP-fix-blaze_defconfig.diff	23
B.5	5. (0008-KERNEL-OMAP-use-hw-mac.diff	24
Appe	ndix C.	Fix kernel bugs	24
C.1	1. (0009-KERNEL-OMAP-revert-revert-uv_addr-removal.diff	24
Anne	ndiv D	manifect yml	25



1. Introduction

This document covers how to build and install the Imagination Technologies SGX DDK on an OMAP4 Blaze Tablet with OMAP4430 ES2.3 GP, SGX 540 1.2.0 system running Android.

2. Terminology

Term	Description
Development Machine	This is a Linux development machine used for
	day-to-day development work.

2.1. Command Line Notation

At some points the document describes commands that need to be run in a Linux shell, and the convention used is that if the line starts with a '#' then it's expected that the command is run as the root user. If the line starts with a '\$' then the command can be run as a normal user. Bourne shell syntax is used throughout, and should work with all command shells that understand such syntax (e.g. bash).

The environment variable HOME refers to the user home directory. This is often set automatically by the command shell, but you should check it is set before using it.

It is very highly recommended that the commands in this document, held in code blocks, are typed in rather than cut and pasted. This is because different versions of Word can result in incorrect characters being pasted.

3. Requirements

- 1. An OMAP4 Blaze Tablet OMAP4430 ES 2.3 GP development board
- 2. 1 network cable
- 3. 1 USB mini cable (for serial UART)
- 4. 1 SD/MMC card (at least 64MB capacity)
- 5. 1 SD/MMC card reader
- 6. The arm-2010q1-202-arm-none-linux-gnueabi-i686-pc-linux-gnu.tar.bz2 toolchain package
- 7. The Oracle JDK 6 (Java) installer, jdk-6u29-linux-x64.bin
- 8. A DHCP server running on the network to which the OMAP development board is connected. The DHCP server is used to automatically configure the IP address for the board.
- 9. An NFS servers running on the network to which the OMAP development board is connected.

 The NFS server is used to host the Linux kernel image and target file-system for the board. It



will be assumed in the rest of this guide that the development machine is used as the NFS server.

4. Prerequisite Software

The Linux development machine must have an **AMD64 (64bit) install of Ubuntu 11.10**, in order to build the Android platform and SGX DDK.

After installing Ubuntu, install additional dependencies of Android or the DDK with the following command:

```
# apt-get install gcc-multilib g++-multilib libc6-i386 git-core gnupg flex bison gperf gawk
# apt-get install build-essential zip curl libncurses5-dev zliblg-dev lib32z1-dev
# apt-get install lib32tinfo-dev uboot-mkimage lib32ncurses5-dev
```

Extract the ARM cross compiler:

Install Oracle JDK 6 (Java):

```
$ cd $HOME/bin
$ sh /path/to/jdk-6u29-linux-x64.bin
```

Finally, download and install repo:

```
$ wget -0 $HOME/bin/repo https://dl-ssl.google.com/dl/googlesource/git-repo/repo
$ chmod a+x $HOME/bin/repo
```

5. Environment Changes

Some changes are required to the environment. This document assumes the shell is GNU bash, and that <code>\$HOME/.bash_profile</code> will be sourced for login shells. It also assumes it can destroy and re-create the <code>\$HOME/.bash_profile</code> file.

If you already have such a file, modify the instructions below to accommodate it.

5.1. ANDROID_ROOT

Even though this directory does not yet exist, you will create it shortly. This directory is the location of the Android source tree:

```
$ echo export ANDROID_ROOT=\$HOME/android-ics >>~/.bash_profile
```

5.2. DISCIMAGE

DISCIMAGE must point to the out directory of your Android build tree. This location corresponds to the local synchronisable Android directory, and will eventually contain the entire Android user space and driver components:



\$ echo export DISCIMAGE=\\$ANDROID ROOT/out/target/product/blaze >~/.bash profile

5.3. KERNELDIR

Even though this directory may not yet exist, it will be created by "repo sync" below: This directory is the location of the Blaze kernel:

\$ echo export KERNELDIR=\\$ANDROID ROOT/kernel/omap >>~/.bash profile

5.4. PATH - \$HOME/bin Directory

This document assumes that the ARM cross compiler and 'repo' tools exist in \$HOME/bin/:

\$ echo export PATH=\\$PATH:\\$HOME/bin >>~/.bash profile

5.5. PATH – ARM cross compiler

The ARM cross compiler must be added to \$PATH. This compiler is used to build x-loader and u-boot:

\$ echo export PATH=\\$PATH:\\$HOME/bin/arm-2010q1/bin >>~/.bash profile

5.6. PATH – Android ARM cross compiler

The Android ARM cross compiler must be added to \$PATH. It is checked out by following the instructions in the next section. This compiler is used to build the Android platform, the Linux kernel and the SGX DDK (user and kernel):

\$ echo export PATH=\\$PATH:\\$ANDROID_ROOT/prebuilt/linux-x86/toolchain/arm-eabi-4.4.3/bin \
>>~/.bash_profile

5.7. PATH – Oracle JDK 6 (Java)

The Oracle JDK 6 (Java) must be pathed. **NOTE:** It is correct that it prefixes PATH, as openjdk may also be installed, which is not compatible with the Android build system:

\$ echo export PATH=\\$HOME/bin/jdk1.6.0_29/bin:\\$PATH >>~/.bash_profile

5.8. CROSS_COMPILE

When building the Linux kernel and SGX DDK, we must instruct them to use the Android ARM cross compiler:

\$ echo export CROSS_COMPILE=arm-eabi- >>~/.bash_profile

5.9. ARCH

The architecture for the Linux kernel must be set in the environment:



\$ echo export ARCH=arm >>~/.bash profile

5.10. Sourcing new .bash_profile

To avoid having to restart your system, source the newly created .bash_profile file now:

source ~/.bash profile

6. Obtaining Android

It is first necessary to check out the Android sources and build them, before building the SGX DDK or booting the completed OS image.

6.1. Android System Requirements

The reference SGX DDK has been compatibility tested against a specific version of Android. Customers receiving the DDK should always set up the reference system with this specific version and build and run the unit tests upon receipt of DDK source packages.

The following instructions will walk through checking out and building this specific version.

6.2. Checking Out Android Sources

It is important that the instructions on the Android developer website (http://source.android.com/source/downloading.html) are **not** followed verbatim, as this may result in checking out and building a version of Android that is not compatibility tested with the SGX DDK.

The instructions below assume you are using an **amd64** Ubuntu 11.10 system; other install types may work, but have not been tested.

Create and change into the target ANDROID ROOT directory:

```
$ mkdir $ANDROID_ROOT
$ cd $ANDROID_ROOT
```

Initialize repo in this new root:

This will set up repo to pull from the Android Open Source Project (AOSP) repositories.

Now replace the upstream manifest with a variant that fixes the platform version in time:

```
$ rm .repo/manifest.xml
$ cp <Appendix D> .repo/manifest.xml
```

A copy of this manifest is provided as an appendix of this document.

Fetch the platform source with:

```
repo sync

Apply the patches (provided as appendices of this document):
```



```
$ for patch in /path/to/external/*.diff; do patch -Np1 -i $patch; done
```

A description of what each patch does is provided with the patch appendix.

Finally, extract the device overlay (provided with the SGX DDK packages):

```
tar -C $ANDROID_ROOT -zxvf /path/to/blaze_android_device_source_tree_sgxddk_1.08.18.xxxx.tgz
```

This step extracts the device/img/blaze product customization, and is mandatory to build.

6.3. TI OMAP Kernel

TI provide a specialized kernel for the OMAP4 Blaze. This kernel contains Android patches to the normal Linux kernel.

Set this directory up by copying the kernel config into this directory:

```
$ cd $KERNELDIR
$ make blaze_defconfig </dev/null
$ sed -i 's,=m,=n,g' .config
$ make oldconfig</pre>
```

You can now configure the blaze's boot IP address by modifying the kernel command line:

make menuconfig

Go in to the Boot Options and add:

ip=dhcp

This will cause the blaze to get a DHCP address. To specify a static IP address, add instead to the end of the Default kernel command string:

```
ip=10.0.6.132:10.0.6.102:10.0.6.102:255.0.0.0:blaze:eth0:
```

This will cause the blaze to start up with the 10.0.6.132 static IP address. The format of this line is:

```
ip=${ipaddr}:${serverip}:${gatewayip}:${netmask}:${hostname}:eth0:
```

Now build the kernel:

```
$ make -j4 uImage
```

After some time, you should have a \$KERNELDIR/arch/arm/boot/uImage file.

7. Building Android

7.1. Building Android Sources

Change into the target ANDROID_ROOT directory:

```
$ cd $ANDROID_ROOT
```

Start the Android build with the following command (variant of "Building the code" in the above document):



\$ make -j4 TARGET_PRODUCT=blaze TARGET_BUILD_TYPE=release TARGET_BUILD_VARIANT=userdebug

8. Build Driver

8.1. Building From Source Packages

8.1.1. Extract User-mode Source Package

To unpack the user source package supplied by Imagination Technologies on to your SGX Development Machine, run:

\$ tar -zxvf blaze android sgx source tree um 1.08.18.xxxx.tgz -C \$HOME

8.1.2. Build User-mode Sources

Change into the build directory:

\$ cd \$HOME/eurasia/eurasiacon/build/linux2/omap4430_android

Start the build:

\$ make -j4

This will create binaries in eurasia/eurasiacon/binary2 omap4430 android release.

8.1.3. Extract Kernel-mode Source Package

To unpack the kernel source package supplied by Imagination Technologies on to your SGX Development Machine, run:

\$ tar -zxvf blaze_android_sgx_source_tree_km_1.08.18.xxxx.tgz -C \$HOME

8.1.4. Build Kernel-mode Sources

Change into the build directory:

\$ cd \$HOME/eurasia_km/eurasiacon/build/linux2/omap4430_android

Start the build:

\$ make -j4

This will create binaries in <code>eurasia_km/eurasiacon/binary2_omap4430_android_release</code>. These binaries need to be copied into the unpacked & compiled UM tree, for future installation:

\$ cp \$HOME/eurasia_km/eurasiacon/binary2_omap4430_android_release/target/*.ko \
\$HOME/eurasia/eurasiacon/binary2_omap4430_android_release/target

8.1.5. Install Binaries

Finally, install the binaries to \$DISCIMAGE:



```
# cd $HOME/eurasia/eurasiacon/build/linux2/omap4430_android
# make install
```

8.2. Build and Install Instructions for the No Hardware Variant of the SGX DDK

The reference deliverable can be built "no hardware" for a number of alternative SGX cores. The OMAP display controller will still be used.

If hardware composition is disabled, Android can composite in software using the hardware display controller, and no-hardware parameter dumps can be generated for the chosen core.

The following example builds for SGX 543MP2; adjust it as necessary for your core. The example also enables PDUMP which is typically useful (but not required) for no-hardware builds.

8.2.1. Extract User-mode Source Package

To unpack the kernel source package supplied by Imagination Technologies on to your SGX Development Machine, run:

```
$ tar -zxvf blaze_android_sgx_source_tree_um_1.08.18.xxxx.tgz -C $HOME
```

8.2.2. Build User-mode Sources

Change into the build directory:

```
$ cd $HOME/eurasia/eurasiacon/build/linux2/omap4430_android
```

Start the build:

```
$ make NO_HARDWARE=1 PDUMP=1 SGXCORE=543 SGXCOREREV=141 \
    SGX_FEATURE_MP=1 SGX_FEATURE_MP_CORE_COUNT=2
```

This will create binaries in eurasia/eurasiacon/binary2_omap4430_android_release.

8.2.3. Extract Kernel-mode Source Package

To unpack the kernel source package supplied by Imagination Technologies on to your SGX Development Machine, run:

```
$ tar -zxvf blaze_android_sgx_source_tree_km_1.08.18.xxxx.tgz -C $HOME
```

8.2.4. Build Kernel-mode Sources

Change into the build directory:

```
$ cd $HOME/eurasia_km/eurasiacon/build/linux2/omap4430_android
```

Start the build:

```
$ make NO_HARDWARE=1 PDUMP=1 SGXCORE=543 SGXCOREREV=141 \
    SGX_FEATURE_MP=1 SGX_FEATURE_MP_CORE_COUNT=2
```

This will create binaries in <code>eurasia_km/eurasiacon/binary2_omap4430_android_release</code>. These binaries need to be copied into the unpacked & compiled UM tree, for future installation:



\$ cp \$HOME/eurasia_km/eurasiacon/binary2_omap4430_android_release/*.ko \
\$HOME/eurasia/eurasiacon/binary2_omap4430_android_release

8.2.5. Install Binaries

Finally, install the binaries to \$DISCIMAGE:

```
# cd $HOME/eurasia/eurasiacon/build/linux2/omap4430_android
# make install
```

9. Driver Binary Installation

9.1. SGX DDK binaries

To unpack the binary user mode package supplied by Imagination Technologies on to your SGX Development Machine, run:

```
$ tar -zxvf blaze android sgx binaries um xxxx.tgz -C $HOME
```

9.2. SGX DDK kernel module binaries

To unpack the binary kernel driver, run in the same directory:

```
$ tar -zxvf blaze_android_sgx_binaries_km_xxxx.tgz -C $HOME
```

9.3. SGX DDK binaries installation

Enter the extracted binary directory:

```
$ cd $HOME/binary_omap4430_android_release
```

Install the DDK software:

```
# ./install.sh

Note: The log of the files installed can be found in
```

\$DISCIMAGE /etc/powervr ddk install.log.

10. Building First and Second Stage Boot-Loaders

As shipped, the Blaze does not have any boot-loader. To perform early SOC configuration, the first-stage x-loader boot-loader must be built. Furthermore, to boot Linux ulmage files, the second-stage y-boot bootloader must also be built.

NOTE: x-loader and u-boot are very sensitive to the cross compiler version used. You must provide the cross compile variable as specified below!

NOTE: When upgrading u-boot or x-loader, generally both parts must be updated and built.

NOTE: u-boot must always be built before x-loader.



10.1. Compile U-Boot

```
$ cd $ANDROID_ROOT/repo/u-boot
$ make CROSS_COMPILE=arm-none-linux-gnueabi- omap4430sdp_config
$ make CROSS_COMPILE=arm-none-linux-gnueabi-
```

This should output a file called "u-boot.bin".

10.2. Compile X-Loader

```
$ cd $ANDROID_ROOT/repo/x-loader
$ make CROSS_COMPILE=arm-none-linux-gnueabi- omap4430sdp_config
$ make CROSS_COMPILE=arm-none-linux-gnueabi- ift
```

This should output a file called "MLO".

11. Hardware Installation

11.1. Preparing SD-card and Installing Boot-Loaders

The SD-card must be partitioned and formatted specially to be recognized by the Blaze device.

Start by inserting the SD-card into an SD-card reader connected to your development machine. Upon doing so, the card should be detected by Linux and a new SCSI block device created.

If your Linux distribution automatically mounts the card upon insertion, please make sure the card is un-mounted before proceeding.

(You can inspect dmesg to see which device was created, or list the devices before and after with ls /dev/sd*)

This guide will assume the device found was /dev/sdx

Start by creating a new partition table on the SD-card (this is a destructive operation, all data on the card may become inaccessible):

```
# fdisk /dev/sdx
Command (m for help): o
Command (m for help): p
Disk /dev/sd?: xxx MB, yyyyy bytes
```

We assume that the card's bytes-per-sector is 512. The card's geometry must now be set to 255 heads and 63 cylinders. This modification requires the cylinder count be recomputed.

Since we have 255 heads * 63 sectors * 512b sectors, we must divide the total capacity in bytes ($_{yyyyy}$ above) by 8225280. Ignore any fractional cylinders from this result.

```
Command (m for help): x
Expert command (m for help): h
Number of heads (1-256, default 4): 255
Expert command (m for help): s
Number of sectors (1-63, default 62): 63
Expert command (m for help): c
Number of cylinders (1-1048576, default 1015): <insert calculated result>
```

Without restarting fdisk, proceed by creating a 64MB FAT32, active, primary partition at the start of the SD-card:



```
Expert command (m for help): r

Command (m for help): n

Command action
e extended
p primary partition (1-4)
p

Partition number (1-4): 1

First cylinder (1-y, default 1): 1

Last cylinder or +size or +sizeM or +sizeK (x-y, default y): +64M

Command (m for help): a

Partition number (1-4): 1

Command (m for help): t

Selected partition 1

Hex code (type L to list codes): c

Changed system type of partition 1 to c (W95 FAT32 (LBA))
```

Create a new partition for application data:

```
Command (m for help): n
Command action
e extended
p primary partition (1-4)
p
Partition number (1-4): 2
First cylinder (a-y, default a): a
Last cylinder or +size or +sizeM or +sizeK (b-c, default c): c
Command (m for help): t
Partition number (1-4): 2
Selected partition 2
Hex code (type L to list codes): c
Changed system type of partition 2 to c (W95 FAT32 (LBA))
```

Write the new partition table to the SD-card:

```
Command (m for help): w
```

The fdisk program should terminate successfully.

Now format the partitions you created with a new FAT32 file-system:

```
# mkfs.vfat -n omap4boot -F 32 /dev/sdx1
# mkfs.vfat -n omap4data -F 32 /dev/sdx2
```

At this point, mount the SD-card. You can do this manually, or by removing and re-inserting the SD-card and letting the distribution automatically mount it.

Copy the X-Loader and U-Boot binaries you created to the SD-card (MLO and u-boot.bin). Always ensure MLO is copied first, as there may be issues with the firmware. Unmount the SD-card and remove it from the card reader.

11.2. Preparing Blaze Device For SD-card + eMMC Boot

The majority of Blaze devices are shipped pre-configured to boot from SD-card.

Should this not be the case, or in case you have changed the configuration, the following instructions shall restore the Blaze to the required state:

- 1. Disconnect all cables and the battery from the Blaze device
- 2. Open the rear outer casing
- 3. Locate DIP switch components "CONFIG CTL" (S3) and "SYSBOOT" (S2)



- 4. CONFIG CTL [1:4] should be set to OFF ON ON ON
- 5. SYSBOOT [1:8] should be set to OFF ON OFF ON ON ON ON
- 6. Connect a mini-USB cable to the debug connector (left of power) on the Blaze, and connect the other end to your development Linux machine
 You should find that Linux creates 4 /dev/ttyUSBx devices. 0, 1 and 3 are unused
 NOTE: Power should not be connected and is not required for USB serial enumeration
- 7. Connect your preferred terminal emulator to /dev/ttyUSB2 (the baud settings are 115200 8N1)
- 8. Connect the Blaze to your network with an Ethernet cable, using the rear Ethernet port
- 9. Insert the SD-card containing the boot-loaders you just built into the Blaze's SD-card slot
- Connect power to the Blaze
 A green light should illuminate and messages should be visible on the serial terminal.

11.3. Install Android to Target

The Android build system generates pertinent output in

\$ANDROID_ROOT/out/debug/target/product/blaze for a debug build, or \$ANDROID ROOT/out/target/product/blaze for a release build.

It will always contain "data", "system" and "root" directories.

In these out directory are held the image files which need to be programmed to the blaze using fastboot.

To set up the automatic permissions on the USB device files, create a file called

/etc/udev/rules.d/51-android.rules:

```
# cat > /etc/udev/rules.d/51-android.rules << EOF
SUBSYSTEM=="usb", ATTR(idVendor)=="0451", MODE="0666", GROUP="plugdev"
SUBSYSTEM=="usb", ATTR(idVendor)=="0468", MODE="0666", GROUP="plugdev"
SUBSYSTEM=="usb", ATTR(idVendor)=="18d1", MODE="0666", GROUP="plugdev"
EOF
#</pre>
```

Power on the blaze, connect a micro-USB cable to the micro-USB port, and via the serial console press a key when u-boot prompts you to:



```
-- OMAP 4 (version 00000021) PPA release 0.9.1 --
Reset reason = 00030181
Texas Instruments X-Loader 1.41 (Jan 2 2011 - 20:43:40)
mmc read: Invalid size
Starting OS Bootloader from MMC/SD1 ...
U-Boot 1.1.4-4AI.3^0-dirty (Nov 4 2011 - 10:05:45)
Load address: 0x80e80000
DRAM: 1024 MB
Flash: 0 kB
Using default environment
     serial
In:
Out: serial
Err: serial
Net: KS8851SNL
Hit any key to stop autoboot: 0
OMAP44XX SDP #
```

Enter fastboot:

```
OMAP44XX SDP # fastboot ...
Fastboot entered...
```

If this is a clean blaze, you will need to partition the eMMC for fastboot. You can tell if this is required, as there will be no eff partition table: listed during the u-boot start up (i.e. display will be as above). The partitioning is kicked off from the development PC:

```
$ $ANDROID_ROOT/out/host/linux-x86/bin/fastboot oem format
```

Now you can program the code images to the blaze:

```
cd ${ANDROID_ROOT}
$ANDROID_ROOT/out/host/linux-x86/bin/fastboot erase cache
$ANDROID_ROOT/out/host/linux-x86/bin/fastboot flash boot out/target/product/blaze/boot.img
$ANDROID_ROOT/out/host/linux-x86/bin/fastboot flash system out/target/product/blaze/system.img
$ANDROID_ROOT/out/host/linux-x86/bin/fastboot flash userdata
out/target/product/blaze/userdata.img
```

You now have a bootable Android blaze. You should now boot it, to allow the SGX drivers to be updated.

After the blaze has booted, and depending on your selected configuration from section 6.3 TI OMAP Kernel, you will need to configure the ADBHOST environment variable with the IP address of your blaze.

If you used DHCP, look for the line formatted as follows in the text output by the blaze during bootup:

```
IP-Config: Got DHCP answer from 0.0.0.0, my address is 192.168.0.55
```

In this case, the IP address to use would be 192.168.0.55. Otherwise use your selected static IP address:



\$ export ADBHOST=192.168.0.55

To push the driver binaries to the blaze, with the blaze switched on and booted:

cd \$ANDROID_ROOT source build/envsetup.sh lunch blaze-userdebug adb root adb sync



Appendix A. Patches to Fix Identified Platform Bugs

A.1. 0001-VARIOUS-gcc-4.6-build-fixes.diff

```
--- a/external/gtest/include/gtest/internal/gtest-param-util.h
+++ b/external/gtest/include/gtest/internal/gtest-param-util.h
@@ -38,6 +38,8 @@
#include <utility>
#include <vector>
+using std::ptrdiff t;
 #include <gtest/internal/gtest-port.h>
#if GTEST HAS PARAM TEST
--- a/external/mesa3d/src/glsl/linker.cpp
+++ b/external/mesa3d/src/glsl/linker.cpp
@@ -67,6 +67,7 @@
#include <cstdio>
#include <cstdarg>
#include <climits>
+#include <cstddef>
 #include <pixelflinger2/pixelflinger2 interface.h>
@@ -1762,4 +1763,4 @@ done:
    //hieralloc free(mem ctx);
\ No newline at end of file
--- a/external/oprofile/common.mk
+++ b/external/oprofile/common.mk
@@ -37,7 +37,7 @@ HAVE_LIBBFD := false
ifeq ($(TARGET_ARCH),arm)
toolchain := prebuilt/$(HOST_PREBUILT_TAG)/toolchain/arm-linux-androideabi-4.4.x
common_host_c_includes := $(common_c_includes) $(toolchain)/include
-common host cflags := $(common cflags) -fexceptions -DANDROID HOST -DHAVE XCALLOC
+common_host_cflags := $(common_cflags) -fpermissive -fexceptions -DANDROID_HOST -
DHAVE XCALLOC
common host ldlibs libiconv :=
ifeq ($(HOST OS) - $(HOST ARCH), darwin-x86)
--- a/frameworks/compile/slang/slang rs export foreach.cpp
+++ b/frameworks/compile/slang/slang_rs_export_foreach.cpp
@@ -244,7 +244,7 @@ RSExportForEach *RSExportForEach::Create(RSContext *Context,
                                     clang::SourceLocation(),
                                     &Ctx.Idents.get(Id));
      llvm::StringRef ParamName = PVD->getName();
       //llvm::StringRef ParamName = PVD->getName();
       clang::FieldDecl *FD =
           clang::FieldDecl::Create(Ctx,
```

Ubuntu 11.10 ships with GCC 4.6. Some parts of the Android platform are built for the host, using this compiler, and have bugs which prevent a clean build with GCC 4.6. This patch fixes those bugs.



A.2. 0002-COMPILE-disable-host-librsloader-test.diff

A bug in the Android ICS build system means that test-librsloader is not linked to libpthread on the host, even though it requires pthread symbols. This patch disables the problematic test.

A.3. 0003-BUILD-ubuntu-gcc-FORTIFY_SOURCE-workaround.diff

This is another Ubuntu GCC 4.6 build fix. A fix was already merged by Google, but accidentally unmerged. This patch exists temporarily to address this mistake.

Appendix B. Patches To Support Modular SGX Driver

B.1. 0004-KERNEL-OMAP-drop-dsscomp-PVR_SGX-dependency.diff

The dependency CONFIG_DSSCOMP creates on PVR_SGX is synthetic, and because we want to disable the in-kernel version of the DDK, but to still utilize DSSCOMP we need to break this dependency.

Doing so won't break DSSCOMP, it just means the code won't do anything until a DDK is installed.



B.2. 0005-KERNEL-OMAP-export-various-ion-and-tiler-functions.diff

```
--- a/kernel/omap/drivers/base/power/opp.c
+++ b/kernel/omap/drivers/base/power/opp.c
@@ -217,6 +217,7 @@ int opp get opp count(struct device *dev)
         return count;
+EXPORT SYMBOL GPL(opp get opp count);
 * opp_find_freq_exact() - search for an exact frequency
@@ -306,6 +307,7 @@ struct opp *opp_find_freq_ceil(struct device *dev, unsigned long *freq)
         return opp;
+EXPORT_SYMBOL_GPL(opp_find_freq_ceil);
 * opp_find_freq_floor() - Search for a rounded floor freq
--- a/kernel/omap/drivers/gpu/ion/ion.c
+++ b/kernel/omap/drivers/qpu/ion/ion.c
@@ -33,77 +33,6 @@
 #include "ion priv.h"
 #define DEBUG
- * struct ion_device - the metadata of the ion device node
- * @dev: the actual misc device
- * @buffers: an rb tree of all the existing buffers
- * @lock: lock protecting the buffers & heaps trees
- * @heaps: list of all the heaps in the system
- * @user_clients: list of all the clients created from userspace
-struct ion device {
      struct miscdevice dev;
       struct rb root buffers;
      struct mutex lock;
      struct rb_root heaps;
         long (*custom ioctl) (struct ion client *client, unsigned int cmd,
                                  unsigned long arg);
     struct rb_root user_clients;
struct rb_root kernel_clients;
       struct dentry *debug_root;
-};
- * struct ion_client - a process/hw block local address space
- * @ref: for reference counting the client - * @node: node in the tree of all clients
- * @dev: node in the tree of all clients
- * @dev: backpointer to ion device
- * @handles: an rb tree of all the handles in this client
- * @lock: lock protecting the tree of handles
- * @heap_mask: mask of all supported heaps
- * @name: used for debugging
- * @task: used for debugging
                         used for debugging
- * A client represents a list of buffers this client may access.
- \star The mutex stored here is used to protect both handles tree
- \star as well as the handles themselves, and should be held while modifying either.
-struct ion_client {
      struct kref ref;
        struct rb node node;
       struct ion device *dev;
        struct rb_root handles;
```



```
struct mutex lock;
       unsigned int heap_mask;
      const char *name;
      struct task struct *task;
      pid_t pid;
       struct dentry *debug_root;
-};
_/**
- * ion handle - a client local reference to a buffer
              reference count back pointer to the client the buffer resides in
- * @ref:
- * @client:
                       pointer to the buffer
- * @buffer:
- * @node: node in the client's handle rbtree
- * @kmap_cnt: count of times this client has mapped to kernel
- * @dmap_cnt: count of times this client has mapped for dma
- * @usermap_cnt: count of times this client has mapped for userspace
_ *
- \star Modifications to node, map_cnt or mapping should be protected by the
- \star lock in the client. Other fields are never changed after initialization.
-struct ion handle {
       struct kref ref;
       struct ion client *client;
      struct ion_buffer *buffer;
     struct rb_node node;
     unsigned int kmap_cnt;
        unsigned int dmap cnt;
        unsigned int usermap_cnt;
-};
/* this function should only be called while dev->lock is held */
static void ion_buffer_add(struct ion_device *dev,
                            struct ion buffer *buffer)
--- a/kernel/omap/drivers/gpu/ion/ion priv.h
+++ b/kernel/omap/drivers/gpu/ion/ion priv.h
@@ -22,6 +22,7 @@
#include <linux/mutex.h>
#include <linux/rbtree.h>
#include <linux/ion.h>
+#include <linux/miscdevice.h>
 struct ion_mapping;
@@ -35,6 +36,77 @@ struct ion kernel mapping {
        void *vaddr;
};
+ * struct ion_device - the metadata of the ion device node
+ * @dev:
             the actual misc device
+ * @buffers: an rb tree of all the existing buffers
+ * @lock: lock protecting the buffers & heaps trees
+ * @heaps: list of all the heaps in the system
+ * @user_clients: list of all the clients created from userspace
+struct ion_device {
     struct miscdevice dev;
       struct rb root buffers;
      struct mutex lock;
       struct rb root heaps;
        long (*custom ioctl) (struct ion client *client, unsigned int cmd,
                                unsigned long arg);
        struct rb root user clients;
        struct rb root kernel clients;
        struct dentry *debug root;
```



```
+};
+ * struct ion client - a process/hw block local address space
+ * @ref: for reference counting the client  
+ * @node: node in the tree of all clients
+ * @node: node in the tree of all clients
+ * @dev: backpointer to ion device
+ * @handles: an rb tree of all the handles in this client
+ * @lock: lock protecting the tree of handles
+ * @heap_mask: mask of all supported heaps
+ * @name: used for debugging
+ * @task: used for debugging
+ * @task:
                           used for debugging
+ * A client represents a list of buffers this client may access.
+ * The mutex stored here is used to protect both handles tree
+ \star as well as the handles themselves, and should be held while modifying either.
+struct ion client {
      struct kref ref;
        struct rb_node node;
         struct ion device *dev;
         struct rb_root handles;
       struct mutex lock;
      unsigned int heap_mask;
const char *name;
struct task_struct *task;
       pid_t pid;
         struct dentry *debug root;
+};
+ * ion handle - a client local reference to a buffer
              reference count
back pointer to the client the buffer resides in
+ * @ref:
+ * @client:
+ * @buffer: pointer to the buffer
+ * @node: node in the client's handle rbtree
+ * @kmap_cnt: count of times this client has mapped to kernel
+ * @dmap_cnt: count of times this client has mapped for dma
+ * @usermap_cnt: count of times this client has mapped for userspace
+ * Modifications to node, map_cnt or mapping should be protected by the
+ * lock in the client. Other fields are never changed after initialization.
+ */
+struct ion_handle {
+ struct kref ref;
       struct ion client *client;
      struct ion_buffer *buffer;
       struct rb_node node;
         unsigned int kmap cnt;
       unsigned int dmap_cnt;
         unsigned int usermap cnt;
+};
 struct ion_buffer *ion_handle_buffer(struct ion_handle *handle);
--- a/kernel/omap/drivers/gpu/ion/omap/omap_ion.c
+++ b/kernel/omap/drivers/gpu/ion/omap/omap_ion.c
@@ -36,6 +36,7 @@ int omap_ion_tiler_alloc(struct ion_client *client,
         return omap tiler alloc(tiler heap, client, data);
+EXPORT SYMBOL GPL(omap ion tiler alloc);
 int omap ion nonsecure tiler alloc(struct ion client *client,
                              struct omap ion tiler alloc data *data)
```



This patch makes some TILER and ion symbols visible to GPL kernel modules. The SGX DDK (in modular form) requires these symbols be exported.

(The reason for the code movement of ion structs is due to EXPORT_SYMBOL_GPL's requirement that the storage size of all function parameters is known. This is so that the kernel can sanity-check the size of data structures at module load time.)

B.3. 0006-KERNEL-OMAP-fix-MUSB-gadget-build-break.diff

```
--- a/kernel/omap/drivers/usb/musb/musb core.c
+++ b/kernel/omap/drivers/usb/musb/musb_core.c
@@ -929,8 +929,10 @@ void musb_start(struct musb *musb)
       /* put into basic highspeed mode and start session */
       temp = MUSB_POWER_ISOUPDATE | MUSB_POWER_HSENAB;
                                     /* MUSB POWER ENSUSPEND wedges tusb */
+#ifdef CONFIG USB GADGET MUSB HDRC
       if (musb->softconnect)
               temp |= MUSB POWER SOFTCONN;
+#endif
       musb writeb (regs, MUSB POWER, temp);
       musb->is active = 0;
@@ -2006,7 +2008,9 @@ musb init controller(struct device *dev, int nIrq, void iomem *ctrl)
       /* Init IRQ workqueue before request_irq */
       INIT_WORK(&musb->irq_work, musb_irq_work);
+#ifdef CONFIG USB GADGET MUSB HDRC
       INIT_WORK(&musb->hz_mode_work, musb_hz_mode_work);
+#endif
       /* attach to the IRQ */
       if (request irq(nIrq, musb->isr, 0, dev name(dev), musb)) {
```

This patch allows the MUSB driver's OTG mode to be switched off and built in HOST only mode.

This simplifies support for mouse & keyboard attachments to the blaze device.



B.4. 0007-KERNEL-OMAP-fix-blaze_defconfig.diff

```
--- a/kernel/omap/arch/arm/configs/blaze defconfig
+++ b/kernel/omap/arch/arm/configs/blaze defconfig
@@ -38,7 +38,7 @@ CONFIG PREEMPT=y
CONFIG HIGHMEM=y
CONFIG COMPACTION=y
CONFIG ARM FLUSH CONSOLE ON RESTART=y
-CONFIG_CMDLINE="console=tty02,115200n8 mem=1G vmalloc=768M androidboot.console=tty02
omap_wdt.timer_margin=30"
+CONFIG CMDLINE="console=tty02,115200n8 mem=1G vmalloc=768M omap_wdt.timer_margin=30
omapfb.vram=0:8M"
CONFIG CMDLINE EXTEND=y
CONFIG CPU FREQ=y
CONFIG CPU FREQ DEFAULT GOV INTERACTIVE=y
@@ -223,7 +223,7 @@ CONFIG TWL6030 POWEROFF=y
# CONFIG_TWL6030_MADC is not set
CONFIG REGULATOR TWL4030=y
CONFIG MEDIA SUPPORT=y
-CONFIG PVR SGX=y
+# CONFIG PVR SGX is not set
CONFIG PVR NEED PVR DPF=y
CONFIG_PVR_NEED_PVR_ASSERT=y
CONFIG_PVR_USSE_EDM_STATUS_DEBUG=y
@@ -285,14 +285,13 @@ CONFIG USB SUSPEND=y
#CONFIG USB EHCI HCD is not set
CONFIG USB MUSB HDRC=y
CONFIG USB MUSB OMAP2PLUS=y
-CONFIG USB MUSB OTG=y
-CONFIG_USB_GADGET_MUSB_HDRC=y
+CONFIG_USB_MUSB_HOST=y
CONFIG_USB_ACM=y
CONFIG_USB_STORAGE=y
CONFIG USB SERIAL=y
CONFIG USB GADGET=y
CONFIG USB GADGET VBUS DRAW=500
-CONFIG_USB_G_ANDROID=y
+# CONFIG_USB_G_ANDROID is not set
CONFIG USB OTG WAKELOCK=y
CONFIG MMC=y
CONFIG MMC UNSAFE RESUME=y
```

This patch alters the default kernel config in the following ways:

- Adds androidboot.hardware=blaze omapfb.vram=0:8M to the kernel command line.
- Disables SGX DDK fork
- Switches MUSB driver from OTG mode to HOST mode.
- Disables USB Android gadget support (enables connection to adb over TCP)



B.5. 0008-KERNEL-OMAP-use-hw-mac.diff

This patch alters the kernel omap Ethernet driver to use the built in MAC address if available.

Appendix C. Fix kernel bugs

C.1. 0009-KERNEL-OMAP-revert-revert-uv_addr-removal.diff

```
--- a/kernel/omap/drivers/video/omap2/dsscomp/device.c
+++ b/kernel/omap/drivers/video/omap2/dsscomp/device.c
@@ -234,13 +234,9 @@ static long setup mgr(struct dsscomp dev *cdev,
               u32 addr = (u32) oi->address;
               /* convert addresses to user space */
               if (oi->cfg.color mode == OMAP DSS COLOR NV12) {
                      if (oi->uv_addr)
                              oi->uv = hwc virt to phys((u32) oi->uv addr);
                              oi->uv = hwc_virt_to_phys(addr +
               if (oi->cfg.color_mode == OMAP_DSS_COLOR_NV12)
                      oi->uv = hwc virt to phys(addr +
                                     oi->cfg.height * oi->cfg.stride);
               oi->ba = hwc_virt_to_phys(addr);
               r = r ? : dsscomp set ovl(comp, oi);
--- a/kernel/omap/include/video/dsscomp.h
+++ b/kernel/omap/include/video/dsscomp.h
@@ -356,7 +356,6 @@ struct dss2 ovl info {
               /* user-space interfaces */
               struct {
                      void *address; /* main buffer address */
                      void *uv_addr; /* uv buffer address */
                       \star For DSSCIOC_CHECK_OVL we allow specifying just the
```

This patch reverts a change which breaks binary compatibility with the hardware composer in ICS.



Appendix D. manifest.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<manifest>
 <remote fetch=".." name="aosp"/>
 <remote fetch="git://git.omapzoom.org/" name="omapzoom"/>
 <default remote="aosp" revision="refs/tags/android-4.0.1 r1" sync-j="4"/>
 cproject name="device/generic/goldfish"
revision="5feb8ecfd93c4e3c9eec89ab20dd143d05f7e91c"/>
 project name="device/google/accessory/arduino"
revision="9b1ef69828775a15396b753c16a83417bb769138"/>
 project name="device/google/accessory/demokit"
revision="c35b0f59498895a58dcc3d0ab8fb03683e123ded"/>
 project name="kernel/omap" remote="omapzoom"
revision="d335b7ff950345d62b2267244067f1746a694e3f"/>
 cproject name="platform/abi/cpp" path="abi/cpp"
revision="6426040f1be4a844082c9769171ce7f5341a5528"/>
 cproject name="platform/bionic" path="bionic"
revision="faa7c1d29f9ed0b3eb252bb0bd43e7596eed5d9c"/>
 revision="d3271024770ddcc2fb87dd22f8280764545ab05a"/>
 platform/bootable/diskinstaller" path="bootable/diskinstaller"
revision="411bb9df76e5b21affae73f076e5d292197b66be"/>
 project name="platform/bootable/recovery" path="bootable/recovery"
revision="441031dadc4f5e8c1487468229781702bc08fb14"/>
 cproject name="platform/build" path="build"
revision="a5158b31d97e25832d778a41a31df6ece0fc627e">
  <copyfile dest="Makefile" src="core/root.mk"/>
 </project>
 cproject name="platform/cts" path="cts"
revision="266440ef9b7aee437d971afb688a91b6a48e8cca"/>
 project name="platform/dalvik" path="dalvik"
revision="3931f79801b67577bf8ac12d0b3fb5b4aeaaf766"/>
 project name="platform/development" path="development"
revision="bc43ef4554c457c499af9e5f998f6f79a484f4a3"/>
 revision="2d989273040f563d449f7d10d92fbc7c0af33f32"/>
 project name="platform/external/android-mock" path="external/android-mock"
revision="40bb73886c61d4b2e96bab98b50c1cbfcb54d9a3"/>
 project name="platform/external/antlr" path="external/antlr"
revision="939f4a47010d361698e8f81a67e2337e180fc086"/>
 revision="5b53d279675709a4beb54974c72e257c1262da2c"/>
 project name="platform/external/apache-http" path="external/apache-http"
revision="6c9d8c58d3ed710f87c26820d903bb8aad81754f"/>
 project name="platform/external/apache-xml" path="external/apache-xml"
revision="74b8044dcd1208a1fc11ee9638584be74663c5a3"/>
 project name="platform/external/astl" path="external/astl"
revision="d13073fbb2bdb9a1bca751f103725a12de7ceafa"/>
 project name="platform/external/bison" path="external/bison"
revision="4af3c477523bc96a5a535500a722cd563f1d486f"/>
 project name="platform/external/blktrace" path="external/blktrace"
revision="55236cdbcee4e543d69e2c25dbf27c62301d760a"/>
 project name="platform/external/bluetooth/bluez" path="external/bluetooth/bluez"
revision="cfeb2e819959b28ce98f5a2358bf753a05839228"/>
 project name="platform/external/bluetooth/glib" path="external/bluetooth/glib"
revision="1143b9918eab068401b604eb11c3f651f4e38b25"/>
 project name="platform/external/bluetooth/hcidump" path="external/bluetooth/hcidump"
revision="7322661808c2006b7848e79e6bb72b37fbcf6710"/>
 revision="120c7be3b96ad42d92b9db1a75e5e5845bf3a723"/>
```



```
project name="platform/external/bsdiff" path="external/bsdiff"
revision="81872540236d9bb15cccf963d05b9de48baa5375"/>
 project name="platform/external/bzip2" path="external/bzip2"
revision="048dacdca43eed1534689ececcf2781c63e1e4ba"/>
 project name="platform/external/chromium" path="external/chromium"
revision="c0c5e0fca18f5a0912fdba1bd5c5ca2ad0c2693c"/>
 cproject name="platform/external/clang" path="external/clang"
revision="6fbdfec363f8c74e0a4fdb23fa3303cbf5b1fb49"/>
 cproject name="platform/external/collada" path="external/collada"
revision="538700ec332c8306a1283f8dfdb016e493905e6f"/>
 project name="platform/external/dbus" path="external/dbus"
revision="12a8f9246cc292e34c0c0fa20f2dbf8d738dc11e"/>
 project name="platform/external/dhcpcd" path="external/dhcpcd"
revision="0d3a47d979ac35a49b2a2da9e80e16bd37aab877"/>
 project name="platform/external/dnsmasq" path="external/dnsmasq"
revision="f621afad94df46204c25fc2593a19d704d2637f5"/>
 project name="platform/external/doclava" path="external/doclava"
revision="7ab64e63c47c4b13472f230d22265cd2cd50fef1"/>
 project name="platform/external/dropbear" path="external/dropbear"
revision="f57594030e578089ecf52e29559f0703b1a8ea6b"/>
 project name="platform/external/e2fsprogs" path="external/e2fsprogs"
revision="d5f550bb2f556c5d287f7c8d2b77223654bcec37"/>
 project name="platform/external/easymock" path="external/easymock"
revision="c9a234086537e5fd820b110bbd99e3cdc695004c"/>
 project name="platform/external/elfutils" path="external/elfutils"
revision="84cf4183ba6f577ee01abe7f1f5a6d4b23df35a8"/>
 project name="platform/external/embunit" path="external/embunit"
revision="336b7c65098af0d1be69f2db55f4e75342d73b3f"/>
 cproject name="platform/external/emma" path="external/emma"
revision="4d37e21b7c2fa378dbf7cfe2ea57d7f5991fe6cd"/>
 cproject name="platform/external/esd" path="external/esd"
revision="224a67f2683a7ee997179fc5dd16115e39987b0f"/>
 project name="platform/external/expat" path="external/expat"
revision="6df134250feab71edb5915ecaa6268210bca76c5"/>
 revision="16bd4c7a4d1bfe229068b637614dad7c48dd2ceb"/>
 cproject name="platform/external/fdlibm" path="external/fdlibm"
revision="988ffeb12a6e044ae3504838ef1fee3fe0716934"/>
 project name="platform/external/flac" path="external/flac"
revision="5893fbe890f5dab8e4146d2baa4bd2691c0739e0"/>
 project name="platform/external/freetype" path="external/freetype"
revision="aeb407daf3711a10a27f3bc2223c5eb05158076e"/>
 revision="8af338f520b04f8360a452875b9885374a1b7d29"/>
 revision="2e672fab1b8935ab6df5c2fc69386fe6b4ade873"/>
 project name="platform/external/giflib" path="external/giflib"
revision="b2597268aef084202a8c349d1cc072c03c6e22eb"/>
 patch" revision="cecbe12841337860291c2d6a5728b681ec5fca2a"/>
 project name="platform/external/grub" path="external/grub"
revision="cd484b7fcd18d5f967cadbaeb6d27b62f015a5e2"/>
 cproject name="platform/external/gtest" path="external/gtest"
revision="2ae00dcfeddad61a0df358a6f91b100f919cdb12"/>
 project name="platform/external/guava" path="external/guava"
revision="436f221940e8b7757119b00031f61cdae085bc84"/>
 oject name="platform/external/harfbuzz" path="external/harfbuzz"
revision="5deafc828f0892d6c75f12067bc366cc70475802"/>
 project name="platform/external/hyphenation" path="external/hyphenation"
revision="2c8b0b3430ee6a9ee501e6cc7921f8790851c286"/>
 project name="platform/external/icu4c" path="external/icu4c"
revision="0fa67b93b831c6636ca18b152a1b1b14cc99b034"/>
 project name="platform/external/iproute2" path="external/iproute2"
revision="132841c0d7e86fabcec443b3b54aee2699b301a4"/>
 revision="3724e61c7fb7a792d36c4dbec826e06b1aabd039"/>
```



```
opect name="platform/external/iptables" path="external/iptables"
revision="3b2deb17f065c5664bb25e1a28489e5792eb63ff"/>
 project name="platform/external/javasqlite" path="external/javasqlite"
revision="0f1e79b33591d98a93678a8f8e93ebff20a061c3"/>
 platform/external/javassist" path="external/javassist"
revision="14b4d945586243192c8118f4f49be59ebbf561b8"/>
 project name="platform/external/jdiff" path="external/jdiff"
revision="e4694302d6a3786c64d954e0b3cf42786283bd3c"/>
 project name="platform/external/jhead" path="external/jhead"
revision="754078052c687f6721536009c816644c73e4f145"/>
 project name="platform/external/jpeg" path="external/jpeg"
revision="d4fad7f50f79626455d88523207e05b868819cd8"/>
 project name="platform/external/jsilver" path="external/jsilver"
revision="a618b151d54625078424bc5940f6bfd63344d11b"/>
 project name="platform/external/jsr305" path="external/jsr305"
revision="100f99d625909fd17a722a0ed0148549afd55cf8"/>
 project name="platform/external/junit" path="external/junit"
revision="b8ee2b059bd6a2fbb8618aa17b64fb921d6df00f"/>
 project name="platform/external/kernel-headers" path="external/kernel-headers"
revision="e723352f19d4cb6efb790d210edd99228629e2db"/>
 project name="platform/external/libffi" path="external/libffi"
revision="5dea54fd57265ce037ac94055b9f94a45558b39e"/>
 project name="platform/external/libgsm" path="external/libgsm"
revision="5e4516958690b9a1b2c98f88eeecba3edd2dbda4"/>
 project name="platform/external/liblzf" path="external/liblzf"
revision="6946aa575b0949d045722794850896099d937cbb"/>
 cproject name="platform/external/libnfc-nxp" path="external/libnfc-nxp"
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 pet name="platform/external/libnl-headers" path="external/libnl-headers"
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</manifest>

This is the upstream 4.0.1-r1 manifest, with some additional repositories.