BuildSystem.mk

SPEAKERS

Genymobile

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- SoftAtHome : 3 years - Linux System for HGW and STB
- Genymobile : 2 years - ROM cooking

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- Archos : 3 years - ROM cooking for Archos devices (Archos 5 IT - GEN 10)
- Genymobile : 2 years - ROM cooking

AGENDA

Genymobile

01

How to make

02

Device definition

03

Android.mk

04

One last bite

HOW TO MAKE

source, lunch, make !

HOW TO MAKE

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```
# source ./build/envsetup.sh
#
# head -n 15 build/envsetup.sh
function hmm() {
cat <<EOF
Invoke ". build/envsetup.sh" from your shell to add the following functions to your
environment:
- lunch:   lunch <product_name>-<build_variant>
- tapas:   tapas [<App1> <App2> ...] [arm|x86|mips|armv5] [eng|userdebug|user]
- croot:   Changes directory to the top of the tree.
- m:       Makes from the top of the tree.
- mm:      Builds all of the modules in the current directory, but not their
dependencies.
- mmm:     Builds all of the modules in the supplied directories, but not their
dependencies.
- mma:     Builds all of the modules in the current directory, and their
dependencies.
- mmma:    Builds all of the modules in the supplied directories, and their
dependencies.
- cgrep:   Greps on all local C/C++ files.
- jgrep:   Greps on all local Java files.
- resgrep: Greps on all local res/*.xml files.
- godir:   Go to the directory containing a file.
#
```

HOW TO MAKE

lunch

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```
You're building on Linux

Lunch menu... pick a combo:
     1. aosp_arm-eng
     2. aosp_x86-eng
     3. aosp_mips-eng
     4. vbox_x86-eng
     5. vbox86p-userdebug
     6. vbox86p-eng
     7. vbox86t-userdebug
     8. vbox86t-eng
     9. vbox86tp-userdebug
     10. vbox86tp-eng
     11. aosp_deb-userdebug
     12. aosp_flo-userdebug
     13. aosp_grouper-userdebug
     14. aosp_tilapia-userdebug
     15. mini_armv7a_neon-userdebug
     16. mini_mips-userdebug
     17. mini_x86-userdebug
     18. aosp_hammerhead-userdebug
     19. aosp_mako-userdebug
     20. aosp_manta-userdebug

Which would you like? [aosp_arm-eng] 9

============================================
PLATFORM_VERSION_CODENAME=REL
PLATFORM_VERSION=4.4.2
TARGET_PRODUCT=vbox86tp
TARGET_BUILD_VARIANT=userdebug
TARGET_BUILD_TYPE=release
TARGET_BUILD_APPS=
TARGET_ARCH=x86
TARGET_ARCH_VARIANT=x86
TARGET_CPU_VARIANT=
HOST_ARCH=x86
HOST_OS=linux
HOST_OS_EXTRA=Linux-3.11.0-19-generic-x86_64-with-Ubuntu-13.10-saucy
HOST_BUILD_TYPE=release
BUILD_ID=KOT49H
OUT_DIR=out
============================================
```

HOW TO MAKE

make

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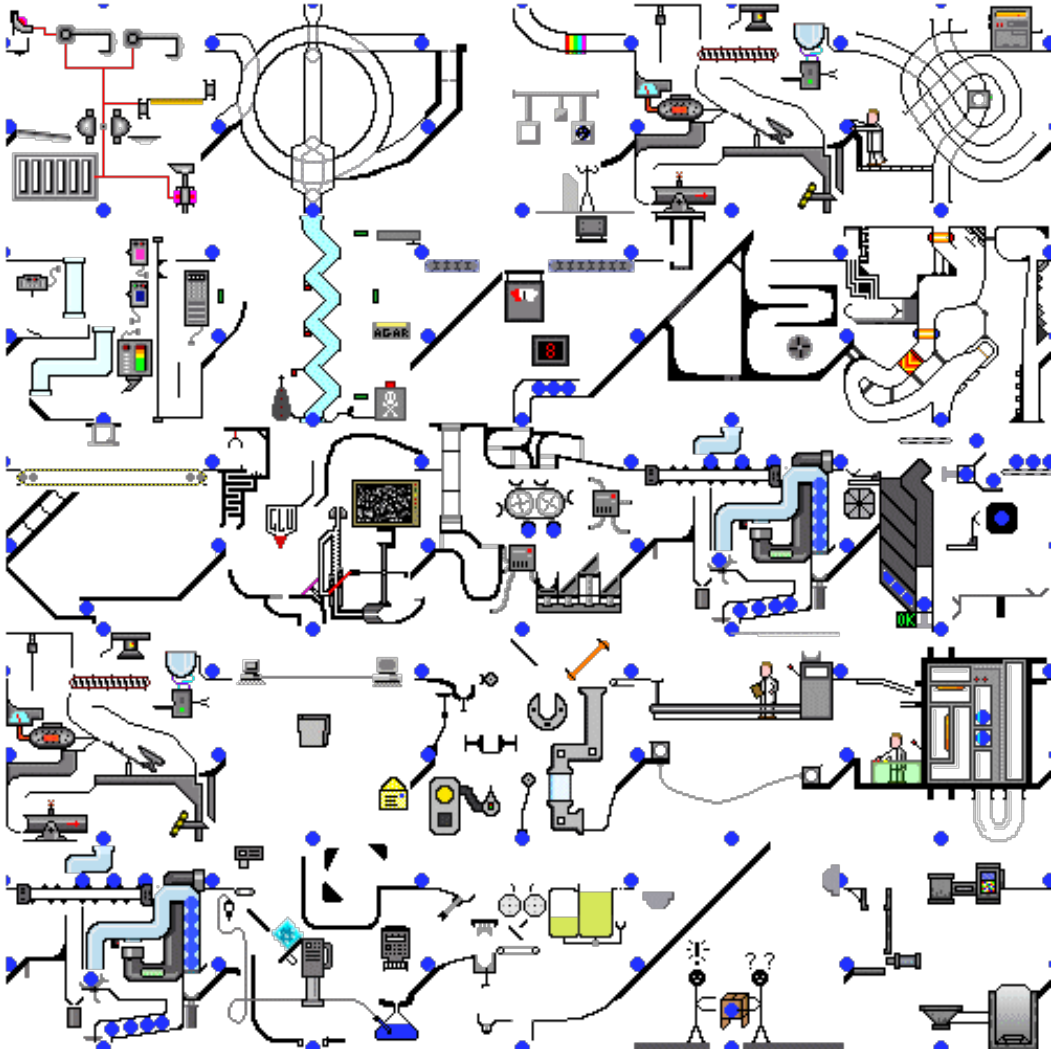

make -j42

It’s coffee time !

DEVICE DEFINITION

What’s my target ?

DEVICE DEFINITION

vendorsetup.sh, AndroidProduct.mk

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```
add_lunch_combo TARGETNAME-TYPE
```

vendorsetup.sh

Lunch entry point

TYPE = eng | userdebug | release

```
PRODUCT_MAKEFILES = TARGETNAME.mk
```

AndroidProducts.mk

The first makefile

DEVICE DEFINITION

vendorsetup.sh, AndroidProduct.mk

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```
# tail -n1 device/lge/hammerhead/vendorsetup.sh
add_lunch_combo aosp_hammerhead-userdebug
#
# tail -n3 device/lge/hammerhead/AndroidProducts.mk
PRODUCT_MAKEFILES := \
    $(LOCAL_DIR)/aosp_hammerhead.mk \
    $(LOCAL_DIR)/full_hammerhead.mk
```

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BoardConfig.mk

Define your device hardware

Can include other BoardConfig.mk

A bunch of specific defines

DEVICE DEFINITION

BoardConfig.mk

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```
# cat device/lge/hammerhead/BoardConfig.mk | grep -vP "(^$|^#.*$)"
TARGET_CPU_ABI := armeabi-v7a
TARGET_CPU_ABI2 := armeabi
TARGET_CPU_SMP := true
TARGET_ARCH := arm
TARGET_ARCH_VARIANT := armv7-a-neon
TARGET_CPU_VARIANT := krait
TARGET_NO_BOOTLOADER := true
BOARD_KERNEL_BASE := 0x00000000
BOARD_KERNEL_PAGESIZE := 2048
BOARD_KERNEL_CMDLINE := console=ttyHSL0,115200,n8 androidboot.hardware=hammerhead
user_debug=31 maxcpus=2 msm_watchdog_v2.enable=1
BOARD_MKBOOTIMG_ARGS := --ramdisk_offset 0x02900000 --tags_offset 0x02700000
MAX_EGL_CACHE_KEY_SIZE := 12*1024
MAX_EGL_CACHE_SIZE := 2048*1024
BOARD_USES_ALSA_AUDIO := true
BOARD_HAVE_BLUETOOTH := true
BOARD_HAVE_BLUETOOTH_BCM := true
BOARD_BLUETOOTH_BDROID_BUILDCFG_INCLUDE_DIR := device/lge/hammerhead/bluetooth
WPA_SUPPLICANT_VERSION      := VER_0_8_X
BOARD_WLAN_DEVICE           := bcmdhd
BOARD_WPA_SUPPLICANT_DRIVER := NL80211
BOARD_WPA_SUPPLICANT_PRIVATE_LIB := lib_driver_cmd_$(BOARD_WLAN_DEVICE)
BOARD_HOSTAPD_DRIVER        := NL80211
BOARD_HOSTAPD_PRIVATE_LIB   := lib_driver_cmd_$(BOARD_WLAN_DEVICE)
WIFI_DRIVER_FW_PATH_PARAM   := "/sys/module/bcmdhd/parameters/firmware_path"
```

DEVICE DEFINITION

BoardConfig.mk

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```
WIFI_DRIVER_FW_PATH_AP      := "/vendor/firmware/fw_bcmdhd_apsta.bin"
WIFI_DRIVER_FW_PATH_STA     := "/vendor/firmware/fw_bcmdhd.bin"
BOARD_USES_SECURE_SERVICES := true
TARGET_NO_RADIOIMAGE := true
TARGET_BOARD_PLATFORM := msm8974
TARGET_BOOTLOADER_BOARD_NAME := hammerhead
TARGET_BOARD_INFO_FILE := device/lge/hammerhead/board-info.txt
BOARD_VENDOR_QCOM_GPS_LOC_API_HARDWARE := $(TARGET_BOARD_PLATFORM)
TARGET_NO_RPC := true
BOARD_EGL_CFG := device/lge/hammerhead/egl.cfg
USE_OPENGL_RENDERER := true
VSYNC_EVENT_PHASE_OFFSET_NS := 7500000
SF_VSYNC_EVENT_PHASE_OFFSET_NS := 5000000
TARGET_USES_ION := true
TARGET_USERIMAGES_USE_EXT4 := true
BOARD_BOOTIMAGE_PARTITION_SIZE := 23068672
BOARD_RECOVERYIMAGE_PARTITION_SIZE := 23068672
BOARD_SYSTEMIMAGE_PARTITION_SIZE := 1073741824
BOARD_USERDATAIMAGE_PARTITION_SIZE := 13725837312
BOARD_CACHEIMAGE_PARTITION_SIZE := 734003200
BOARD_CACHEIMAGE_FILE_SYSTEM_TYPE := ext4
BOARD_FLASH_BLOCK_SIZE := 131072
BOARD_CHARGER_DISABLE_INIT_BLANK := true
BOARD_CHARGER_ENABLE_SUSPEND := true
TARGET_RECOVERY_PIXEL_FORMAT := RGBX_8888
TARGET_RECOVERY_UI_LIB := librecovery_ui_hammerhead
```

DEVICE DEFINITION

BoardConfig.mk

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```
TARGET_RECOVERY_FSTAB = device/lge/hammerhead/fstab.hammerhead
TARGET_RELEASETOOLS_EXTENSIONS := device/lge/hammerhead
PDK_PLATFORM_ZIP_PRODUCT_BINARIES := device/lge/hammerhead-kernel/vmlinux.bz2
BOARD_HAL_STATIC_LIBRARIES := libdumpstate.hammerhead
BOARD_SEPOLICY_DIRS := \
       device/lge/hammerhead/sepolicy
BOARD_SEPOLICY_UNION := \
       device.te \
       app.te \
       file_contexts
HAVE_ADRENO_SOURCE:= false
OVERRIDE_RS_DRIVER:= libRSDriver_adreno.so
TARGET_FORCE_HWC_FOR_VIRTUAL_DISPLAYS := true
TARGET_TOUCHBOOST_FREQUENCY:= 1200
-include vendor/lge/hammerhead/BoardConfigVendor.mk
```

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device.mk

Define your device software

No specific naming

Heavy use of inheritance

DEVICE DEFINITION

device.mk

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INHERIT **BASE DEVICE**

INHERIT **OVERLAY**

INHERIT **VENDOR STUFF**

INHERIT **PRODUCT VARIATION**

DEVICE DEFINITION

device.mk

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Name your device

PRODUCT_NAME
PRODUCT_MODEL
PRODUCT_DEVICE
PRODUCT_MANUFACTURER
PRODUCT_BRAND

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Include software

PRODUCT_PACKAGES
PRODUCT_PACKAGES_DEBUG
PRODUCT_PACKAGES_ENG
PRODUCT_PACKAGES_TESTS
PRODUCT_COPY_FILES

DEVICE DEFINITION

device.mk

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Customize

PRODUCT_PROPERTY_OVERRIDES
PRODUCT_DEFAULT_PROPERTY_OVERRIDES
PRODUCT_RESTRICT_VENDOR_FILES
PRODUCT_PACKAGE_OVERLAYS
DEVICE_PACKAGE_OVERLAYS

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Some leftovers

PRODUCT_AAPT_CONFIG
PRODUCT_AAPT_PREF_CONFIG
PRODUCT_OTA_PUBLIC_KEYS
PRODUCT_EXTRA_RECOVERY_KEYS
PRODUCT_DEFAULT_DEV_CERTIFICATE
And more in build/core/product.mk

DEVICE DEFINITION

device.mk

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```
# cat device/lge/hammerhead/device.mk | magic_summarize
LOCAL_KERNEL := $(TARGET_PREBUILT_KERNEL)
PRODUCT_COPY_FILES := \
    $(LOCAL_KERNEL):kernel
PRODUCT_COPY_FILES += \
    device/lge/hammerhead/init.hammerhead.rc:root/init.hammerhead.rc \
    device/lge/hammerhead/fstab.hammerhead:root/fstab.hammerhead \
    device/lge/hammerhead/ueventd.hammerhead.rc:root/ueventd.hammerhead.rc
# Input device files for hammerhead
PRODUCT_COPY_FILES += \
    device/lge/hammerhead/gpio-keys.kl:system/usr/keylayout/gpio-keys.kl \
    device/lge/hammerhead/gpio-keys.kcm:system/usr/keychars/gpio-keys.kcm \
[...]    device/lge/hammerhead/thermal-engine-hammerhead.conf:system/etc/thermal-
engine.conf
PRODUCT_TAGS += dalvik.gc.type-precise
# This device is xhdpi.  However the platform doesn't
# currently contain all of the bitmaps at xhdpi density so
# we do this little trick to fall back to the hdpi version
# if the xhdpi doesn't exist.
PRODUCT_AAPT_CONFIG := normal hdpi xhdpi xxhdpi
PRODUCT_AAPT_PREF_CONFIG := xxhdpi
PRODUCT_CHARACTERISTICS := nosdcard
DEVICE_PACKAGE_OVERLAYS := \
    device/lge/hammerhead/overlay
```

DEVICE DEFINITION

device.mk

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```
PRODUCT_PACKAGES += \
    gralloc.msm8974 \
    libgenlock \
    hwcomposer.msm8974 \
        [...]
    flp.msm8974
PRODUCT_PROPERTY_OVERRIDES += \
    ro.hwui.texture_cache_size=72 \
    debug.qualcomm.sns.hal=w \
    debug.qualcomm.sns.daemon=w \
        [...]
    debug.qualcomm.sns.libsensor1=w
PRODUCT_DEFAULT_PROPERTY_OVERRIDES += \
    rild.libpath=/system/lib/libril-qc-qmi-1.so
# Camera configuration
PRODUCT_DEFAULT_PROPERTY_OVERRIDES += \
    camera.disable_zsl_mode=1
# Input resampling configuration
PRODUCT_PROPERTY_OVERRIDES += \
    ro.input.noresample=1
# setup dalvik vm configs.
$(call inherit-product, frameworks/native/build/phone-xhdpi-2048-dalvik-heap.mk)
$(call inherit-product-if-exists, hardware/qcom/msm8x74/msm8x74.mk)
$(call inherit-product-if-exists, vendor/qcom/gpu/msm8x74/msm8x74-gpu-vendor.mk)
$(call inherit-product-if-exists,
hardware/broadcom/wlan/bcmdhd/firmware/bcm4339/device-bcm.mk)
```

Android.mk

A piece of Android

Android.mk, Android.mk everywhere

Define a component

```
# find ./ -name Android.mk | wc -l
2242
```

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Any component needs

A working directory

```
LOCAL_PATH := $(call my-dir)
```

A clean environment

```
include $(CLEAR_VARS)
```

A name

```
LOCAL_MODULE := mymodule
LOCAL_PACKAGE_NAME := mypackage
```

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Any component needs

A type

include BUILD_something

Usually, some source files

LOCAL_SRC_FILES= files

A tag

LOCAL_MODULE_TAGS := tag

Many types of components

```
# cat build/core/config.mk
[...]
BUILD_HOST_STATIC_LIBRARY:= $(BUILD_SYSTEM)/host_static_library.mk
BUILD_HOST_SHARED_LIBRARY:= $(BUILD_SYSTEM)/host_shared_library.mk
BUILD_STATIC_LIBRARY:= $(BUILD_SYSTEM)/static_library.mk
BUILD_RAW_STATIC_LIBRARY := $(BUILD_SYSTEM)/raw_static_library.mk
BUILD_SHARED_LIBRARY:= $(BUILD_SYSTEM)/shared_library.mk
BUILD_EXECUTABLE:= $(BUILD_SYSTEM)/executable.mk
BUILD_RAW_EXECUTABLE:= $(BUILD_SYSTEM)/raw_executable.mk
BUILD_HOST_EXECUTABLE:= $(BUILD_SYSTEM)/host_executable.mk
BUILD_PACKAGE:= $(BUILD_SYSTEM)/package.mk
BUILD_PHONY_PACKAGE:= $(BUILD_SYSTEM)/phony_package.mk
BUILD_HOST_PREBUILT:= $(BUILD_SYSTEM)/host_prebuilt.mk
BUILD_PREBUILT:= $(BUILD_SYSTEM)/prebuilt.mk
BUILD_MULTI_PREBUILT:= $(BUILD_SYSTEM)/multi_prebuilt.mk
BUILD_JAVA_LIBRARY:= $(BUILD_SYSTEM)/java_library.mk
BUILD_STATIC_JAVA_LIBRARY:= $(BUILD_SYSTEM)/static_java_library.mk
BUILD_HOST_JAVA_LIBRARY:= $(BUILD_SYSTEM)/host_java_library.mk
BUILD_DROIDDOC:= $(BUILD_SYSTEM)/droiddoc.mk
BUILD_COPY_HEADERS := $(BUILD_SYSTEM)/copy_headers.mk
BUILD_NATIVE_TEST := $(BUILD_SYSTEM)/native_test.mk
BUILD_HOST_NATIVE_TEST := $(BUILD_SYSTEM)/host_native_test.mk
BUILD_NOTICE_FILE := $(BUILD_SYSTEM)/notice_files.mk
[...]
```

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Some useful keywords

For linking

LOCAL_SHARED_LIBRARY
LOCAL_STATIC_LIBRARY
LOCAL_JAVA_LIBRARY
LOCAL_STATIC_JAVA_LIBRARY

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Some useful keywords

For signing

LOCAL_CERTIFICATE
LOCAL_PRIVILEGED_MODULE

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Some useful keywords

For native code

- LOCAL_CFLAGS
- LOCAL_CPPFLAGS

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Some useful keywords

For java stuff

- LOCAL_PROGUARD_FLAG_FILES
- LOCAL_PROGUARD_ENABLED
- LOCAL_AAPT_FLAGS

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Some useful keywords

For dependency handling

LOCAL_REQUIRED_MODULES
LOCAL_PACKAGE_OVERRIDES

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Some useful keywords

And even more

Full list in build/core/clear_vars.mk

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Many useful functions

in build/core/definitions.mk

- all-java-files-under
- all-files-under
- all-makefiles-under
- and many more

Android.mk

packages/apps/Settings/Android.mk

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```
# cat packages/apps/Settings/Android.mk
LOCAL_PATH:= $(call my-dir)
include $(CLEAR_VARS)

LOCAL_JAVA_LIBRARIES := bouncycastle conscrypt telephony-common
LOCAL_STATIC_JAVA_LIBRARIES := android-support-v4 android-support-v13 jsr305

LOCAL_MODULE_TAGS := optional

LOCAL_SRC_FILES := \
        $(call all-java-files-under, src) \
        src/com/android/settings/EventLogTags.logtags

LOCAL_PACKAGE_NAME := Settings
LOCAL_CERTIFICATE := platform
LOCAL_PRIVILEGED_MODULE := true

LOCAL_PROGUARD_FLAG_FILES := proguard.flags

LOCAL_AAPT_FLAGS += -c zz_ZZ

include $(BUILD_PACKAGE)

# Use the folloing include to make our test apk.
include $(call all-makefiles-under,$(LOCAL_PATH))
```

One last bite

There’s always more

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More makefiles

untold module makefiles

- CleanSpec.mk
- Application.mk

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Even more makefiles

The build system itself

build/core/main.mk
build/core/*.mk

Base devices

build/target/**

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Non-make stuff

Python

build/tool/releasetools/

- build_image.py
- img_from_target_files
- ota_from_target_files

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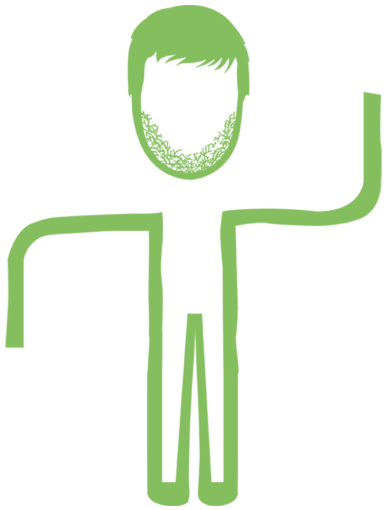
Non-make stuff

Java

build/tools/signapk

Thank You for your time !

If you have any question ?



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Copyrights

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The following copyright have been stripped from all the examples :

```
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#
```