Rockie's Android Porting Guide

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Rockie's Android Porting Guide（1）——Build your own board

（1）在 android 跟目录下执行
. build/envsetup.sh

（2）建立自己的 board
copy build/target/board/generic to build/target/board/idea6410

修改 build/target/product/AndroidProduct.mk,添加
　　$(LOCAL_DIR)/idea6410.mk \

copy build/target/product/generic.mk to build/target/product/idea6410.mk

修改
Overrides
PRODUCT_BRAND := idea6410
PRODUCT_DEVICE := idea6410
PRODUCT_NAME := idea6410

（3）tapas
[kyon@SEP4020 android2.0]$ tapas
Build for the simulator or the device?
　　　1. Device
　　　2. Simulator
Which would you like? [1]

Build type choices are:
　　　1. release
　　　2. debug
Which would you like? [1] 1

Which product would you like? [generic] idea6410

Variant choices are:
　　　1. user

    2. userdebug
    3. eng
Which would you like? [eng]

==
PLATFORM_VERSION_CODENAME=Eclair
PLATFORM_VERSION=Eclair
TARGET_PRODUCT=idea6410
TARGET_BUILD_VARIANT=eng
TARGET_SIMULATOR=false
TARGET_BUILD_TYPE=release
TARGET_ARCH=arm
HOST_ARCH=x86
HOST_OS=linux
HOST_BUILD_TYPE=release
BUILD_ID=ECLAIR
==

[kyon@SEP4020 android2.0]$

以上只是基于 generic 简单的复制，需要更详细的定制开发板设备

附录：
1）build/target/product/idea6410.mk 内容
This is a generic product that isn't specialized for a specific device.
It includes the base Android platform. If you need Google-specific features,
you should derive from generic_with_google.mk

PRODUCT_PACKAGES := \
    AccountAndSyncSettings \
    AlarmClock \
    AlarmProvider \
    Bluetooth \
    Calculator \
    Calendar \
    Camera \
    CertInstaller \
    DrmProvider \
    Email \
    Gallery \
    LatinIME \
    Mms \
    Music \
    Settings \

Sync \
        Updater \
        CalendarProvider \
        SyncProvider

$(call inherit-product, $(SRC_TARGET_DIR)/product/core.mk)

Overrides
PRODUCT_BRAND := idea6410
PRODUCT_DEVICE := idea6410
PRODUCT_NAME := idea6410

产品名称及包含的应用程序

2）build/target/board/idea6410/BoardConfig.mk
config.mk
#
Product-specific compile-time definitions.
#

The generic product target doesn't have any hardware-specific pieces.
TARGET_NO_BOOTLOADER := true
TARGET_NO_KERNEL := true
TARGET_CPU_ABI := armeabi
HAVE_HTC_AUDIO_DRIVER := true
BOARD_USES_GENERIC_AUDIO := true

不编译 bootloader 及内核
使用 arm eabi 编译器
使用 HTC 和通用音频（没有使用 ALSA）

如果需要添加 HAL 层驱动，需要修改此文件

3）build/target/board/idea6410/AndroidBoard.mk
LOCAL_PATH := $(call my-dir)

file := $(TARGET_OUT_KEYLAYOUT)/tuttle2.kl
ALL_PREBUILT += $(file)
$(file) : $(LOCAL_PATH)/tuttle2.kl | $(ACP)
        $(transform-prebuilt-to-target)
include $(CLEAR_VARS)
LOCAL_SRC_FILES := tuttle2.kcm
include $(BUILD_KEY_CHAR_MAP)
目前看来加入了一些键盘映射文件

Rockie's Android Porting Guide（2）——add USB WIFI to your system

手中 zd1211b 无线网卡已经可使用 wpa_supplicant 连接无线网络，
最近的工作主要为修改 android 的 HAL 层，使 android 能够识别该无线网卡。

Android 默认使用 wifi.c 加载无线网卡驱动模块，如果直接编译进内核需要做一定修改。

（1）build/target/board/idea6410/BoardConfig.mk
add

Wifi related defines
BOARD_WPA_SUPPLICANT_DRIVER := WEXT

（2）external\wpa_supplicant\.config
# CONFIG_NO_WPA=y
CONFIG_OS=unix
CONFIG_IEEE8021X_EAPOL=y
CONFIG_EAP_MD5=y
CONFIG_EAP_MSCHAPV2=y
CONFIG_EAP_TLS=y
CONFIG_EAP_PEAP=y
CONFIG_EAP_TTLS=y
CONFIG_EAP_GTC=y
CONFIG_EAP_OTP=y
CONFIG_EAP_SIM=y
CONFIG_EAP_AKA=y
CONFIG_EAP_PSK=y
CONFIG_EAP_SAKE=y
CONFIG_EAP_GPSK=y
CONFIG_EAP_PAX=y
CONFIG_EAP_LEAP=y
CONFIG_PKCS12=y
CONFIG_SMARTCARD=y
CONFIG_WIRELESS_EXTENSION=y
CONFIG_CTRL_IFACE=y
CONFIG_DRIVER_WEXT=y

（3）hardware/libhardware_legacy/wifi/wifi.c
将驱动直接编译进内核

int wifi_load_driver()
{
    char driver_status[PROPERTY_VALUE_MAX];
    int count = 100; /* wait at most 20 seconds for completion */

```
LOGE("wifi driver loaded ！ ");

        return 0;
}



int wifi_unload_driver()
{
    int count = 20; /* wait at most 10 seconds for completion */
LOGE("wifi driver unloaded by rockie!");
    return 0;
```

注意这个定义 static const char IFACE_DIR[]   = "/data/system/wpa_supplicant";

（4）编译整个 android 系统，确认编译完 bin 目录中含有 wpa_supplicant、wpa_cli

（5）修改 init.rc 文件
add

```
    mkdir /data/misc/wifi 0770 system system
    mkdir /data/misc/wifi/sockets 0770 system system
    mkdir /data/system/wpa_supplicant 0770 system system
    chmod 0660 /data/misc/wifi/wpa_supplicant.conf
```

add at the end

```
service    wpa_supplicant    /system/bin/wpa_supplicant    -Dwext    -iwlan0    -d    -c
/data/misc/wifi/wpa_supplicant.conf
#     user wifi
#     group wifi system
    socket wpa_eth0 dgram 0660 wifi system
    disabled
    oneshot

service dhcpcd /system/bin/dhcpcd -f /system/etc/dhcpcd/dhcpcd.conf -d eth0
    disabled
    oneshot

on property:init.svc.wpa_supplicant=stopped
    stop dhcpcd
```

（6）添加 system/etc/wifi/wpa_supplicant.conf

update_config=1

ctrl_interface=/data/system/wpa_supplicant //这个一定要和 IFACE_DIR 对应并保证目录权限

eapol_version=1

ap_scan=1

fast_reauth=1

（7）boot and try

Rockie's Android Porting Guide（3）——Add correct keymap to your system

We already have a keyboard dirver in Linux kernel.

Next, let us notice Android that we have a keyboard.

```
/* gpio buttons from linux*/
static struct gpio_keys_button gpio_buttons[] = {
    {
        .gpio         = S3C64XX_GPN(0),
        .code         = 116,
        .desc         = "ENDCALL",
        .active_low   = 1,
        .wakeup       = 0,
    },
    {
        .gpio         = S3C64XX_GPN(1),
        .code         = 139,
        .desc         = "MENU",
        .active_low   = 1,
        .wakeup       = 0,
    },
    {
        .gpio         = S3C64XX_GPN(2),
        .code         = 99,
        .desc         = "ROTATE",
        .active_low   = 1,
        .wakeup       = 0,
    },
    {
        .gpio         = S3C64XX_GPN(3),
        .code         = 102,
        .desc         = "HOME",
        .active_low   = 1,
        .wakeup       = 0,
    },
    {
```

```
        .gpio          = S3C64XX_GPN(4),
        .code          = 42,
        .desc          = "BACK",
        .active_low    = 1,
        .wakeup        = 0,
    },
    {
        .gpio          = S3C64XX_GPN(5),
        .code          = 158,
        .desc          = "BACK",
        .active_low    = 1,
        .wakeup        = 0,
    }
};
```

（1）Let me see logcat information.

I/EventHub(58): New device: path=/dev/input/event1 name=S3C TouchScreen id=0x10000 (of 0x1) index=1 fd=45 classes=0x4

E/EventHub(58): could not get driver version for /dev/input/mice, Not a typewriter

I/EventHub(58): New keyboard: publicID=65537 device->id=0x10001 devname='gpio-keys' propName='hw.keyboards.65537.devname'   keylayout='/system/usr/keylayout/qwerty.kl' <<<<<<<<Obviously this is not wht we want

I/EventHub(58): New device: path=/dev/input/event0 name=gpio-keys id=0x10001 (of 0x2) index=2 fd=47 classes=0x1

E/EventHub(58): could not get driver version for /dev/input/mouse0, Not a typewriter

I/KeyInputQueue(58): Device added: id=0x0, name=gpio-keys, classes=1

I/KeyInputQueue(58): Device added: id=0x10000, name=S3C TouchScreen, classes=4

I/KeyInputQueue(58):   X: min=0 max=480 flat=0 fuzz=0

I/KeyInputQueue(58):   Y: min=0 max=272 flat=0 fuzz=0

I/KeyInputQueue(58):   Pressure: min=0 max=1 flat=0 fuzz=0

I/KeyInputQueue(58):   Size: unknown values

I/KeyInputQueue(58): No virtual keys found

（2）make a file build/target/board/idea6410/gpio-keys.kl

```
key 158    BACK                 WAKE_DROPPED
key 139    MENU                 WAKE_DROPPED
key 102    HOME                 WAKE
key 116    ENDCALL              WAKE_DROPPED
key 99     ROTATOR
key 42     POWER                WAKE
```

（3）make the another build/target/board/idea6410/gpio-keys.kcm

First,I just copy it from tutule2.kcm,but it does not work.

So I find this form the net,just a little change.

It seems like 9 number keyboard more than qwerty.

[type=QWERTY]

# keycode	display	number	base	caps	fn	caps_fn
A	'A'	'2'	'a'	'A'	'#'	0x00
B	'B'	'2'	'b'	'B'	'<'	0x00
C	'C'	'2'	'c'	'C'	'9'	0x00E7
D	'D'	'3'	'd'	'D'	'5'	0x00
E	'E'	'3'	'e'	'E'	'2'	0x0301
F	'F'	'3'	'f'	'F'	'6'	0x00A5
G	'G'	'4'	'g'	'G'	'-'	'_'
H	'H'	'4'	'h'	'H'	'['	'{'
I	'I'	'4'	'i'	'I'	'$'	0x0302
J	'J'	'5'	'j'	'J'	']'	'}'
K	'K'	'5'	'k'	'K'	'"'	'~'
L	'L'	'5'	'l'	'L'	'''	'`'
M	'M'	'6'	'm'	'M'	'!'	0x00
N	'N'	'6'	'n'	'N'	'>'	0x0303
O	'O'	'6'	'o'	'O'	'('	0x00
P	'P'	'7'	'p'	'P'	')'	0x00
Q	'Q'	'7'	'q'	'Q'	'*'	0x0300
R	'R'	'7'	'r'	'R'	'3'	0x20AC
S	'S'	'7'	's'	'S'	'4'	0x00DF
T	'T'	'8'	't'	'T'	'+'	0x00A3
U	'U'	'8'	'u'	'U'	'&'	0x0308
V	'V'	'8'	'v'	'V'	'='	'^'
W	'W'	'9'	'w'	'W'	'1'	0x00
X	'X'	'9'	'x'	'X'	'8'	0xEF00
Y	'Y'	'9'	'y'	'Y'	'%'	0x00A1
Z	'Z'	'9'	'z'	'Z'	'7'	0x00

on pc keyboards

COMMA	','	','	','	';'	';'	'|'
PERIOD	'.'	'.'	'.'	':'	':'	0x2026
AT	'@'	'0'	'@'	'0'	'0'	0x2022
SLASH	'/'	'/'	'/'	'?'	'?'	'\\'

SPACE	0x20	0x20	0x20	0x20	0xEF01	0xEF01
ENTER	0xa	0xa	0xa	0xa	0xa	0xa

TAB	0x9	0x9	0x9	0x9	0x9	0x9

0	'0'	'0'	'0'	')'	')'	')'
1	'1'	'1'	'1'	'!'	'!'	'!'
2	'2'	'2'	'2'	'@'	'@'	'@'
3	'3'	'3'	'3'	'#'	'#'	'#'
4	'4'	'4'	'4'	'$'	'$'	'$'
5	'5'	'5'	'5'	'%'	'%'	'%'
6	'6'	'6'	'6'	'^'	'^'	'^'
7	'7'	'7'	'7'	'&'	'&'	'&'
8	'8'	'8'	'8'	'*'	'*'	'*'
9	'9'	'9'	'9'	'('	'('	'('
GRAVE	'`'	'`'	'`'	'~'	'`'	'~'
MINUS	'-'	'-'	'-'	'_'	'-'	'_'
EQUALS	'='	'='	'='	'+'	'='	'+'
LEFT_BRACKET	'['	'['	'['	'{'	'['	'{'
RIGHT_BRACKET	']'	']'	']'	'}'	']'	'}'
BACKSLASH	'\'	'\'	'\'	'|'	'\'	'|'
SEMICOLON	';'	';'	';'	':'	';'	':'
APOSTROPHE	'''	'''	'''	'"'	'''	'"'
STAR	'*'	'*'	'*'	'*'	'*'	'*'
POUND	'#'	'#'	'#'	'#'	'#'	'#'
PLUS	'+'	'+'	'+'	'+'	'+'	'+'

（4）add these to AndroidBoard.mk

```
file := $(TARGET_OUT_KEYLAYOUT)/gpio-keys.kl
ALL_PREBUILT += $(file)
$(file) : $(LOCAL_PATH)/gpio-keys.kl | $(ACP)
     $(transform-prebuilt-to-target)

include $(CLEAR_VARS)
LOCAL_SRC_FILES := gpio-keys.kcm
include $(BUILD_KEY_CHAR_MAP)
```

（5）add these to system.prop
android.keylayout.gpio-keys = /system/usr/keylayout/gpio-keys.kl
android.keychar.gpio-keys = /system/usr/keychars/gpio-keys.kcm

（6）build your system again
Now we can see the different:

I/EventHub(63): New device: path=/dev/input/event1 name=S3C TouchScreen id=0x10000

(of 0x1) index=1 fd=50 classes=0x4

E/EventHub(63): could not get driver version for /dev/input/mice, Not a typewriter

E/KeyLayoutMap(63): /system/usr/keylayout/gpio-keys.kl:10: expected keycode, got 'ROTATOR'

I/EventHub(63): New keyboard: publicID=0 device->id=0x10001 devname='gpio-keys' propName='hw.keyboards.0.devname'

keylayout='/system/usr/keylayout/gpio-keys.kl'<<<<<<<<OK correct!

I/EventHub(63): New device: path=/dev/input/event0 name=gpio-keys id=0x10001 (of 0x2) index=2 fd=52 classes=0x1

E/EventHub(63): could not get driver version for /dev/input/mouse0, Not a typewriter

I/KeyInputQueue(63): Device added: id=0x0, name=gpio-keys, classes=1

I/KeyInputQueue(63): Device added: id=0x10000, name=S3C TouchScreen, classes=4

I/KeyInputQueue(63):   X: min=0 max=480 flat=0 fuzz=0

I/KeyInputQueue(63):   Y: min=0 max=272 flat=0 fuzz=0

I/KeyInputQueue(63):   Pressure: min=0 max=1 flat=0 fuzz=0

I/KeyInputQueue(63):   Size: unknown values

I/KeyInputQueue(63): No virtual keys found

System do not know the word "ROTATOR" presently.

You can add a USB-KEYBOARD too.

Rockie's Android Porting Guide（4）——Add SD card to your system

Andorid uses vold to manage SD card and it is easy to use.

But I meet many troubles and finally find that the real problem is in the Linux Kernel.

Thanks to the Android Mail List.

Part I (kernel)

(1)make sure thus kernel configuration in MMC driver

CONFIG_MMC=y

CONFIG_MMC_DEBUG is not set

CONFIG_MMC_UNSAFE_RESUME=y

CONFIG_MMC_EMBEDDED_SDIO is not set

CONFIG_MMC_PARANOID_SD_INIT=y

#

MMC/SD Card Drivers

#

CONFIG_MMC_BLOCK=y

CONFIG_MMC_BLOCK_BOUNCE=y

CONFIG_MMC_BLOCK_PARANOID_RESUME is not set

CONFIG_SDIO_UART is not set
CONFIG_MMC_TEST is not set

#
MMC/SD Host Controller Drivers
#
CONFIG_MMC_SDHCI=y

(2)Disable this option
General Setup ->   Create deprecated sysfs layout for older userspace tools

Before I did this,vold showed a lot of trouble.
And ,my media_path is not right
media_path   /devices/platform/s3c-sdhci.0/mmc_host:mmc0<--my path before turn off that
option

media_path   /devices/platform/s3c-sdhci.0/mmc_host/mmc0 <--this is the right one

Vold may be unhappy to accept my old path,and it didn't work.

```
D/vold      (    42): Accepted connection from framework
D/vold      (    42): dispatch_cmd(send_ums_status):
D/vold      (    42): dispatch_cmd(mount_volume:/sdcard):
E/vold      (    42): Cannot start volume '/sdcard' (volume is not bound)
D/MountListener(    59): handleEvent volume_nomedia:/sdcard
D/MountListener(    59): handleEvent ums_disabled
D/MountListener(    59): handleEvent ums_disconnected
```

(3) rebuild your linux kernel

PART II(android system)

(1) creat a vold.conf in build/target/board/idea6410

vold configuration file for idea6410

```
volume_sdcard {
    ## This is the direct uevent device path to the SD slot on the device
    media_path    /devices/platform/s3c-sdhci.0/mmc_host/mmc0

    media_type        mmc
    mount_point     /sdcard
    ums_path            /devices/platform/usb_mass_storage/lun0
}
```

(2)add those below to AndroidBoard.mk

```
include $(CLEAR_VARS)
LOCAL_MODULE_CLASS := ETC
LOCAL_MODULE := vold.conf
LOCAL_SRC_FILES := $(LOCAL_MODULE)
include $(BUILD_PREBUILT)
```

(3)rebuild the system and check init.rc

```
service vold /system/bin/vold
    socket vold stream 0660 root mount
```

(4)enjoy

```
D/vold     (    42): Accepted connection from framework
D/vold     (    42): dispatch_cmd(send_ums_status):
D/vold     (    42): dispatch_cmd(mount_volume:/sdcard):
I/vold                              (                    42):      Evaluating      dev
'/devices/platform/s3c-sdhci.0/mmc_host/mmc0/mmc0:e624/block/mmcblk0'      for      mountable
filesystems for '/sdcard'
D/MountListener(    61): handleEvent volume_unmounted:/sdcard
D/MountListener(    61): handleEvent ums_disabled
D/MountListener(    61): handleEvent ums_disconnected
D/MountListener(    61): handleEvent volume_checking:/sdcard
```

Rockie's Android Porting Guide（5）
——Change your location and add the screenlock

Today ,I just solved two small questions.
One is changing the system location to CHINA, the other one likes a gift more ,
--a screen lock--and I don not know how to get it.

(I) Change the system location
simple and simple
at the end of build/target/product/idea6410.mk
add this:

CUSTOM_LOCALES := zh_CN

Of coures, you have many choises:

ldpi \
    hdpi \
    mdpi \
    en_US \
    en_GB \
    en_CA \
    en_AU \
    en_NZ \
    en_SG \
    ja_JP \
    fr_FR \
    fr_BE \
    fr_CA \
    fr_CH \
    it_IT \
    it_CH \
    es_ES \
    de_DE \
    de_AT \
    de_CH \
    de_LI \
    nl_NL \
    nl_BE \
    cs_CZ \
    pl_PL \
    zh_CN \
    zh_TW \
    ru_RU \
    ko_KR

(II) Add the screenlock

I have wasted the whole morning online to serch a way to add the screenlock, but no answer.
Then ,I find that build/target/product/sdk.mk has more apps than generic.mk,so I decide to put them in my idea6410.mk.
Luckly,the Screenlock appears and the keyboard(lock & unclok) is working well.

That must be one of the apks ,who can tell one which one?
SoftKeyboard\LiveWallpapersPicker or Fallback?

sdk.mk
    AccountAndSyncSettings \
    AlarmClock \
    Camera \

Calculator \
Development \
DrmProvider \
Email \
Fallback \
GPSEnable \
Launcher \
Music \
Mms \
Settings \
SdkSetup \
CustomLocale \
gpstest \
sqlite3 \
LatinIME \
PinyinIME \
OpenWnn \
libWnnEngDic \
libWnnJpnDic \
libwnndict \
CertInstaller \
LiveWallpapersPicker \
ApiDemos \
GestureBuilder \
SoftKeyboard

generic.mk
AccountAndSyncSettings \
AlarmClock \
AlarmProvider \
Bluetooth \
Calculator \
Calendar \
Camera \
CertInstaller \
DrmProvider \
Email \
Gallery \
LatinIME \
Mms \
Music \
Settings \
Sync \
Updater \

CalendarProvider \
SyncProvider

BTW: Fix a bug about KCM files

W/KeyCharacterMap(401): Can't open keycharmap file
W/KeyCharacterMap(401):   Error   loading   keycharmap   file '/system/usr/keychars/gpio-keys.kcm.bin'. hw.keyboards.0.devname='gpio-keys'
W/KeyCharacterMap(401): Can't open keycharmap file
E/KeyCharacterMap(401):   Can't   find   any   keycharmaps   (also   tried /system/usr/keychars/qwerty.kcm.bin)
I/DEBUG   (414): *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
I/DEBUG   (414):   Build   fingerprint: 'idea6410/idea6410/idea6410/:Eclair/ECLAIR/eng.kyon.20091226.183935:eng/test-keys'
I/DEBUG   (414): pid: 401, tid: 401   >>> android.process.acore <<<
I/DEBUG   (414): signal 11 (SIGSEGV), fault addr 00000004

I rebuild the whole codes for more than ten times and finally find that keypoint "No Read Right"

Solution:
add this to your init.rc

chmod 777 system/usr/keychars/gpio-keys.kcm.bin

Rockie's Android Porting Guide（6）——Add ALSA to your system

(1)First,you need download alsa libs and tools from Android GIT.

git clone git://android.git.kernel.org/platform/external/alsa-lib.git

git clone git://android.git.kernel.org/platform/external/alsa-utils.git

git clone git://android.git.kernel.org/platform/hardware/alsa_sound.git

check each fold and run below command:

git branch -a

git checkout origin/eclair

(2)build/target/board/idea6410/BoardConfig.mk

```
#HAVE_HTC_AUDIO_DRIVER := true
#BOARD_USES_GENERIC_AUDIO := true
BOARD_USES_ALSA_AUDIO := true
BUILD_WITH_ALSA_UTILS := true
```

(3)make clean and rebuild

(4)add asound.conf to your final system/etc/
```
# #
# # Mixer devices
# #
ctl.AndroidPlayback {
        type hw
        card 0 # Can replace with drivers name from /proc/asound/cards
}
ctl.AndroidRecord {
        type hw
        card 0
}


# #
# # Playback devices
# #
pcm.AndroidPlayback {
                type hw
                card 0
                device 0
}

pcm.AndroidPlayback_Speaker {
                type hw
                card 0
                device 0
}

pcm.AndroidPlayback_Speaker_normal {
                type hw
                card 0
                device 0
}

pcm.AndroidPlayback_Speaker_ringtone {
                type hw
                card 0
```

```
                    device 0
}


pcm.AndroidPlayback_Speaker_incall {
                    type hw
                    card 0
                    device 0
}


pcm.AndroidPlayback_Earpiece {
                    type hw
                    card 0
                    device 0
}


pcm.AndroidPlayback_Earpiece_normal {
                    type hw
                    card 0
                    device 0
}


pcm.AndroidPlayback_Earpiece_ringtone {
                    type hw
                    card 0
                    device 0
}


pcm.AndroidPlayback_Earpiece_incall {
                    type hw
                    card 0
                    device 0
}


pcm.AndroidPlayback_Bluetooth {
                    type hw
                    card 0
                    device 0
}


pcm.AndroidPlayback_Bluetooth_normal {
                    type hw
                    card 0
                    device 0
}
```

```
pcm.AndroidPlayback_Bluetooth_ringtone {
                type hw
                card 0
                device 0
}

pcm.AndroidPlayback_Bluetooth_incall {
                type hw
                card 0
                device 0
}

pcm.AndroidPlayback_Headset {
                type hw
                card 0
                device 0
}

pcm.AndroidPlayback_Headset_normal {
                type hw
                card 0
                device 0
}

pcm.AndroidPlayback_Headset_ringtone {
                type hw
                card 0
                device 0
}

pcm.AndroidPlayback_Headset_incall {
                type hw
                card 0
                device 0
}

pcm.AndroidPlayback_Bluetooth-A2DP {
                type hw
                card 0
                device 0
}

pcm.AndroidPlayback_Bluetooth-A2DP_normal {
```

```
                    type hw
                    card 0
                    device 0
}


pcm.AndroidPlayback_Bluetooth-A2DP_ringtone {
                    type hw
                    card 0
                    device 0
}


pcm.AndroidPlayback_Bluetooth-A2DP_incall {
                    type hw
                    card 0
                    device 0
}


pcm.AndroidRecord {
                    type hw
                    card 0
                    device 0
}


pcm.AndroidRecord_Microphone {
                    type hw
                    card 0
                    device 0
}
```