



Customing Android:

Looking inside the droids belly

Embedded Android Appliances

What do I mean by Appliances?

ap · pli · ance

/ə'pliəns/

Noun

A device designed to perform a specific task, typically a domestic one.





Digital Signage Appliances



Why Embedded Android ?

Because...

- ★ Open Source!
- ★ Very rich platform & APIs
- ★ Huge industry & community support
- ★ Wide variety of devices...

Customisation

3 Levels

Levels

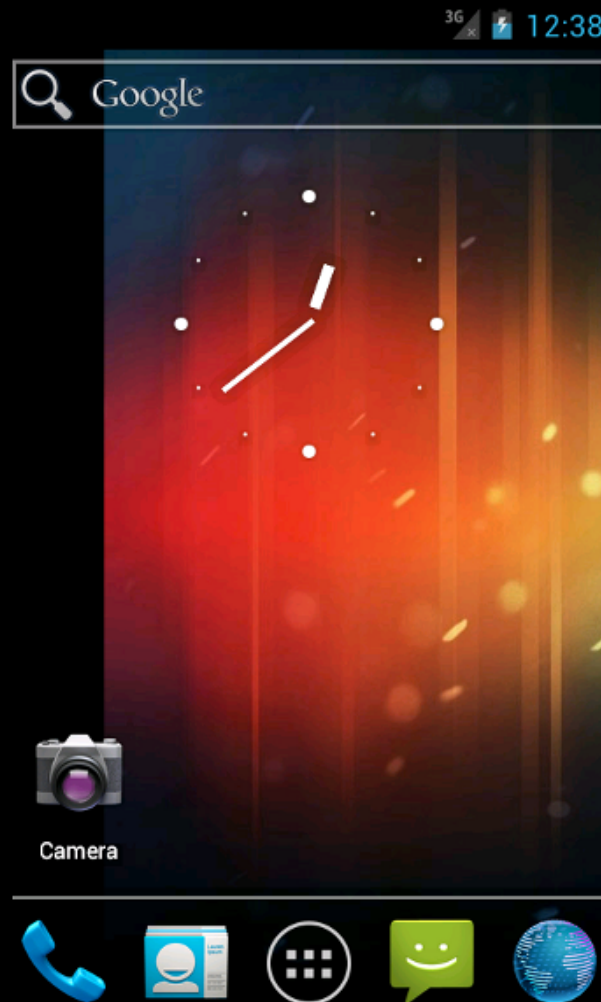
1. User
2. Root
3. Platform

1. User Level Customisation

Things you can do...

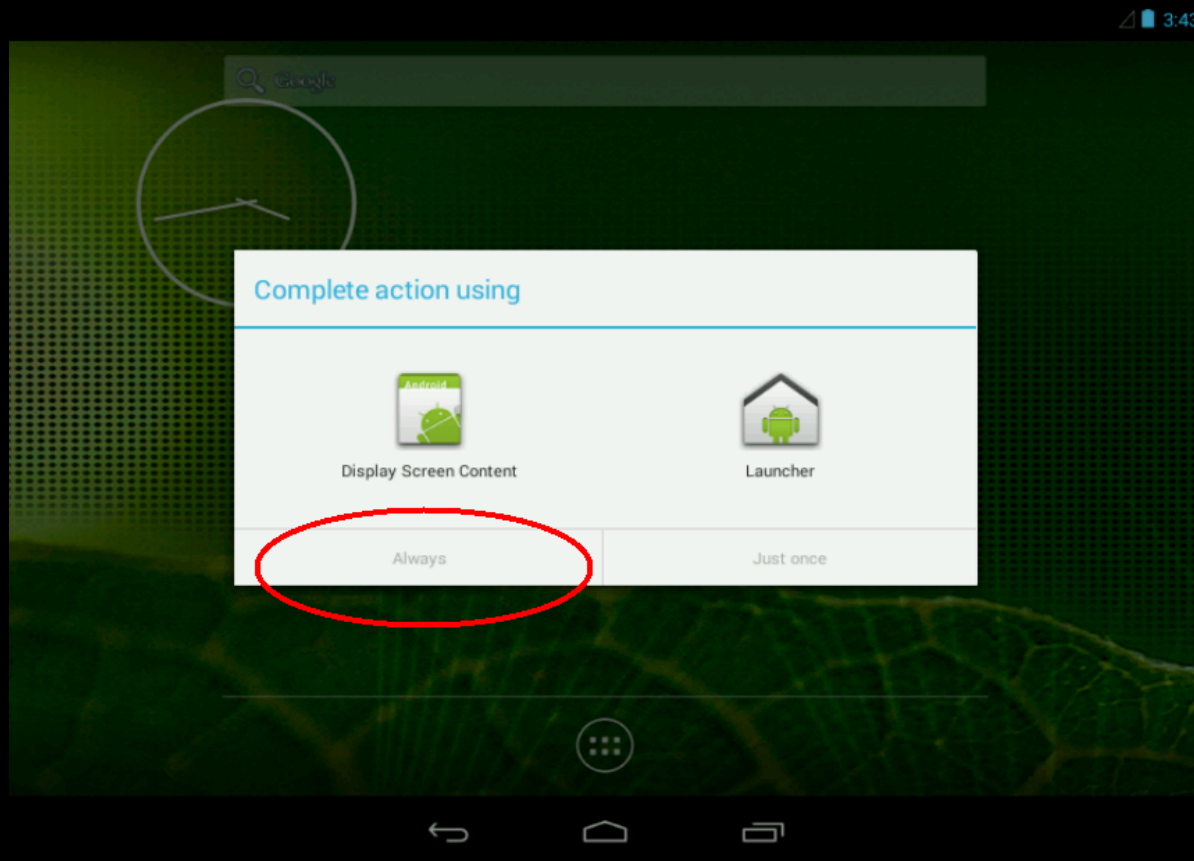
★ Use the Home Intent

Home sweet home



```
<activity android:name=".MyHomeActivity">
  <intent-filter>
    <action android:name="android.intent.action.MAIN" />
    <category android:name="android.intent.category.LAUNCHER" />
    <category android:name="android.intent.category.HOME" />
    <category android:name="android.intent.category.DEFAULT" />
  </intent-filter>
</activity>
```

mi casa es su casa



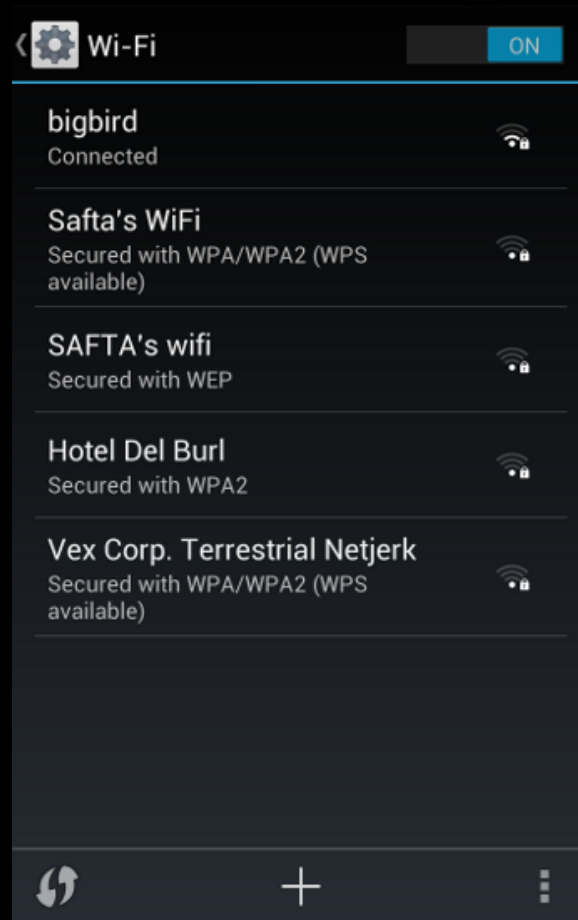
1. User Level Customisation

Things you can do...

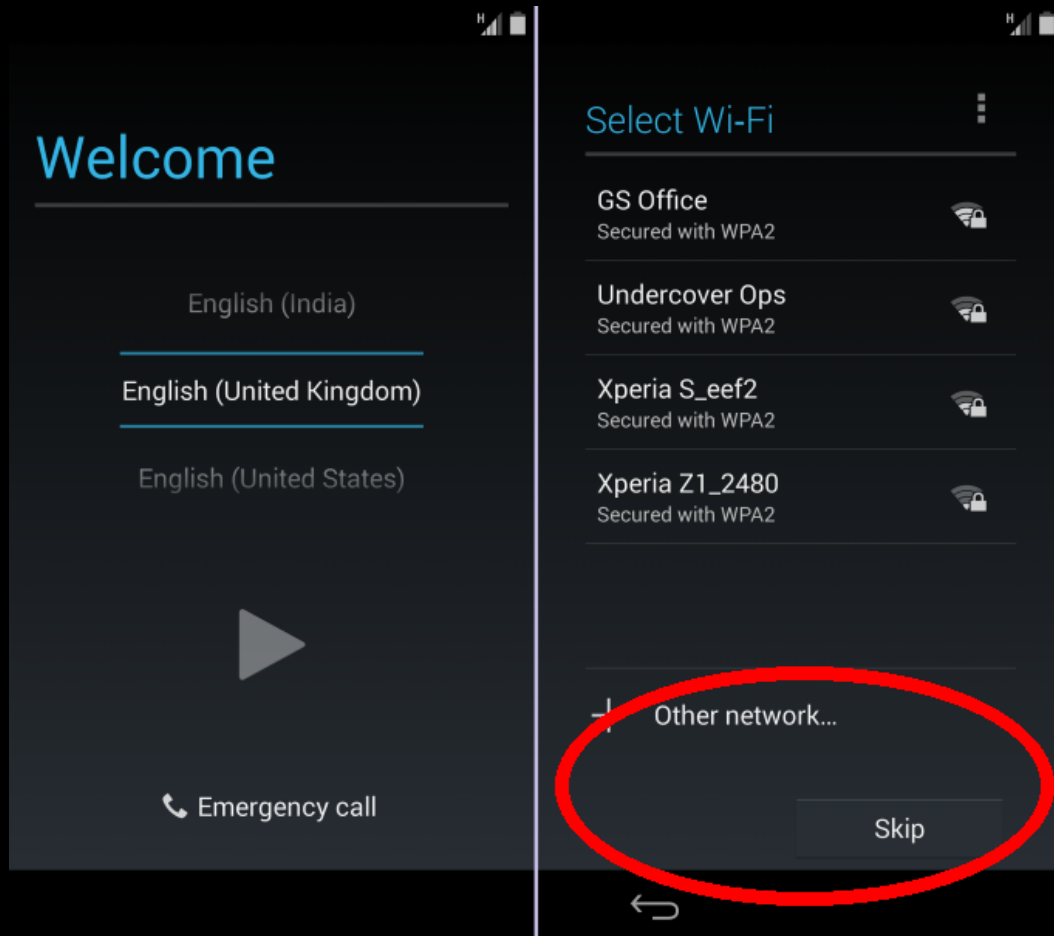
- ★ Use the Home Intent
- ★ Use "public API" Intents
(eg. Wifi config)

```
Intent intent = new  
    Intent(WifiManager.ACTION_PICK_WIFI_NETWORK);  
  
startActivityForResult(intent, 1);
```

Oops... V



Hang on a sec...



Google™



android

What would Kirk do ?



More Clichés...

**READ THE
SOURCE
LUKE**



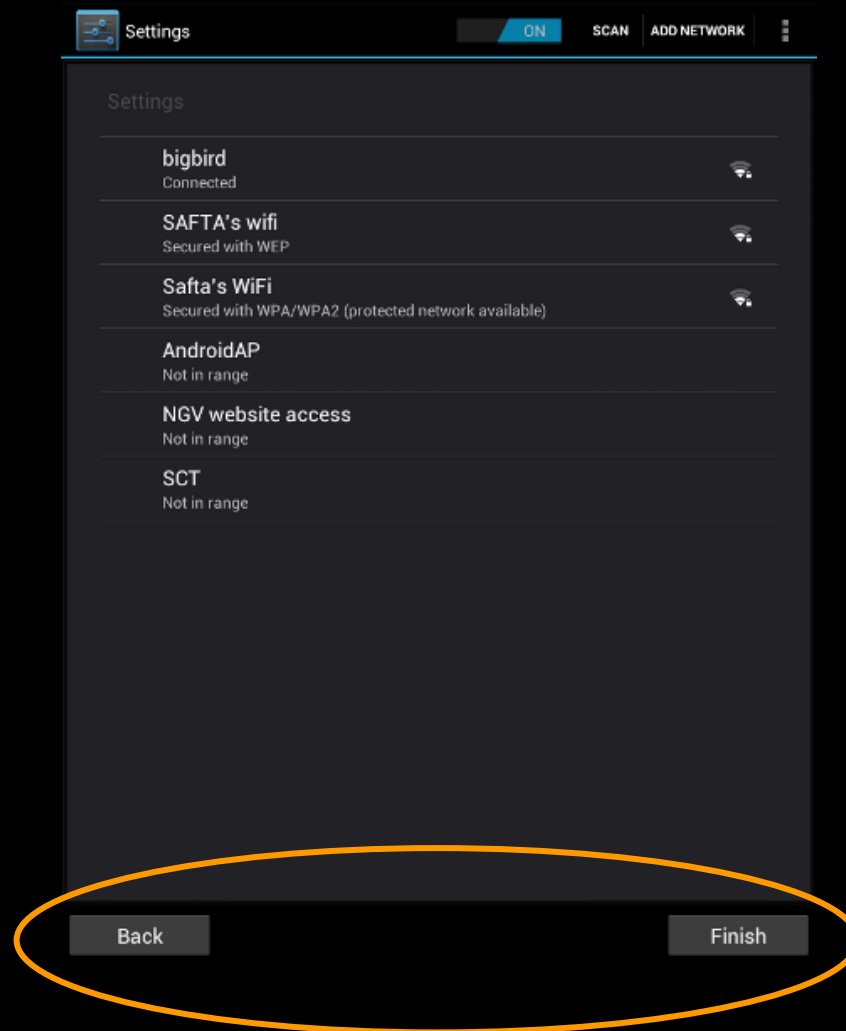
packages/Apps/Settings/src/com/android/settings/wifi/WifiSettings.java

```
Intent intent = new Intent(WifiManager.ACTION_PICK_WIFI_NETWORK);

intent.putExtra("only_access_points", true);
intent.putExtra("extra_prefs_show_button_bar", true);
intent.putExtra("wifi_enable_next_on_connect", true);
intent.putExtra("extra_prefs_set_next_text", "Finish");

startActivityForResult(intent, 1);
```

Ta-Da!



2. Root Level Customisation

No ~~soup~~ root for you!

2. Root Level Customisation

Things you can do...

- ★ Call *Privileged* API's (eg. Reboot Device)
- ★ *Silent* OTA app install/updates

Silent?

Xposed!

- ★ Framework for writing modules to...
- ★ Monkey-patch anything in the Android Java Framework code
- ★ Modified `/system/bin/app_process`
- ★ <http://repo.xposed.info>

3 OS-Level Customisation

A Trilogy in 4 parts

1. User
2. Root
3. OS -> **Android Framework**
4. OS -> **Kernel**

3. OS - Android Customisation

★ Build Android OS yourself



AOSP and Building Android

- ★ hundreds of git repos (>400)
- ★ huge amounts of disk space req'd
- ★ Ubuntu 12.04 + *Oracle* JDK
- ★ >15min on a **very fast** machine
(i7 Quad-core, 8GB, SSDs, hot ccache)
- ★ and then you need to 'flash' img & test on
emu/device :-)

3. OS - Android Customisation

Things you can do...

- ★ choose which apps to build/ship
- ★ customise UI (eg. rm Systembar, Battery/Audio-Vol warnings)
- ★ choose CPU platform (eg. x86 or MIPS instead of ARM)

but wait theres more...

3. OS - Android Customisation

MORE Things you can do...

- ★ workaround bugs in hardware (eg. bad LCD EDID)
- ★ **control** the platform - use your **own** signing certs

A tale of 2 bars (ICS)

```
packages/SystemUI/src/com/android/systemui/statusbar/StatusBar.java
```

```
public void start() {
```

```
...
```

```
        sb = makeStatusBarView();
```

```
AND tablet/TabletStatusBar.java
```

```
public void start() {
```

```
...
```

```
sb.setVisibility(View.GONE);
```

JB & KK ?

- ★ Exercise for the reader...
- ★ Tip: **GREP** is your Friend

4. OS - Kernel

- ★ device drivers, eg. custom touchscreens, wifi cards, etc
- ★ specific hardware / optimisation, eg. run on RPi's !

X. Boss Level - Recovery/Bootloaders!

- ★ CWM - Popular community recovery img
- ★ Fastboot - open protocol for 'talking' to bootloaders over usb
(think "adb for bootloaders")

Lights, Camera, Action!

Sensors

- ★ Camera, Gyro, Accel, Compass
- ★ Sonar, IR, Lidar, Temp

Outputs

- ★ Lights
- ★ Environment control (temperature)

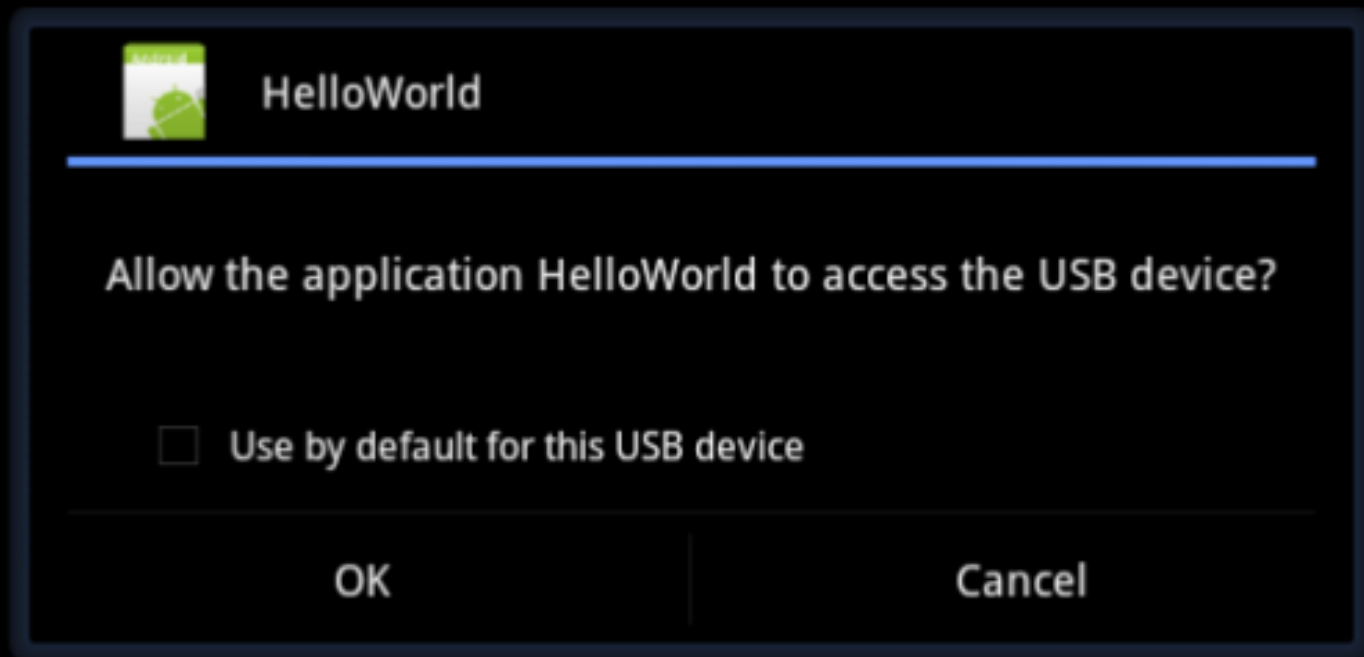


Comms

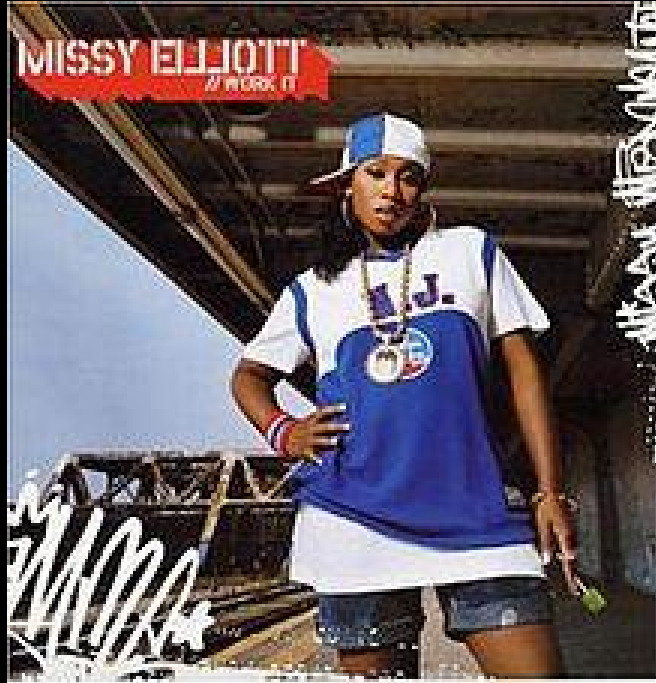
- ★ USB
- ★ ADK
- ★ Bluetooth (LE)
- ★ Audio jack

USB

You *might* want to get rid of this...



ADK



"I put my thing down, flip it, and reverse it"

- "Work It" (Missy Elliot)

Bluetooth LE

- ★ Fix it!

 - (lots of bugs in 4.3 and early 4.4's)

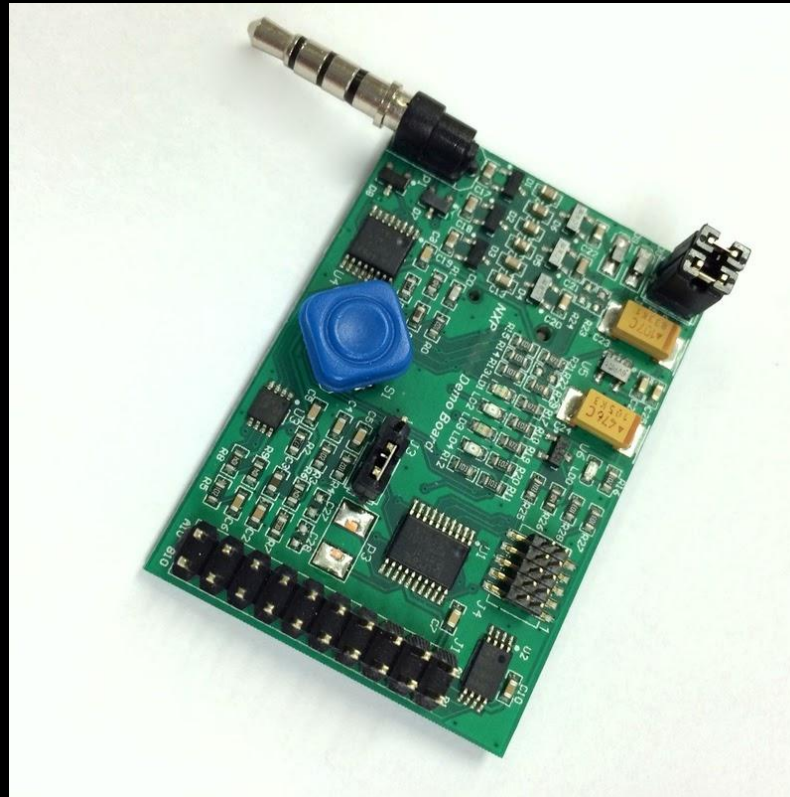
- ★ Advertise it!

 - (API *is* coming in “L” release)

- ★ Tone it down!

 - (several lines on logcat output per LE event)

Audio Jack ?!?!



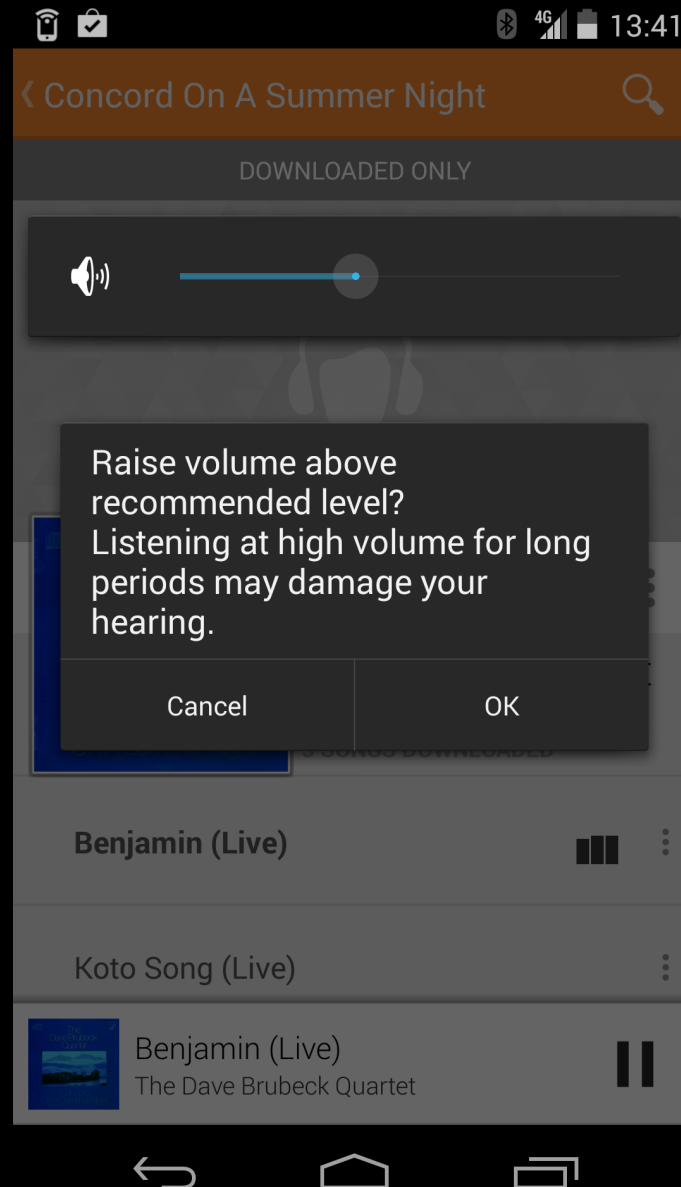
Bonus UART!



But...

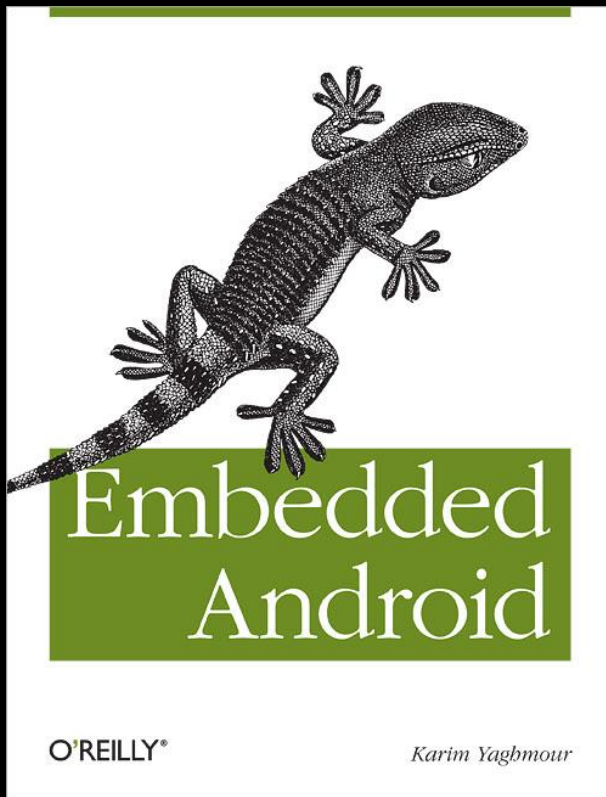
Also *don't*

want this...



References

THE book!



Also..

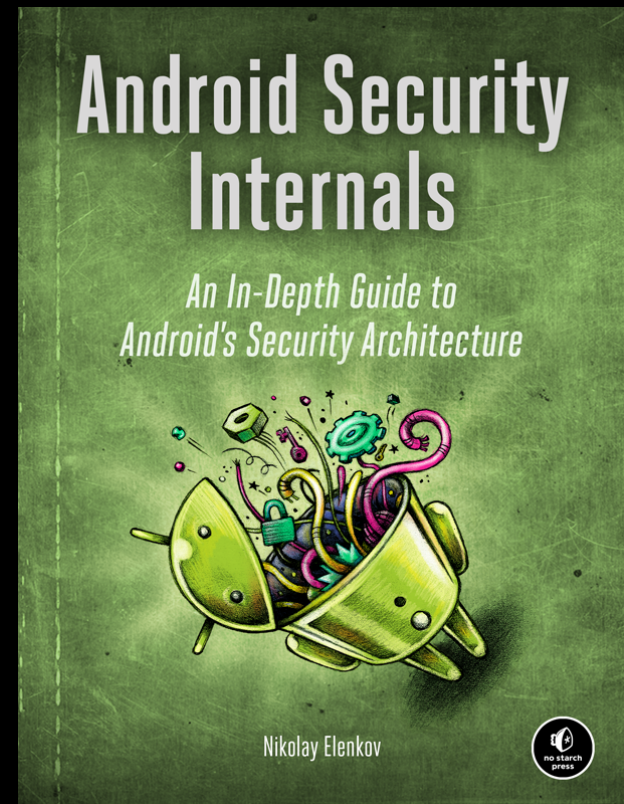


Image Credits

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[read the src luke" - Coding Horror Blog, Jeff Atwood](#)

["android welcome wizard" - geeksquad.co.uk](#)

["audio jack dev board" - NXP](#)

["build lights - wikipedia"](#)

["audio volume warning" - android bug tracker](#)

["usb permissions dialog - phidgets"](#)

[missy elliost cover - wikipedia](#)

[nexus4-uart - hackaday](#)

Thank You!

Questions?

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