



Robotito Verde Chactado aka Mod Your Device

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What is Android?

A mobile-centric Linux distro

patched Linux kernel

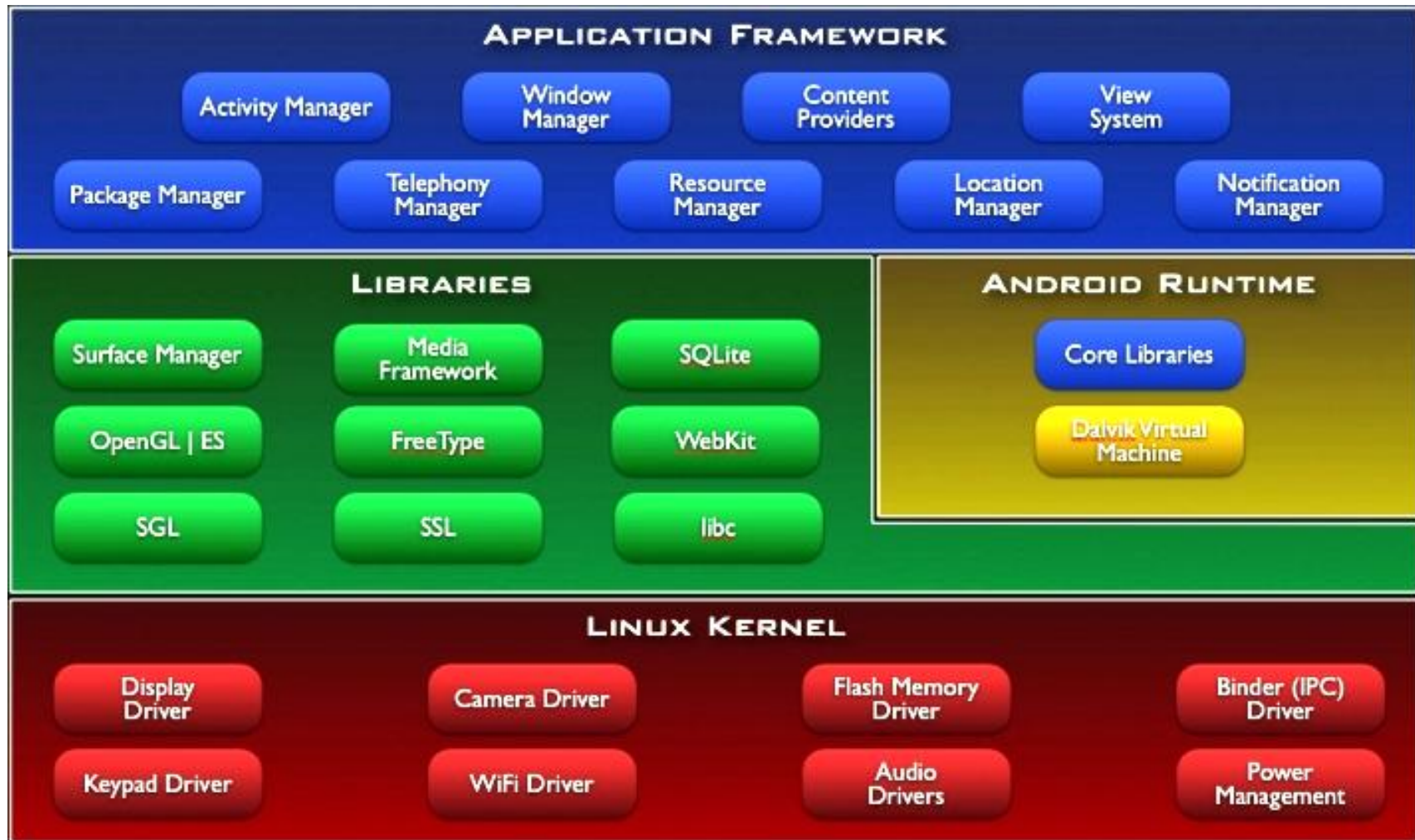
Bionic Libc

Dalvik Java VM

App Framework



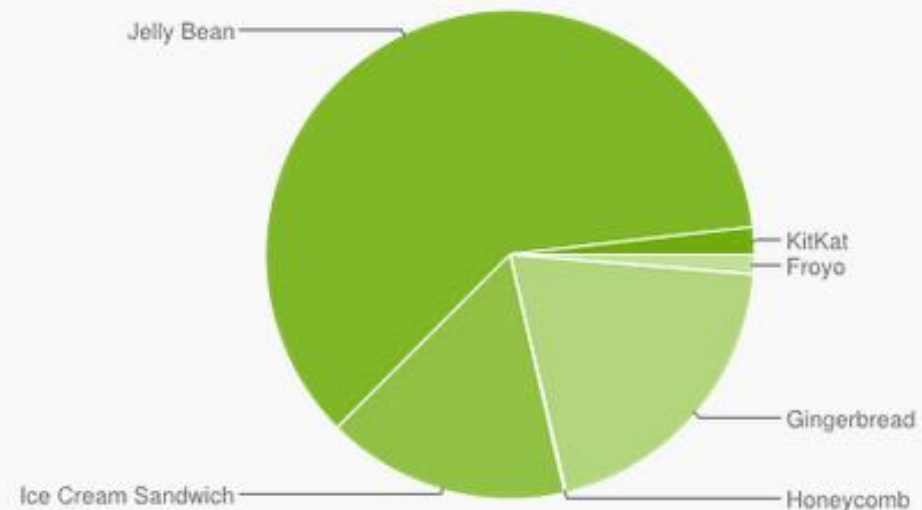
Android Architecture





Android Version Usage

Version	Codename	API	Distribution
2.2	Froyo	8	1.3%
2.3.3 - 2.3.7	Gingerbread	10	20.0%
3.2	Honeycomb	13	0.1%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	16.1%
4.1.x	Jelly Bean	16	35.5%
4.2.x		17	16.3%
4.3		18	8.9%
4.4	KitKat	19	1.8%



Data collected during a 7-day period ending on February 4, 2014.



Android kernel patches

low memory killer

Viking Killer

wake lock

`/sys/power/wake_lock`

early suspend

`/sys/power/request_state`

timed gpio

userspace driver



Android kernel patches

ashmem
cache

pmem
contiguous malloc

binder
IPC

ram console
`/proc/last_kmsg`

android debug bridge



Android kernel patches

... more on:

[linux-kernel-source /](#)
[drivers / staging / android](#)



Bionic Libc

embedded optimized

no fully POSIX

not compatible with GNU Libc

native programs
must linked to this library



Dalvik Java VM

register-based architecture

Java bytecode (.class)



Dalvik Executable (.dex)

low memory requirements



Android Applications

Android Packages (APK)

installation via:

- Google Play Store
 - storage
(usb hd, sd, ...)
 - adb



File System

`/system`

root of a typical linux tree

`/data`

apps data

`/cache`

apps cache

`/mnt`

storage



File System

in /system:

bin, etc, lib, usr

framework
application framework

app
system apps

media
bootanimation.zip



File System

... also in /system:

build.prop

fonts

roboto (android > 4.0)

xbin

optional utilities

vendor

vendor addons



File System

in /data:

app

user apps

data

user data

`com.android.providers.settings`

dalvik-cache

dex files



Android Debug Bridge

adb

install android-tools
or
android-tools-adb

Android SDK

available also for Mac and Win



Android Debug Bridge

`adb shell`

limited standard cmds

getprop, setprop
netcfg
input
am

`busybox`



Settings Database

android_metadata
language

system
volume

secure
lock

SQLite 3



Simple Boot Animation

```
# Usage: make-bootanimation image

# android destination directory
adir="/system/media"

# animation parameters
fps=10
step=5
max=100

mkdir -p bootanimation/part{0,1}

cat > bootanimation/desc.txt << EOF
$(identify -format "%[fx:w] %[fx:h]" $1) $fps
p 1 0 part0
p 0 0 part1
EOF
```



Simple Boot Animation

```
echo -n "generating animation frames: [ "  
for brightness in $(seq 0 $step $max)  
do  
    outfile=$(printf "%03d" $brightness).png  
    [ "$brightness" != "$max" ] && n=0 || n=1  
    convert \  
        -depth 24 \  
        -type TrueColor \  
        -interlace NONE \  
        -modulate $brightness \  
        $1 \  
        PNG24:bootanimation/part$n/$outfile \  
        && echo -en "\b=>"  
done  
echo -e "\b]"  
  
( cd bootanimation  
  zip -qr0 ../bootanimation.zip part0/ part1/ desc.txt )  
  
adb push bootanimation.zip $adir/
```



Android Toolchain

Android NDK

```
make-standalone-toolchain.sh \  
  --platform=android-14 \  
  --install-dir=~/.android-toolchain
```

```
PATH=~/.android-toolchain/bin:$PATH  
export PATH
```

```
$ arm-linux-androideabi- <TAB>
```



Useful Links

Official Android Dev
developer.android.com

XDA Developers
www.xda-developers.com

Android NDK
developer.android.com/sdk/ndk/index.html