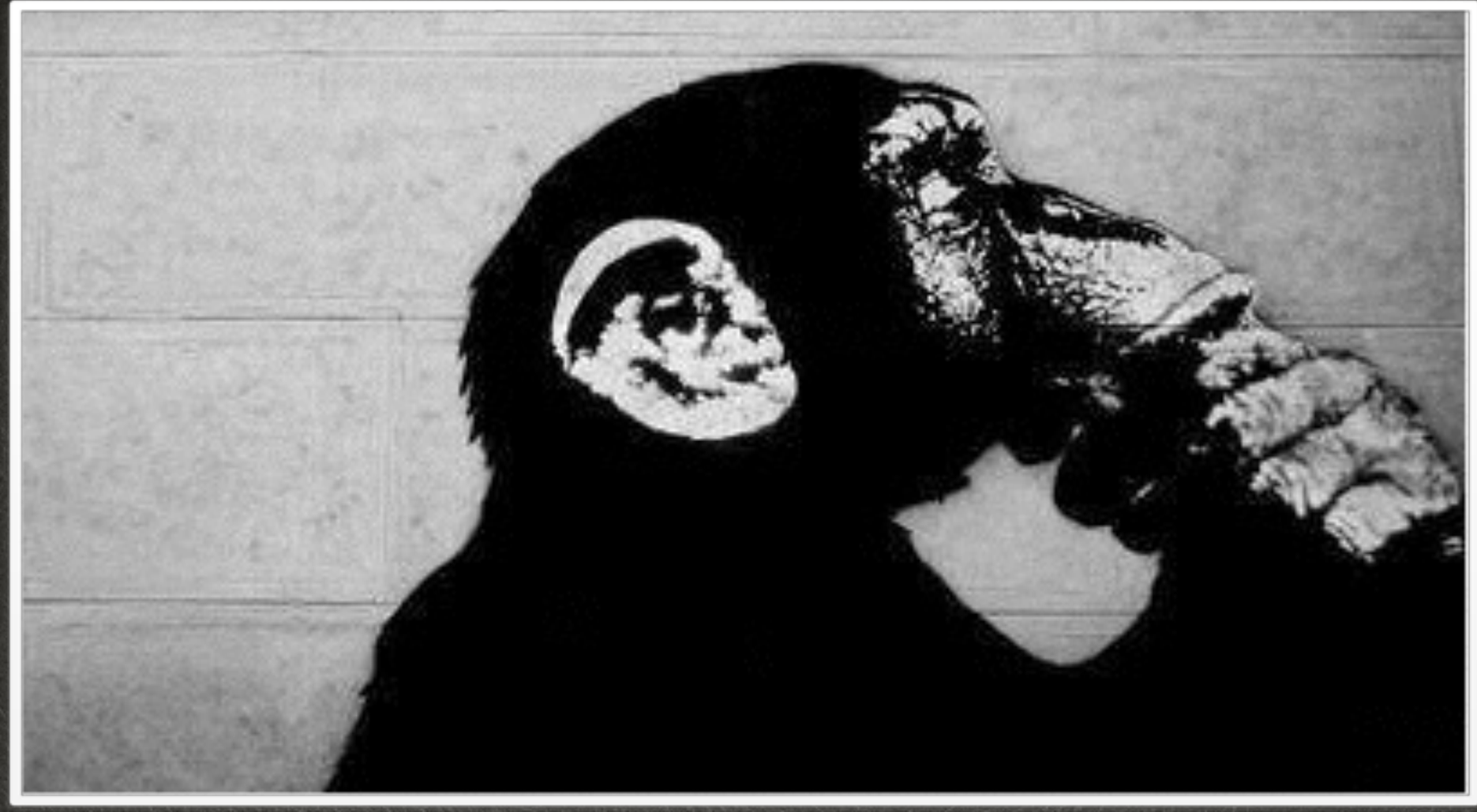
PROGRAMMING AND HACKING ANDROID

Fabrizio Cornelli
HT



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CV

- Filibusta LUG
- Laurea a Crema, nel 2012
- CTO, Enterprise srl
- QA Manager, HT

FIRST RULE OF HT

YOU DO NO TALK ABOUT HT

]HackingTeam[

- Fighting crime since 2001
- Internet is wrong

Summary

- Being a Developer
- Being a Hacker
- Android Architecture Overview
- How to write an APT on Android

```
#include "Investment.h"
#include "MyProjects/Startup/Success.h"
#include "MyProjects/Startup/Business.h"

template< typename BusinessStrategy, typename Investment >
class Business: public BusinessStrategy
{
    Business( Investment& MyInvestment );
```

DEVELOPER

"If it ain't broke, don't fix it"

Software engineer

- Constructive
- Programming skills
- Good Practices
- Design then code (and test)
- RTFM
- Frameworks and Libraries
- Don’t be the first
- High level languages

Software Engineering Proverbs

- The ends does not justify the mean
- Choose two: good, fast, cheap
- Any fool can write code that a computer can understand. Good programmers write code that humans can understand. [M. Fowler]

HACKER

"shit happens"

Hacker

- Deconstructive
- Reverse Engineer
- Lateral Thinking
- Lazy
- Subvert the manual
- Shortcut
- Must be the first
- Low level languages (C, asm)

Hacking Proverbs

- the ends justify the means

- a clever person solves a problem, a wise person avoids it.

Shared values

- Discipline / Focus
- Imagination

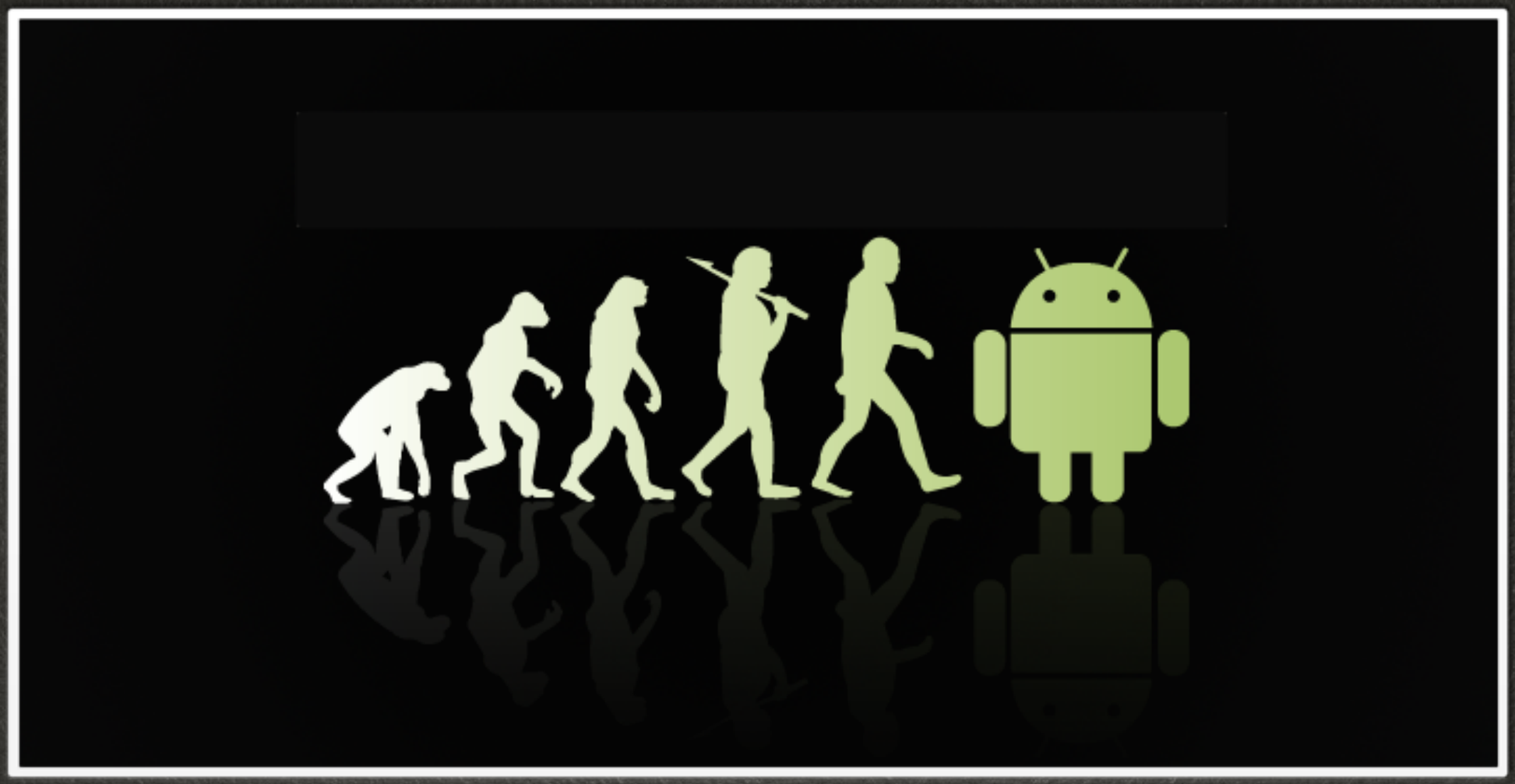
Farmer vs Hunter

- **farmer**
- permanent settlements
- tradition
- patience
- collaboration

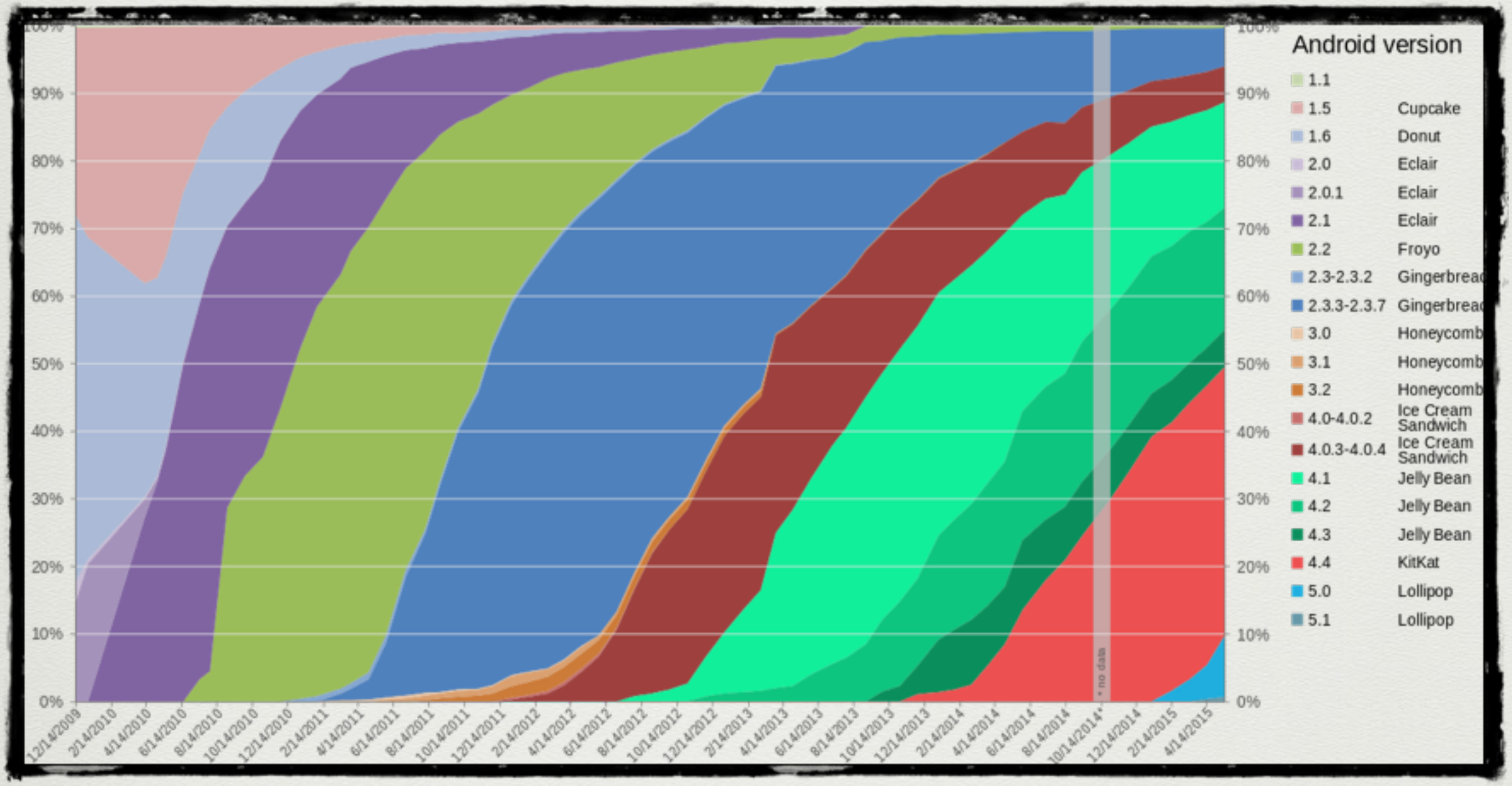
- **hunter**
- autonomy
- innovation
- initiative
- indipendence

Programming

- Be a hacker: get your POC
- Be a developer: evolve an idea to a product



ANDROID


Android version
1.1
1.5 Cupcake
1.6 Donut
2.0 Eclair
2.0.1 Eclair
2.1 Eclair
2.2 Froyo
2.3-2.3.2 Gingerbread
2.3.3-2.3.7 Gingerbread
3.0 Honeycomb
3.1 Honeycomb
3.2 Honeycomb
4.0-4.0.2 Ice Cream Sandwich
4.0.3-4.0.4 Ice Cream Sandwich
4.1 Jelly Bean
4.2 Jelly Bean
4.3 Jelly Bean
4.4 KitKat
5.0 Lollipop
5.1 Lollipop
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
* no data
12/14/2009
2/14/2010
4/14/2010
6/14/2010
8/14/2010
10/14/2010
12/14/2010
2/14/2011
4/14/2011
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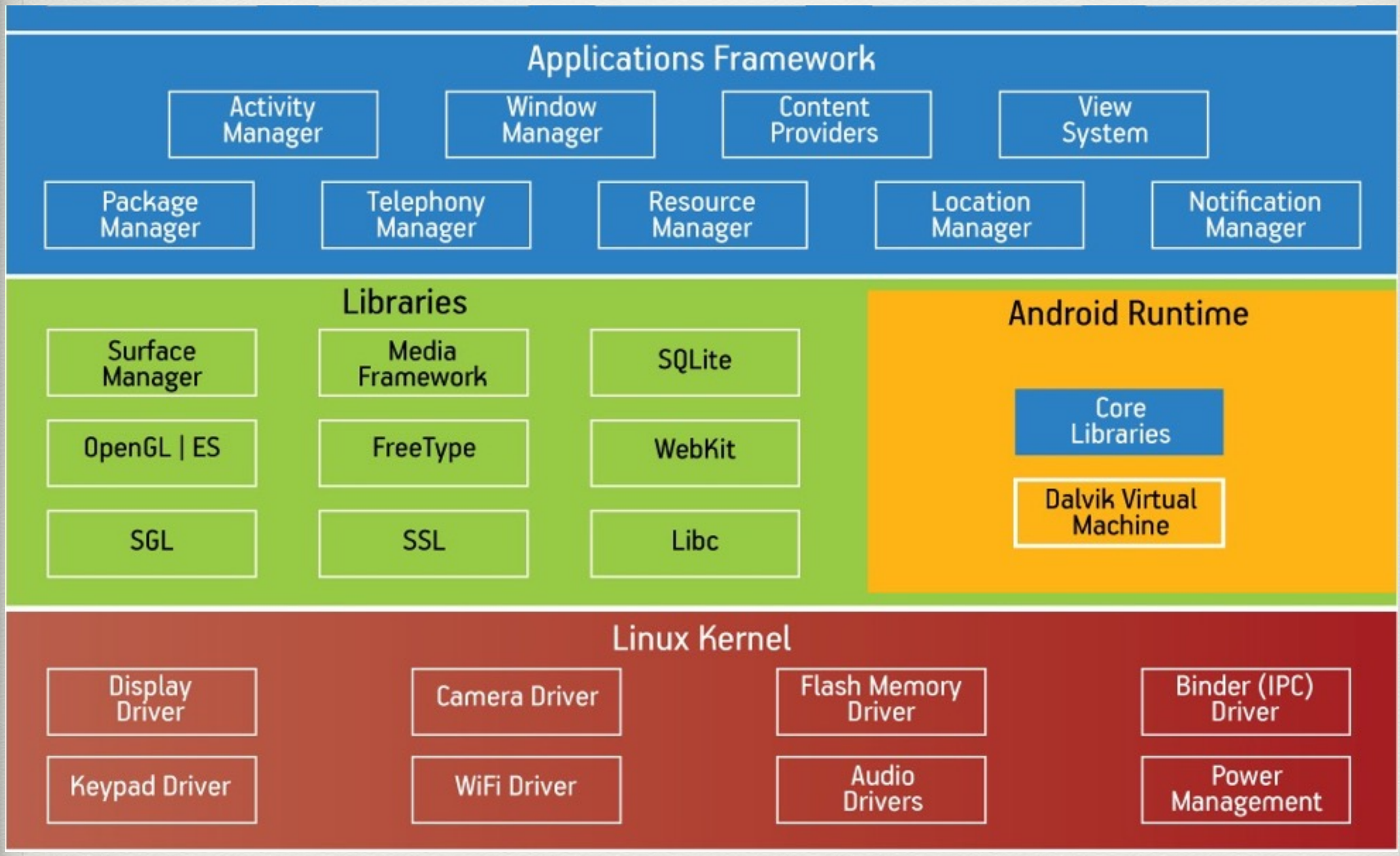
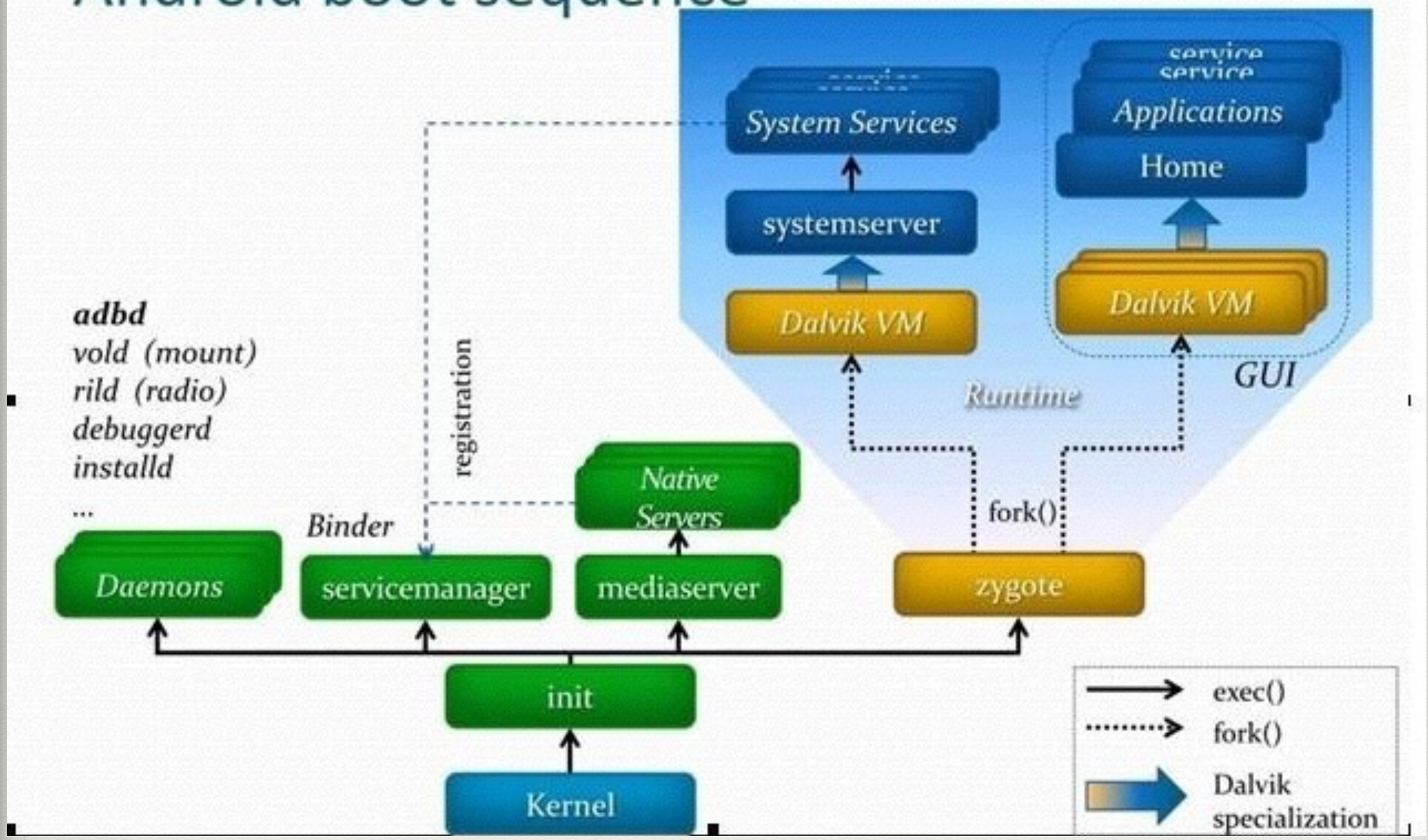
10/14/2014*
12/14/2014
2/14/2015
4/14/2015


Applications Framework
Activity Manager
Window Manager
Content Providers
View System
Package Manager
Telephony Manager
Resource Manager
Location Manager
Notification Manager
Libraries
Surface Manager
Media Framework
SQLite
OpenGL | ES
FreeType
WebKit
SGL
SSL
Libc
Android Runtime
Core Libraries
Dalvik Virtual Machine
Linux Kernel
Display Driver
Camera Driver
Flash Memory Driver
Binder (IPC) Driver
Keypad Driver
WiFi Driver
Audio Drivers
Power Management

Boot

- firmware
- kernel
  - drivers
  - fs
- user space (init)
  - dalvik /ART
  - daemons
  - GC

Android boot sequence



APK

- classes.dex : Code
- Manifest
- Resources / Assets /Licence
- Libs
- Signature

Dalvik

- Process VM
- register based
- Java -> bytecode
- APK
- .dex -> .odex
- JIT

Android Runtime (ART)

- .dex -> elf
- AOT Compilation

ANDROID DEVELOPMENT

Android Studio

- IntelliJ Platform
- IDE
- gradle / ant
- adb
- emulator

ADB

- Android Debug Bridge
- Device in Debug Mode
- subcommands:
  - shell
  - pull
  - push
  - install
  - kill-server
  - reboot

REVERSING

Tools

- Decompilers
  - jd-gui
  - dad
  - jeb
- Apk dissectors
  - androguard
  - apktool
- Reversing Frameworks
  - IDA
  - Radare
- Network analyzer
  - Wireshark / tcpdump
  - burp

apktool

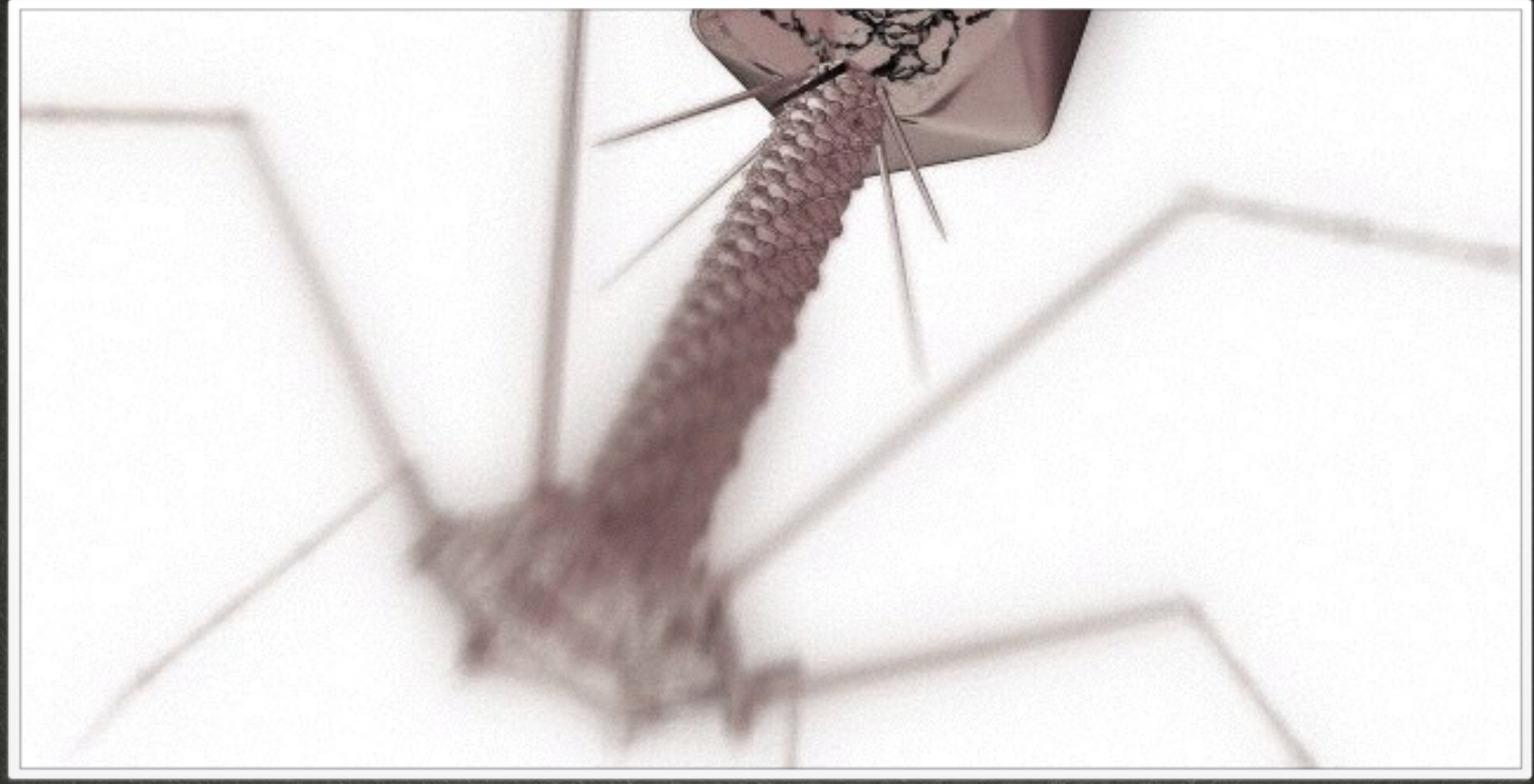
- decode apk
- build apk
- internal use of smali/baksmali
- needs jarsigner

smali

```
.method public static main([Ljava/lang/String;)V
    .registers 2

    sget-object v0, Ljava/lang/System;->out:Ljava/io/PrintStream;

    const-string   v1, "Hello World!"

    invoke-virtual {v0, v1}, Ljava/io/PrintStream;->println(Ljava/lang/String;)V

    return-void
.end method
```

learn from malware

- http://contagiominidump.blogspot.it/
- virus total
- androguard DatabaseAndroidMalwares



APT CONCEPTS

Advanced Persistence Threats

Life cycle

- Configuration
- Build
- Installation
- Execution
- Persistence
- Data Exfiltration
- Uninstall

HACKING ANDROID

Get the root

- Flash the OS
- Use a local to root exploit
- Use a system exploit

Starting at the boot

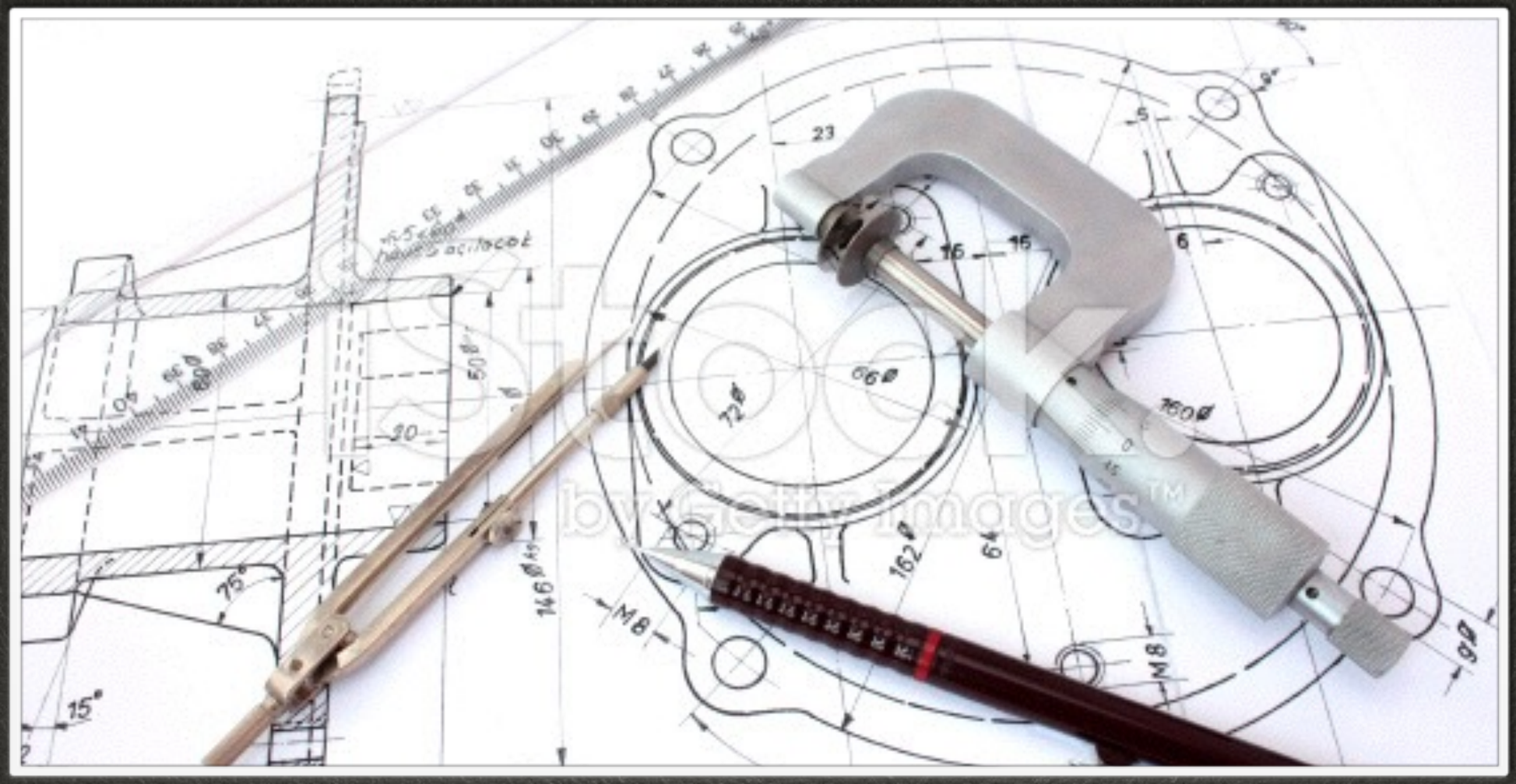
- Use the Manifest
- Use the OS (root)

Get data

- Use Android API
- Use OS libraries
- Get data reading memory (root)
- Get data reading files (root)

Communication

- Covered link
- Use Android API



ENGINEER A PRODUCT

Agile programming

Protect from hackers

- anti reversing tricks
- polymorphic tools
- encryption and obfuscation
- anti virtualisation tricks
- packing
- virtualize

Maintain the code

- Versioning
- Continuous integration
- Testing and code coverage
- Acceptance tests
- Automatic tests

Make a product

- Customer support
- Release policies
- Marketing

LINKS

NOW HIRING