Advanced Android Debugging

Contents

1 Debugging

Any piece of software or hardware ever designed must have gone through debug a process. Debug provides us a window to sneak into a running application.

Android provides an excellent platform for debugging apk through eclipse IDE.

However there is more of debugging for advanced users, which is quite useful and fast.

2 Installing adb, and setting debugging environment

If you have installed and setup android development enviroment for eclipse, then you have all the debugging tools with you.

If not, you can install *adb* on Ubuntu-12.10 onwards by

```
sudo apt-get install android-tools-adb
```

or you can download the entire Android-sdk(400 MB uncompressed) here and setup manually.

or for a 32bit Linux machine, you may download it from this link and make the binary as executable

```
chmod +x adb
```

2.1 Setting udev rules for adb to run as a normal user

Set udev rules for android usb in */etc/udev/rules.d/51-android.rules*, open terminal and do

```
sudo gedit /etc/udev/rules.d/51-android.rules
```

and enter these two rules

```
SUBSYSTEM=="usb", ATTR{idVendor}=="19d2", MODE="0666", GROUP="plugdev"
SUBSYSTEM=="usb", ATTR{idVendor}=="18d1", MODE="0666", GROUP="plugdev"
```

save and exit. Now restart udev services by

```
sudo service udev restart
```

That's all, now enjoy debugging in eclipse or through adb without the need of root access.

3 Getting connected using WiFi, and USB cable

If your project demands a WiFi based debugging then follow this approach. First ensure that both your host machine and android device are in same WiFi network.

Connect android(Aakash), and host-machine through USB cable. Wait for debugging icon on android side, when ready issue

```
adb tcpip 5555
```

You will get confirmation message as *restarting in TCP mode port: 5555* on the terminal emulator. Now remove your USB cable, and issue

```
adb connect <your-android-device-ip>
```

If success, it will print *connected* on your terminal.

Now you can debug your android through adb or test apk's through eclipse debugging wirelessly.

When done, it's better to disconnect gracefully

```
adb disconnect <your-android-device-ip>
```

4 adb options

adb stands for **android debug bridge**. It's a client command line tool which lets you communicate with an emulator instance or connected Android device.

4.1 adb push/pull

These are most frequently used adb commands. Let's try them.

Assuming the device is connected to host-machine

```
adb push README.rst /mnt/sdcard
```

This will copy README.rst to /mnt/sdcard, internal sdcard of Aakash tablet.

Let's try copying from device to our host-machine

```
adb pull /mnt/sdcard/README.rst /tmp
```

This will copy README.rst to */tmp* directory.

Let's try pushing a directory to android

```
adb push data /mnt/sdcard/data
```

This will copy the content of *data* directory to *data* directory in sdcard.

Similarly you can try pulling this directory to */tmp*

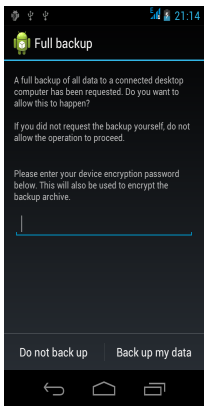
```
adb pull /mnt/sdcard/data /tmp/data
```

4.2 adb backup/restore

These are useful tools. Option *-all* will backup all apps

```
adb backup -all -f /tmp/backup.ab
```

Now unlock your android device, and select "Backup up my data". You can optionally set a password too.



After confirming operation on android device, your terminal emulator will change to

```
srikant@dell ~/Documents/talks-handouts $ adb backup -all -f /tmp/backup.ab
Now unlock your device and confirm the backup operation.
```

The backup operation sadly doesn't have any progress bar, it take time depending on number of apps installed.

Similarly, to restore one can do

```
adb restore /tmp/backup.ab
```

This will again ask for confirmation on android side, select "Restore my data" to start restore process. Again no progress bar.

> ***Note***
>
> backup and restore doesn't work with Aakash device. There are many other tools freely available for same purpose.

4.3 adb shell

This is again a most frequently used command. One can use "adb shell" to execute any shell command inside android environment

```
adb shell <command>
```

We will see more of "adb shell" later.

4.4 adb logcat

This will simply show live log of all processes running on device. The *-d* flag will dump the output to stdout and exit. Let's try this out

```
adb logcat -d | grep README.rst
```

grep will search for 'README.rst' in logcat output.

```
srikant@dell ~/Documents/talks-handouts $ adb logcat -d | grep README.rst
D/MediaScanner(  257): to scan /mnt/extsd/apk repository/APL/README.rst
srikant@dell ~/Documents/talks-handouts $
```

Try searching other terms in logcat for effective debugging or you can run logcat to view live status of your android device.

5 package manager(pm)

(pm) tool perform actions and queries on application packages installed on the device. Syntax to use

```
adb shell pm <command>
```

Let's try few command to retrieve package information

```
adb shell pm list packages
```

```
srikant@dell ~ $ adb shell pm list packages
package:android
package:cn.wps.moffice_eng
package:com.aakash.pusthak.launch
package:com.acerapps.chessgrandmaster
package:com.adobe.flashplayer
package:com.android.aldiko
package:com.android.backupconfirm
package:com.android.browser
package:com.android.calculator2
```

If you want to uninstall any package, simply issue

```
adb shell pm uninstall com.aakash.lab
```

To set install location for apk's, internal or external sdcard

```
adb shell pm set-install-location 1
```

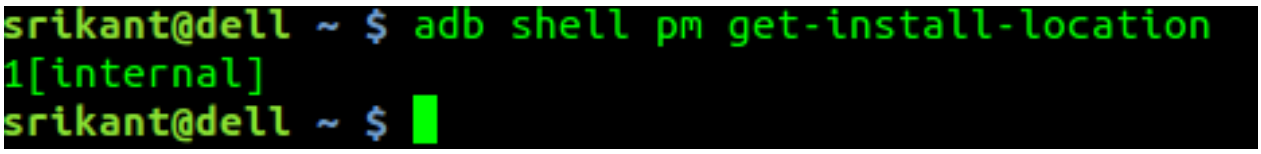
0: Auto—Let system decide the best location

1: internal device storage

2: external media

To get current install location

```
adb shell pm get-install-location
```



6 activity manager(am)

Within an adb shell, one can issue commands with the activity manager (am) tool to perform various system actions, such as start an activity, force-stop a process etc.

Let's checkout few examples

```
adb shell am start -a android.intent.action.VIEW
```

This will open "Complete action using" menu.

Similarly, if one want to **kill all background apps**, then issue

```
adb shell am kill-all
```

To test various screen resolutions for your application

```
adb shell am display-size 320x240
```

Remember, you can not test your app in resolution higher than actual screen resolution.

For eg: on Aakash the native screen resolution is 800x480 so one can't test apps for 1280x800.

> ***Warning***
>
> This option(display-size) may crash your display, you then may have to factory reset your device. Works with phone, crashes sometimes with Aakash. So use it wisely. You have been warned.

By the way, to do factory reset, goto settings -> Backup and reset -> Factory data reset and confirm. This will remove all the apps.

7 Automating tasks

7.1 Automating tasks on android side

For various reasons you may want your certain script to start automatically when device boots. This can be achieved by carefully observing *init.rc* file.

In case of aakash, to run a bash script at boot time we need to put the entry of the bash script in **/system/bin/preinstall.sh**, this file get called at boot time and anything inside it will be executed.

Explore init.rc and preinstall.sh only if you know what you are doing. Any wrong entry in **/system/bin/preinstall.sh** may kill your device.

> ***Warning***
>
> Again, you have been warned.

7.2 Automating tasks on host side

With **adb** , one can easily script, for eg:

To monitor RAM usage of Android device every 1 sec, one can write a simple shell script and execute

```
1 #!/bin/sh
2
3 while true
4 do
5    adb shell busybox free -m
6    sleep 1
7 done
```

The above script can be done in one line too, in terminal emulator

```
while true; do adb shell busybox free -m ; sleep 1; done
```

To cancel the loop, just use ^C .

Let's try another script. This time let's try installing all the apks present in present working directory

```
for each in $(ls *.apk); do adb install -r $each; done
```

These are very trivial examples, there are lot of exciting things possible with scripts.

8 Using busybox

BusyBox provides several stripped-down Unix tools in a single executable file (less than 1 MB). It is used in almost every embedded Linux device.

Inside *adb shell* (i.e in android device) it can be accessed as

```
busybox
```

This will print list of commands possible with busybox. Busybox can also be accessed from terminal as

```
adb shell busybox
```

To access any command use

```
adb shell busybox <command-name> <command's-flag>
```

We will see few important examples with busybox

Listing all files

```
busybox ls -l
```

```
root@android:/ # busybox ls -l
total 1664
-rw-rw-rw-    1 0        0               0 Mar  1 05:33 26-
-rw-rw-rw-    1 0        0               0 Mar  1 05:33 27
drwxr-xr-x    3 0        0               0 Mar  1 04:37 acct
drwxrwx---    4 1000     2001         4096 Mar  1 05:40 cache
dr-x------    2 0        0               0 Mar  1 04:37 config
lrwxrwxrwx    1 0        0              17 Mar  1 04:37 d -> /sys/kernel/debug
drwxrwx--x   20 1000     1000         4096 Nov 16 10:32 data
-rw-r--r--    1 400      401           116 Aug  8  2012 default.prop
drwxr-xr-x   11 0        0            2600 Mar  1 04:38 dev
lrwxrwxrwx    1 0        0              11 Mar  1 04:37 etc -> /system/etc
-rwxr-x---    1 400      401         102852 Aug  8  2012 init
-rwxr-x---    1 400      401           2344 Aug  8  2012 init.goldfish.rc
-rwxr-x---    1 400      401          18439 Aug  8  2012 init.rc
-rwxr-x---    1 400      401           2443 Aug  8  2012 init.sun5i.rc
-rwxr-x---    1 400      401           2230 Aug  8  2012 init.sun5i.usb.rc
-rwxr-x---    1 400      401        1536000 Aug  8  2012 initlogo.rle
drwxrwxr-x    8 0        1000             0 Mar  1 04:37 mnt
dr-xr-xr-x  123 0        0                0 Jan  1  1970 proc
drwx------    2 0        0                0 Jul 31  2012 root
drwxr-x---    2 400      401              0 Aug  8  2012 sbin
lrwxrwxrwx    1 0        0               11 Mar  1 04:37 sdcard -> /mnt/sdcard
drwxr-xr-x   12 0        0                0 Mar  1 04:37 sys
drwxr-xr-x   14 0        0             4096 Jan  1  1970 system
-rw-r--r--    1 400      401            272 Aug  8  2012 ueventd.goldfish.rc
-rw-r--r--    1 400      401           3825 Aug  8  2012 ueventd.rc
-rw-r--r--    1 400      401           1037 Aug  8  2012 ueventd.sun5i.rc
lrwxrwxrwx    1 0        0              14 Mar  1 04:37 vendor -> /system/vendor
root@android:/ #
```

Changing file permissions

```
adb shell busybox chmod 755 /mnt/sdcard
```

For opening a file for editing, it's better to do **adb shell** first and then:

```
busybox vi /mnt/sdcard/README.rst
```

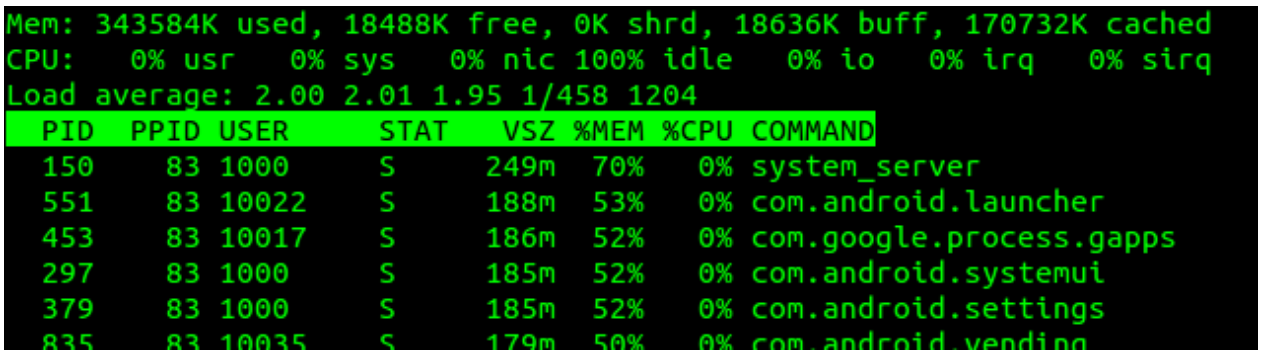
Use **i** or press <INSERT> key to go to editing mode.

To save, press <ESC> key to exit from editing mode. Then use **:wq** to write and quit.

If you have edited a file but want to discard changes, press <ESC> to exit from editing mode, and then use **:q!** to quit without saving.

To know system load

```
adb shell busybox top
```



To find out partition table

```
adb shell busybox df -h
```

To find out disk usage of any file

```
adb shell busybox du -sh
```

To know list of mounted devices

```
adb shell mount
```

In most of the android devices **/system** is marked as *ro*, only when you get **root** access to your device you can make changes there. But it make sense to mark system partition as *ro* unless required. To change our mount options to *ro*

```
adb shell busybox mount -o rw,remount  /system
```

9 Practical example

This we use at our Aakash logistics facility, to obtain MAC address from a new device automatically we use this approach in a Python script:

```
adb shell svc wifi enable
```

then

```
adb shell ip link show wlan0 | busybox awk '/ether/ {print $2}'
```

finally disable wifi, if not required

```
adb shell svc wifi disable
```

10 Monitor android

Monitor is a gui tool to monitor packages, apps, threads, processes etc. One can use it to capture screenshot too.

11 Suggested readings

1. http://developer.android.com/index.html
2. http://developer.android.com/tools/help/adb.html