# Android File System

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Ref: Wei-Meng Lee, “BEGINNING ANDROID™ 4 APPLICATION DEVELOPMENT “, Ch6 , John Wiley & Sons , 2012

## File System

- Most of the Android user are using their Android phone just for calls, SMS, browsing and basic apps, But form the development prospective, we should know about Android internal structure.
- Android uses several partitions (like boot, system, recovery , data etc) to organize files and folders on the device just like Windows OS.

## File System

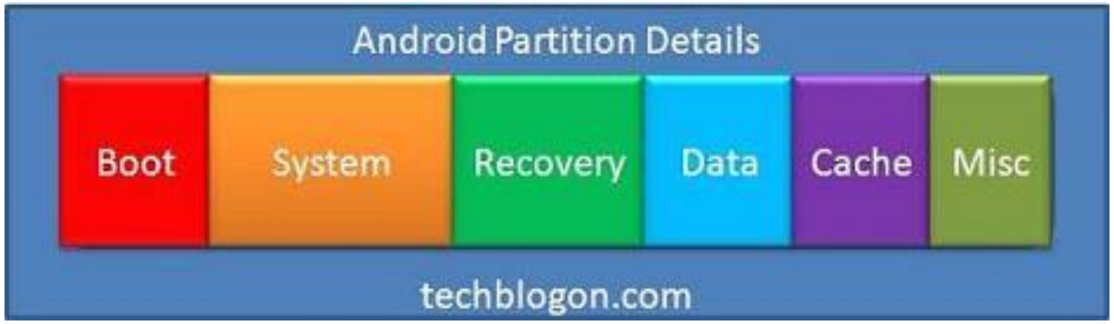
- Each of these partitions has it’s own functionality, But most of us don’t know  the significance of each partition and its contents.
- In this article, we will take you on a tour of Android partitions. So lets start the android file system tutorial.

## File System

- There are mainly 6 partitions in Android phones, tablets and other Android devices.
- Note that there might be some other partitions available, it differs from Model to Model. But logically below 6 partitions can be found in any Android devices.

## File System

- /boot
- /system
- /recovery
- /data
- /cache
- /misc

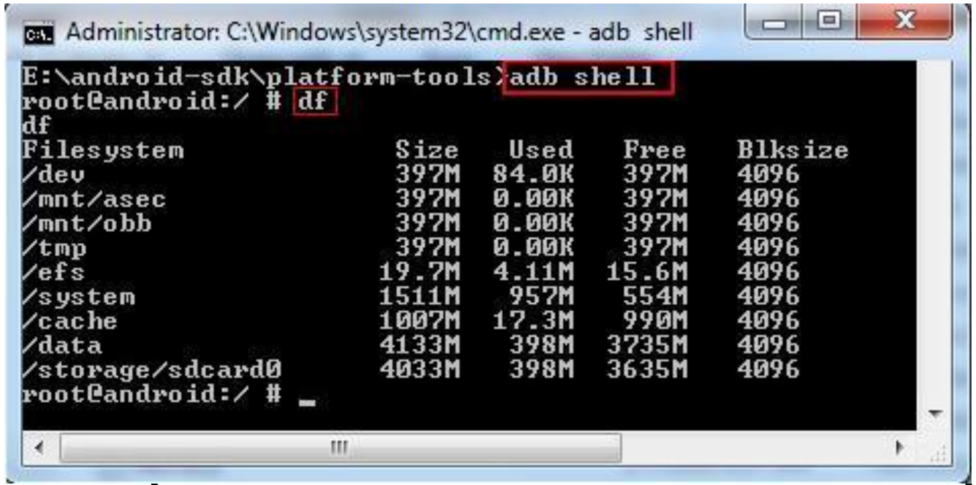


Also Below are the for SD Card Fie System Partitions.

- /sdcard
- /sd-ext

## File System

- You can know which partitions are available along with the partition size for all partition in your android device. Go through the below image and run the adb command as shown in that image.



```
E:\android-sdk\platform-tools>adb shell
root@android:/ # df
df
Filesystem               Size     Used     Free   Blksize
/dev                     397M    84.0K     397M   4096
/mnt/asec                397M    0.00K     397M   4096
/mnt/obb                 397M    0.00K     397M   4096
/tmp                     397M    0.00K     397M   4096
/efs                    19.7M    4.11M    15.6M   4096
/system                 1511M     957M     554M   4096
/cache                  1007M    17.3M     990M   4096
/data                   4133M     398M    3735M   4096
/storage/sdcard0        4033M     398M    3635M   4096
root@android:/ # _
```

- Note: boot and recovery partition is not displayed in the above image.

## /boot

- This is the boot partition of your Android device, as the name suggests.
- It includes the android kernel and the ramdisk.
- The device will not boot without this partition.
- Wiping this partition from recovery should only be done if absolutely required and once done, the device must NOT be rebooted before installing a new one, which can be done by installing a ROM that includes a /boot partition.

## /system

- As the name suggests, this partition contains the entire Android OS.
- This includes the Android GUI and all the system applications that come pre-installed on the device.
- Wiping this partition will remove Android from the device without rendering it unbootable, and you will still be able to put the phone into recovery or bootloader mode to install a new ROM.

## /recovery

- This is specially designed for backup.
- The recovery partition can be considered as an alternative boot partition, that lets the device boot into a recovery console for performing advanced recovery and maintenance operations on it.

## /data

- It is called userdata partition.
- This partition contains the user's data like your contacts, sms, settings and all android applications that you have installed.
- While you are doing factory reset on your device, this partition will wipe out, Then your device will be in the state, when you use for he first time, or the way it was after the last official or custom ROM installation.

## /cache

- This is the partition where Android stores frequently accessed data and app components.
- Wiping the cache doesn’t effect your personal data but simply gets rid of the existing data there, which gets automatically rebuilt as you continue using the device.

## /misc

- This partition contains miscellaneous system settings in form of on/off switches.
- These settings may include CID (Carrier or Region ID), USB configuration and certain hardware settings etc.
- This is an important partition and if it is corrupt or missing, several of the device's features will will not function normally.

## /sdcard

- This is not a partition on the internal memory of the device but rather the SD card.
- In terms of usage, this is your storage space to use as you see fit, to store your media, documents, ROMs etc. on it.
- Wiping it is perfectly safe as long as you backup all the data you require from it, to your computer first.
- Though several user-installed apps save their data and settings on the SD card and wiping this partition will make you lose all that data.

## /sd-ext

- This is not a standard Android partition, but has become popular in the custom ROM scene.
- It is basically an additional partition on your SD card that acts as the /data partition.
- It is especially useful on devices with little internal memory allotted to the /data partition.
- Thus, users who want to install more programs than the internal memory allows can make this partition and use it for installing their apps.

## File System

- Sometimes you might prefer to use the traditional file system to store your data.
- For example, you might want to store the text of poems you want to display in your applications.
- In Android, you can use the classes in the java.io package to do so.

## Saving to Internal Storage

- The first way to save fi les in your Android application is to write to the device's internal storage.

```
<TextView
    android:layout_width="fill_parent"
    android:layout_height="wrap_content"
    android:text="Please enter some text" />

<EditText
    android:id="@+id/txtText1"
    android:layout_width="fill_parent"
    android:layout_height="wrap_content" />

<Button
    android:id="@+id/btnSave"
    android:text="Save"
    android:layout_width="fill_parent"
    android:layout_height="wrap_content"
    android:onClick="onClickSave" />

<Button
    android:id="@+id/btnLoad"
    android:text="Load"
    android:layout_width="fill_parent"
    android:layout_height="wrap_content"
    android:onClick="onClickLoad" />
```

## Saving to Internal Storage

In the FilesActivity.java file, add the following statements in bold:

```
import java.io.FileInputStream;
import java.io.FileOutputStream;
import java.io.IOException;
import java.io.InputStreamReader;
import java.io.OutputStreamWriter;

import android.app.Activity;
import android.os.Bundle;
import android.view.View;
import android.widget.EditText;
import android.widget.Toast;

public class FilesActivity extends Activity {
    EditText textBox;
    static final int READ_BLOCK_SIZE = 100;

    /** Called when the activity is first created. */
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        textBox = (EditText) findViewById(R.id.txtText1);
    }
```

# Saving to Internal Storage

```
public void onClickSave(View view) {

    String str = textBox.getText().toString();
    try
    {
        FileOutputStream fOut =
                openFileOutput("textfile.txt",
                        MODE_WORLD_READABLE);
        OutputStreamWriter osw = new
                OutputStreamWriter(fOut);

        //---write the string to the file---
        osw.write(str);
        osw.flush();
        osw.close();

        //---display file saved message---
        Toast.makeText(getBaseContext(),
                "File saved successfully!",
                Toast.LENGTH_SHORT).show();

        //---clears the EditText---
        textBox.setText("");
    }
    catch (IOException ioe)
    {
        ioe.printStackTrace();
    }

}
```

## Saving to Internal Storage

- To save text into a file, you use the FileOutputStream class.
- The openFileOutput() method opens a named file for writing, with the mode specified.
- In this example, you used the MODE_WORLD_READABLE constant to indicate that the file is readable by all other applications.
  - MODE_PRIVATE
  - MODE_APPEND
  - MODE_WORLD_WRITEABLE

# Saving to Internal Storage

- To convert a character stream into a byte stream, you use an instance of the OutputStreamWriter class, by passing it an instance of the FileOutputStream object:

```
OutputStreamWriter osw = new
        OutputStreamWriter(fOut);
```

- You then use its write() method to write the string to the file.
- To ensure that all the bytes are written
- to the file, use the flush() method.
- Finally, use the close() method to close the file.

```
public void onClickLoad(View view) {
    try
    {
        FileInputStream fIn =
                openFileInput("textfile.txt");
        InputStreamReader isr = new
                InputStreamReader(fIn);

        char[] inputBuffer = new char[READ_BLOCK_SIZE];
        String s = "";

        int charRead;
        while ((charRead = isr.read(inputBuffer))>0)
        {
            //---convert the chars to a String---
            String readString =
                    String.copyValueOf(inputBuffer, 0,
                            charRead);
            s += readString;

            inputBuffer = new char[READ_BLOCK_SIZE];
        }
        //---set the EditText to the text that has been
        // read---
        textBox.setText(s);

        Toast.makeText(getBaseContext(),
                "File loaded successfully!",
                Toast.LENGTH_SHORT).show();


       }
       catch (IOException ioe) {
          ioe.printStackTrace();
       }

    }

 }
```

## Saving to Internal Storage

- To read the content of a fi le, you use the FileInputStream class, together with the InputStreamReader class:

```
FileInputStream fIn =
        openFileInput("textfile.txt");
```

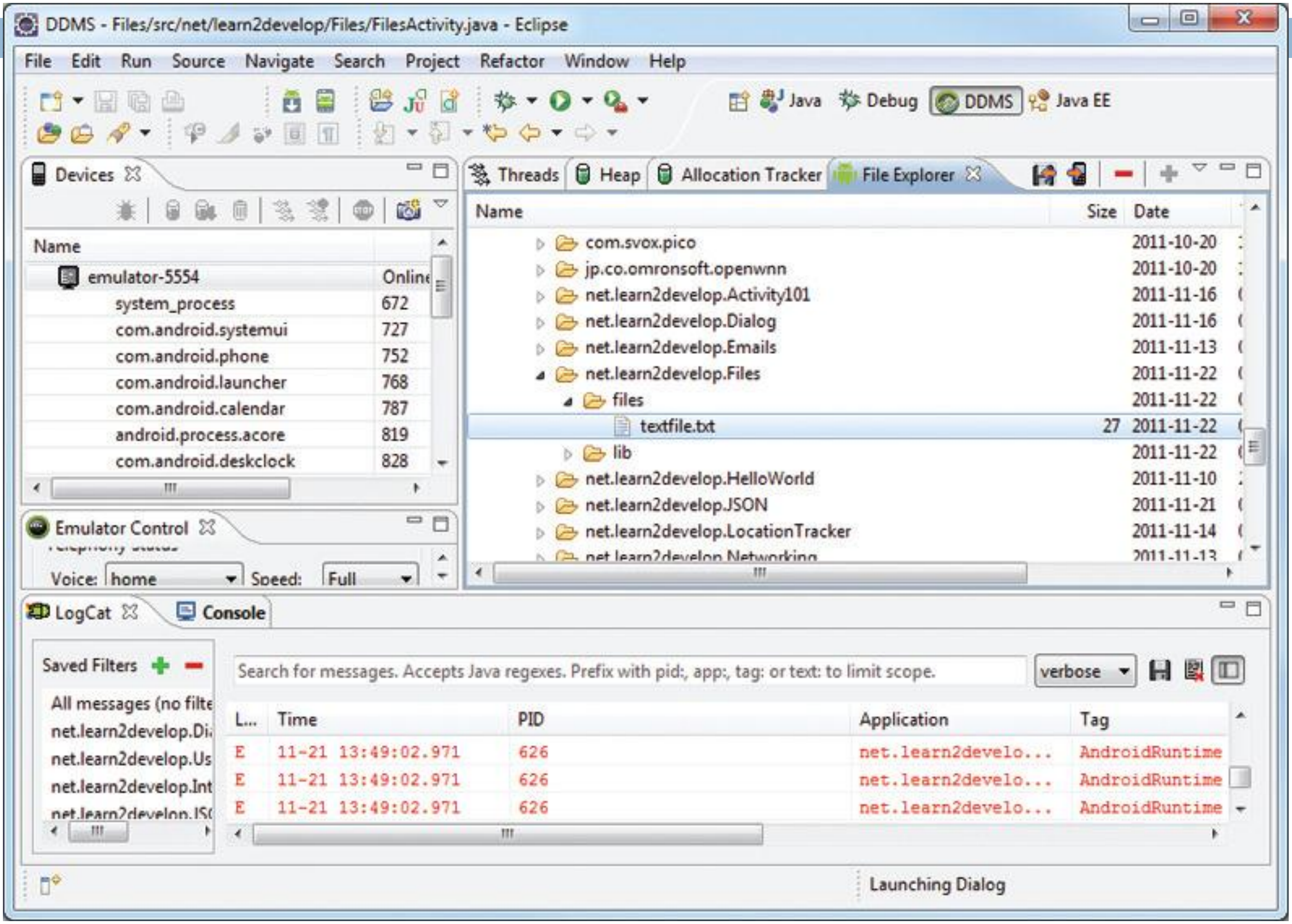
```
InputStreamReader isr = new
        InputStreamReader(fIn);
```

- The read() method of the InputStreamReader object checks the number of characters read and returns -1 if the end of the file is reached.

## Saving to Internal Storage

- When testing this application on the Android emulator, you can use the DDMS perspective to verify that the application did indeed save the fi le into the application's files directory
- (see Figure 6-11; the entire path is /data/data/net.learn2develop.Files/files)

# Saving to Internal Storage


DDMS - Files/src/net/learn2develop/Files/FilesActivity.java - Eclipse
File Edit Run Source Navigate Search Project Refactor Window Help
Java Debug DDMS Java EE
Devices
Threads Heap Allocation Tracker File Explorer
Emulator Control
LogCat Console
Saved Filters
verbose
Launching Dialog

| Name | |
|---|---|
| emulator-5554 | Online |
| system_process | 672 |
| com.android.systemui | 727 |
| com.android.phone | 752 |
| com.android.launcher | 768 |
| com.android.calendar | 787 |
| android.process.acore | 819 |
| com.android.deskclock | 828 |

| Name | Size | Date |
|---|---|---|
| com.svox.pico | | 2011-10-20 |
| jp.co.omronsoft.openwnn | | 2011-10-20 |
| net.learn2develop.Activity101 | | 2011-11-16 |
| net.learn2develop.Dialog | | 2011-11-16 |
| net.learn2develop.Emails | | 2011-11-13 |
| net.learn2develop.Files | | 2011-11-22 |
| files | | 2011-11-22 |
| textfile.txt | 27 | 2011-11-22 |
| lib | | 2011-11-22 |
| net.learn2develop.HelloWorld | | 2011-11-10 |
| net.learn2develop.JSON | | 2011-11-21 |
| net.learn2develop.LocationTracker | | 2011-11-14 |

Voice: home Speed: Full

All messages (no filte
net.learn2develop.Di
net.learn2develop.Us
net.learn2develop.Int
net.learn2develop.IS

Search for messages. Accepts Java regexes. Prefix with pid:, app:, tag: or text: to limit scope.

```
L...  Time                  PID   Application           Tag
E     11-21 13:49:02.971    626   net.learn2develo...   AndroidRuntime
E     11-21 13:49:02.971    626   net.learn2develo...   AndroidRuntime
E     11-21 13:49:02.971    626   net.learn2develo...   AndroidRuntime
```

## Saving to SD card

- Using the project created in the previous section as the example, to save the text entered by the user in the SD card, modify the onClick() method of the Save button as shown in bold here.
- **import android.os.Environment;**

```
//---SD Card Storage---
File sdCard = Environment.getExternalStorageDirectory();
File directory = new File (sdCard.getAbsolutePath() +
    "/MyFiles");
directory.mkdirs();
File file = new File(directory, "textfile.txt");
FileOutputStream fOut = new FileOutputStream(file);

/*
FileOutputStream fOut =
        openFileOutput("textfile.txt",
                MODE_WORLD_READABLE);
*/
```

## Saving to SD card

- The preceding code uses the getExternalStorageDirectory() method to return the full path to the external storage.
- Typically, it should return the "/sdcard" path for a real device, and "/mnt/ sdcard" for an Android emulator.
  - However, you should never try to hardcode the path to the SD card, as manufacturers may choose to assign a different path name to the SD card.
  - Hence, be sure to use the getExternalStorageDirectory() method to return the full path to the SD card.
- You then create a directory called MyFiles in the SD card.
- Finally, you save the file into this directory.

## Saving to SD card

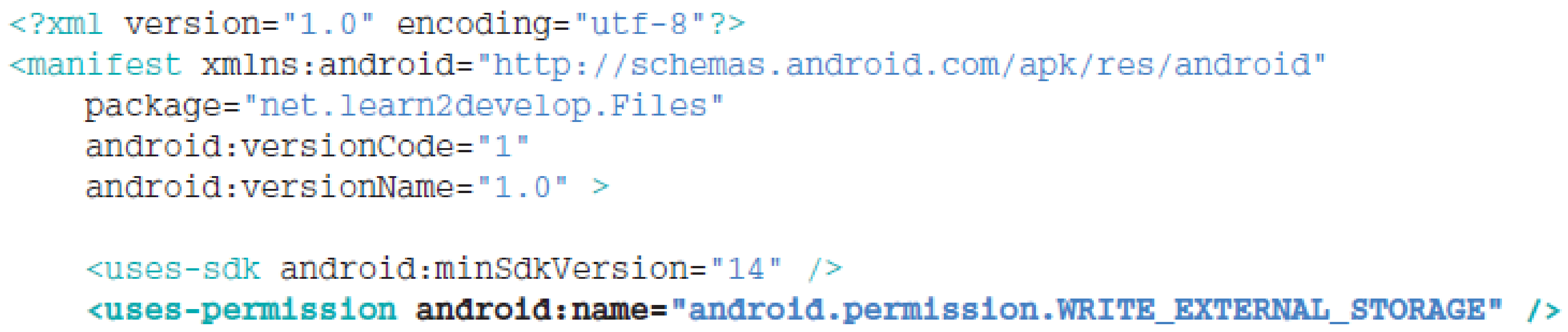
- To load the file from the external storage, modify the onClickLoad() method for the Load button:

```
//---SD Storage---
File sdCard = Environment.getExternalStorageDirectory();
File directory = new File (sdCard.getAbsolutePath() +
    "/MyFiles");
File file = new File(directory, "textfile.txt");
FileInputStream fIn = new FileInputStream(file);
InputStreamReader isr = new InputStreamReader(fIn);

/*
FileInputStream fIn =
        openFileInput("textfile.txt");
InputStreamReader isr = new
        InputStreamReader(fIn);
*/
```

# Saving to SD card

- Note that in order to write to the external storage, you need to add the WRITE_EXTERNAL_STORAGE permission in your AndroidManifest.xml file:



```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="net.learn2develop.Files"
    android:versionCode="1"
    android:versionName="1.0" >

    <uses-sdk android:minSdkVersion="14" />
    <uses-permission android:name="android.permission.WRITE_EXTERNAL_STORAGE" />
```