JÖNKÖPING UNIVERSITY

School of Engineering

ANDROID FILE SYSTEM

Peter Larsson-Green
Jönköping University
Spring 2020

SHARED PREFERENCES

Key/value pairs of String/primitive data types stored in files.

- Inside an activity (Activity specific):

```
SharedPreferences preferences = getPreferences(MODE_PRIVATE);
```

- Inside an activity (Activity independent):

```
SharedPreferences preferences = getSharedPreferences(
  "the-name",
  MODE_PRIVATE
);
```

Older versions of Android supported different modes.

SHARED PREFERENCES

Write:

```
SharedPreferences.Editor editor = preferences.edit();
editor.putInt("luckyNumber", 7);
editor.putString("name", "Hello");
editor.apply(); // Save changes asynchronously or...
editor.commit(); // ...save change synchronously.
```

Read:

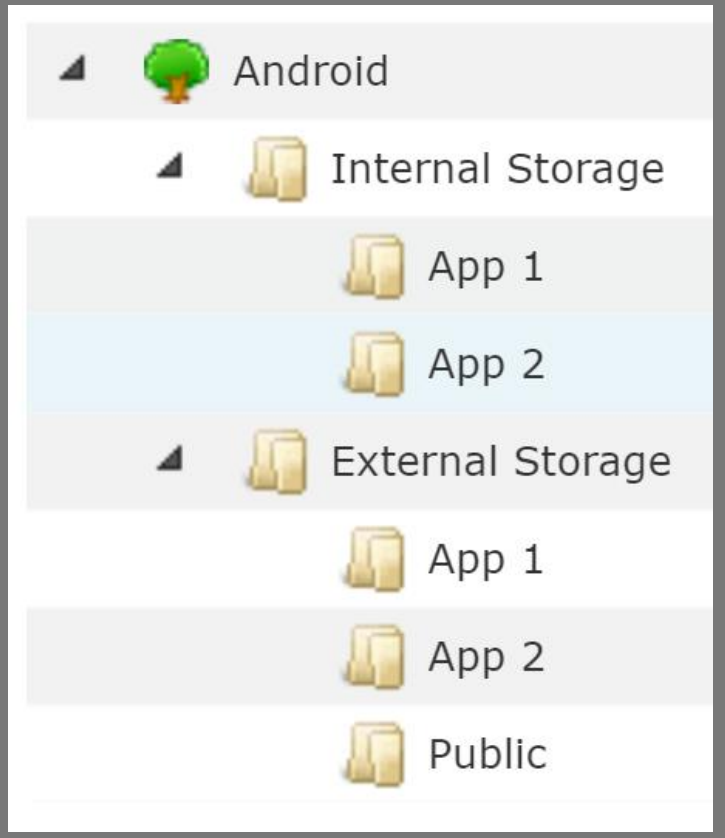
```
int luckyNumber = preferences.getInt("luckyNumber", -1);
String name = preferences.getString("name", "???");
```

Default value.

THE FILE SYSTEM

Android is built on Linux.

- File system consist of folders and files.
- Additional security measures has been added:
  - Each app has a "private" folder.
    - Only your app can read/write files from/to it.
    - The user can't see files inside of it.
  - Each app has a "public" folder.
    - Other apps can read/write files from/to it.
    - The user can see the files inside it, but typically shouldn't.
  - There also exists a shared "public" folder.
    - Any app can read/write files from/to it.
    - The user can see the files inside of it.



THE FILE SYSTEM - HISTORY LESSON

In the beginning, there were two different storages:

- Internal storage.
  - This is where applications are installed, and the "private" folders are stored.
  - On-board memory, always available.
- External storage.
  - This is where the "public" folders are stored.
  - Can be a memory card ⇒ can be removed ⇒ not always available.
  - Can be connected to computer with USB cable ⇒ not always available.

Some OEMs then skipped the memory card.

- The on-board memory contains both internal and external storage.
- Users think they don't have an external storage; "*There's no memory card :S*"

THE FILE SYSTEM - HISTORY LESSON

From API level 8:

- Apps can be installed on external storage.
  - https://developer.android.com/guide/topics/data/install-location.html

From API level 3:

- The permission `WRITE_EXTERNAL_STORAGE` is required to write to any "public" folder.

From API level 16:

- The permission `READ_EXTERNAL_STORAGE` is required to read from any "public" folder.

From API level 19:

- Your own public folder does not require the permissions `READ_EXTERNAL_STORAGE` and `WRITE_EXTERNAL_STORAGE`.
- Android started to support "secondary external storage".
  - https://developer.android.com/about/versions/android-4.4.html#ExternalStorage

THE FILE SYSTEM - SUMMARY

	Read/Write access	Cache	Accessible	Delete on uninstall
Internal	Your application	Yes	Always	Yes
External	All applications & Other devices	Yes	Not necessarily always	Your folder

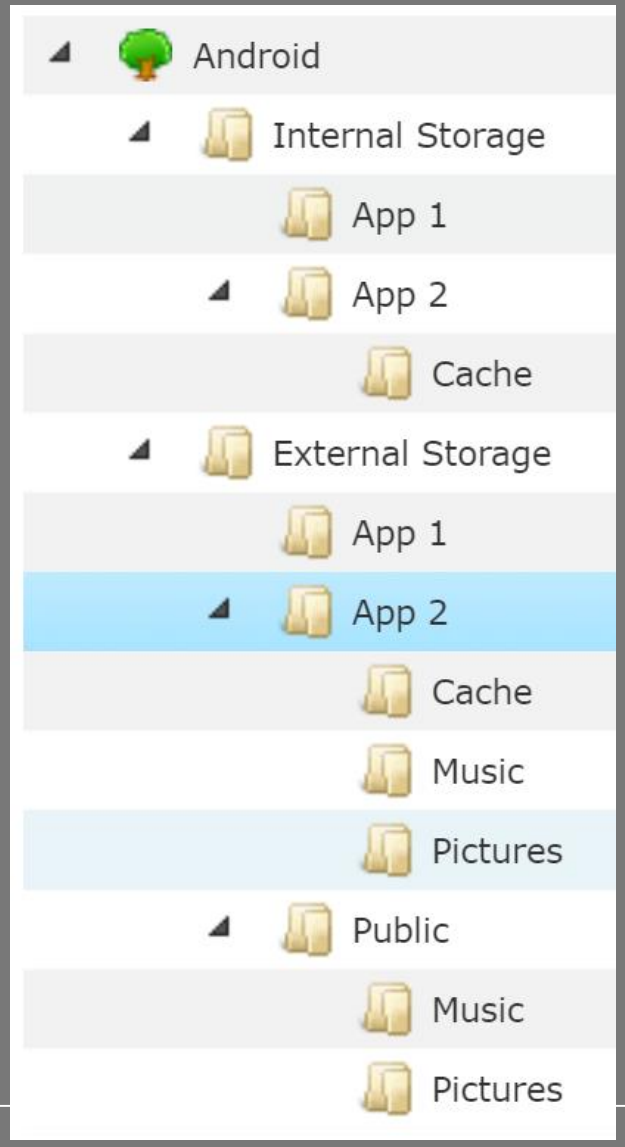
Files can belong to your app or the user.

At most 1024 open files on some devices (all applications!).

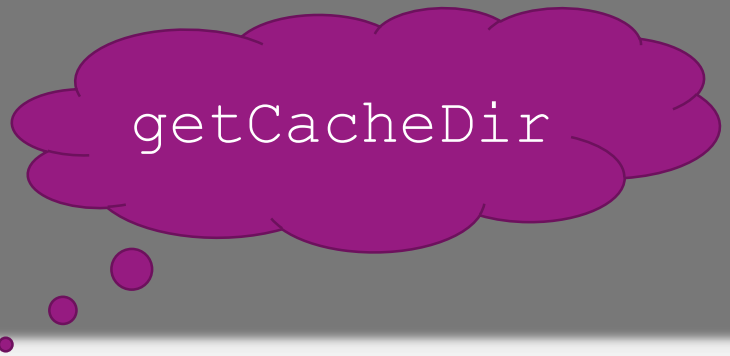
SD Card removed. Connected to PC.

THE FILE SYSTEM

Think of it like this:

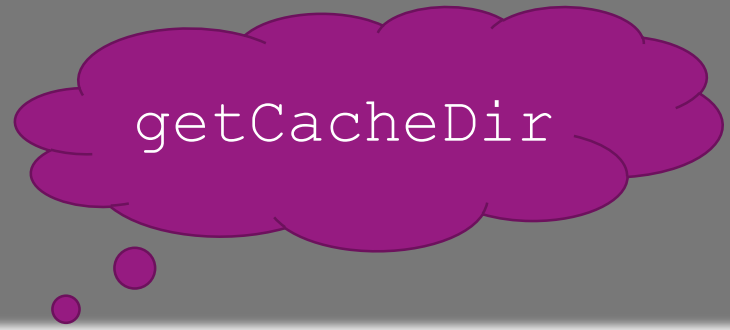


WRITE TO INTERNAL STORAGE




```
File folder = aContext.getFilesDir();
File theFile = new File(folder, "my-file.txt");
FileOutputStream outputStream = new FileOutputStream(theFile);
OutputStreamWriter writer = new OutputStreamWriter(outputStream);
writer.write("The content of the file.");
writer.close();
```

READ FROM INTERNAL STORAGE




```
File folder = aContext.getFilesDir();
File theFile = new File(folder, "my-file.txt");
FileInputStream inputStream = new FileInputStream(theFile);
// Read from inputStream...
inputStream.close();
```

CHECKING EXTERNAL STORAGE

```
String state = Environment.getExternalStorageState();
boolean canIWrite = Environment.MEDIA_MOUNTED.equals(state);
```

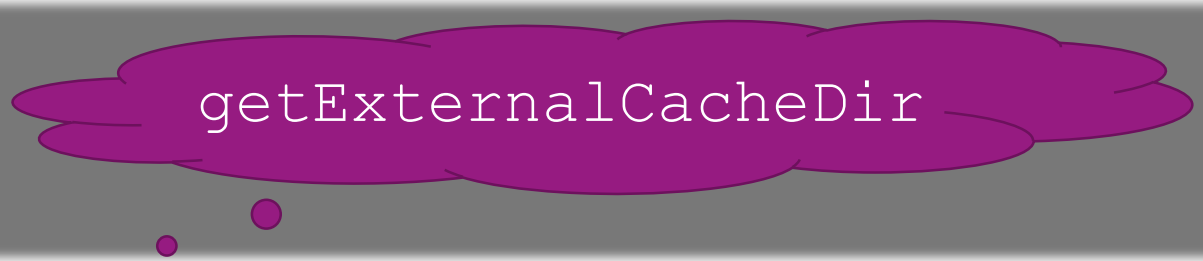
Path to external storage varies by Android version.

- 1 & 2: /sdcard
- 4 & 5: /mnt/shell/emulated/0
- 6 : /storage/emulated/0

Never use hardcoded paths!

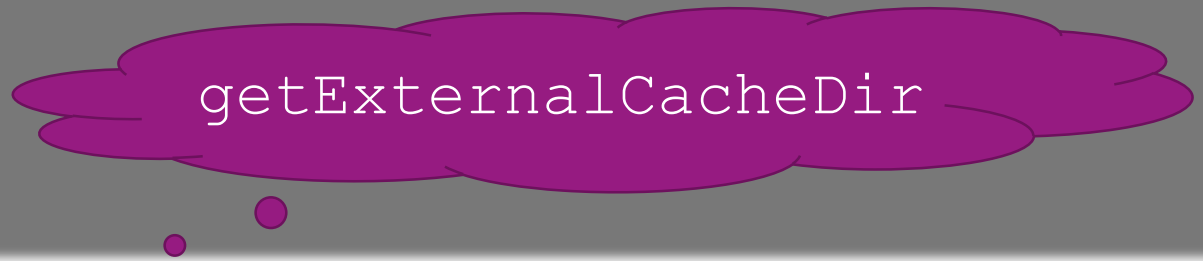
WRITE TO EXTERNAL STORAGE

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




```
File folder = aContext.getExternalFilesDir(Environment.DIRECTORY_MUSIC);
File theFile = new File(folder, "my-file.txt");
FileOutputStream outputStream = new FileOutputStream(theFile);
OutputStreamWriter writer = new OutputStreamWriter(outputStream);
writer.write("The content of the file.");
writer.close();
```

READ FROM EXTERNAL STORAGE




```
File folder = aContext.getExternalDir(Environment.DIRECTORY_MUSIC);
File theFile = new File(folder, "my-file.txt");
FileInputStream inputStream = new FileInputStream(theFile);
// Read from inputStream...
inputStream.close();
```

SHARED EXTERNAL STORAGE

Folders shared by all applications on external storage.

```
File folder = Environment.getExternalStoragePublicDirectory(
  Environment.DIRECTORY_MUSIC
);
```