Lesson 15

Android Persistency: Files

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Notes are based on:
Android Developers
http://developer.android.com/index.html

Android Files

Android's file management is similar to typical Java IO operations.

Files can be stored *internally* in the device's (small) main memory or *externally* in the much larger SD card.

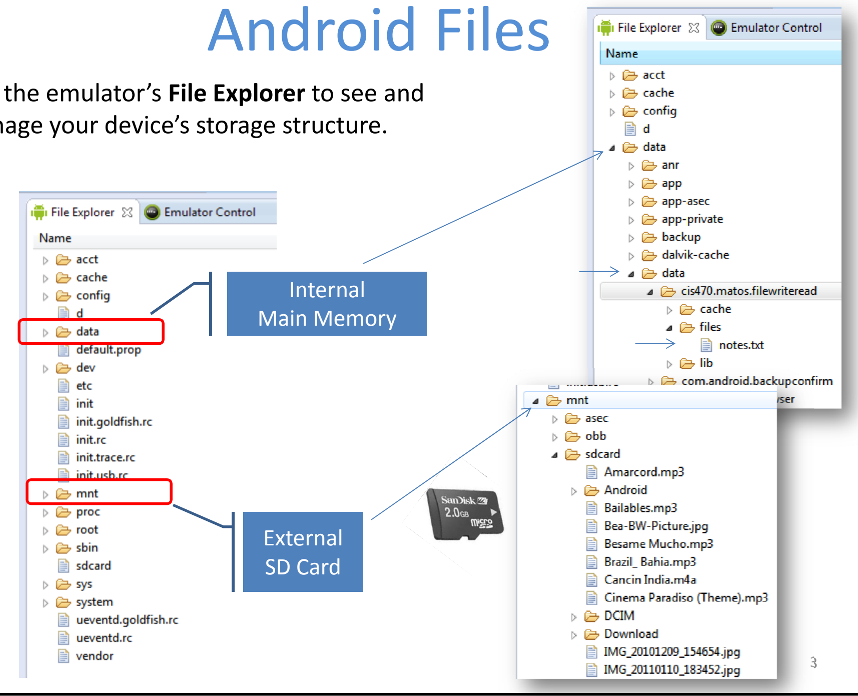
Files stored in the device's memory, share space with other application's resources such as code, icons, pictures, music, ….

Internal files are called: **Resource Files.**

External files to be attached to the compiled **.apk** could be stored in the folder **res/raw** (*create it if needed!*)

Android Files

Use the emulator's **File Explorer** to see and manage your device's storage structure.

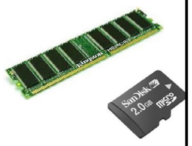


```
acct
cache
config
d
data
default.prop
dev
etc
init
init.goldfish.rc
init.rc
init.trace.rc
init.usb.rc
mnt
proc
root
sbin
sdcard
sys
system
ueventd.goldfish.rc
ueventd.rc
vendor
```

```
acct
cache
config
d
data
  anr
  app
  app-asec
  app-private
  backup
  dalvik-cache
  data
    cis470.matos.filewriteread
      cache
      files
        notes.txt
      lib
    com.android.backupconfirm
```

```
mnt
  asec
  obb
  sdcard
    Amarcord.mp3
    Android
    Bailables.mp3
    Bea-BW-Picture.jpg
    Besame Mucho.mp3
    Brazil_ Bahia.mp3
    Cancin India.m4a
    Cinema Paradiso (Theme).mp3
    DCIM
    Download
    IMG_20101209_154654.jpg
    IMG_20110110_183452.jpg
```

Android Files



Your data storage options are usually driven by parameters such as:
size (small/large), location (internal/external), accessibility (private/public).

1.	**Shared Preferences**	Store private primitive data in key-value pairs.
2.	**Internal Storage**	Store private data on the device's memory.
3.	**External Storage**	Store public data on the shared external storage.
4.	**SQLite Databases**	Store structured data in a private/public database.
5.	**Network Connection**	Store data on the web with your own network server.

Android Files

Key	Value

Shared Preferences. Good for a few items saved as <**KeyName, Value**>

```java
private void usingPreferences(){
  // Save data in a SharedPreferences container
  // We need an Editor object to make preference changes.

  SharedPreferences settings = getSharedPreferences("my_preferred_Choices",
                                                  Context.MODE_PRIVATE);
  SharedPreferences.Editor editor = settings.edit();
          editor.putString("favorite_color", "#ff0000ff");
          editor.putInt("favorite_number", 101);
  editor.commit();

  // retrieving data from SharedPreferences container
  String favColor = settings.getString("favorite_color", "default black");
  int favNumber = settings.getInt("favorite_number", 0);

  Toast.makeText(this, favColor + " " + favNumber, 1).show();

}
```

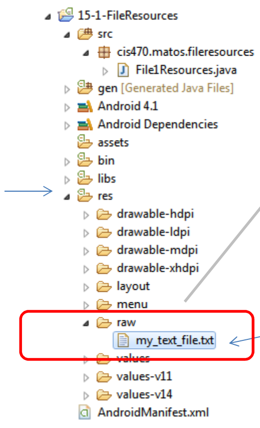
Android Files

Internal Storage. Using Android Resource Files

An Android application may include a number of resources such as those in: **res/drawable** , **res/raw, res/menu, res/style,** etc.

Resources could be accessed through the **.getResources()** method. For example:

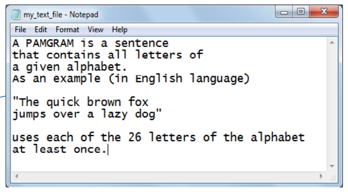
```java
InputStream is = this.getResources()
                          .openRawResource(R.drawable.my_text_file);
```



```
15-1-FileResources
  src
    cis470.matos.fileresources
      File1Resources.java
  gen [Generated Java Files]
  Android 4.1
  Android Dependencies
  assets
  bin
  libs
  res
    drawable-hdpi
    drawable-ldpi
    drawable-mdpi
    drawable-xhdpi
    layout
    menu
    raw
      my_text_file.txt
    values
    values-v11
    values-v14
  AndroidManifest.xml
```

If needed create the **res/raw** folder.

Use drag/drop to place the file **my_text_file.txt** in **res** folder. It will be stored in the device's memory as part of the .apk

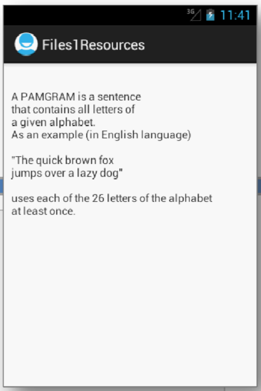


```
A PAMGRAM is a sentence
that contains all letters of
a given alphabet.
As an example (in English language)

"The quick brown fox
jumps over a lazy dog"

uses each of the 26 letters of the alphabet
at least once.
```

Example of a Spanish Pamgram
La cigüeña tocaba cada vez mejor el saxofón y el búho pedía kiwi y queso.

Android Files

Example 0: Reading a Resource File (see previous figure)



A PAMGRAM is a sentence
that contains all letters of
a given alphabet.
As an example (in English language)

"The quick brown fox
jumps over a lazy dog"

uses each of the 26 letters of the alphabet
at least once.

```
//reading an embedded RAW data file
public class File1Resources extends Activity {
   TextView txtMsg;
   @Override
   public void onCreate(Bundle savedInstanceState) {
      super.onCreate(savedInstanceState);
      setContentView(R.layout.main);

      txtMsg = (TextView) findViewById(R.id.textView1);
      try {
         PlayWithRawFiles();

      } catch (IOException e) {
         txtMsg.setText( "Problems: " + e.getMessage() );
      }
   }// onCreate
```

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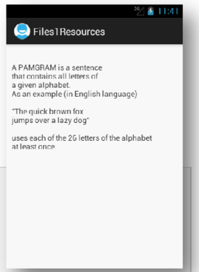
Android Files

Example 1: Reading a Resource File (see previous figure)



A PAMGRAM is a sentence
that contains all letters of
a given alphabet.
As an example (in English language)

"The quick brown fox
jumps over a lazy dog"

uses each of the 26 letters of the alphabet
at least once.

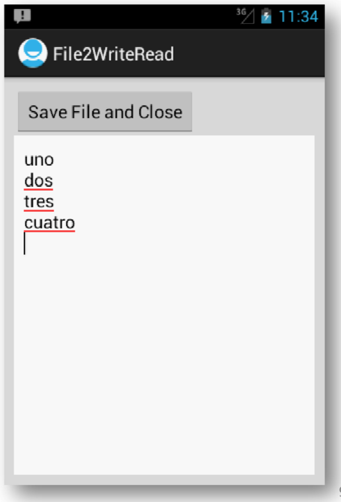
```
   public void PlayWithRawFiles() throws IOException {
      String str="";
      StringBuffer buf = new StringBuffer();

      int fileResourceId = R.raw.my_text_file;
      InputStream is = this.getResources().openRawResource(fileResourceId);
      BufferedReader reader = new BufferedReader(new InputStreamReader(is));

      if (is!=null) {
         while ((str = reader.readLine()) != null) {
               buf.append(str + "\n" );
               }
      }
      is.close();
      txtMsg.setText( buf.toString() );

   }// PlayWithRawFiles

} // File1Resources
```

Android Files

Example 2: (Internal Storage) Read/Write an Internal File.

In this example an application collects data from the UI and saves it to a persistent data file into the (limited) internal Android System space area.

Next time the application is executed the *Resource File* will be read and its data shown on the UI

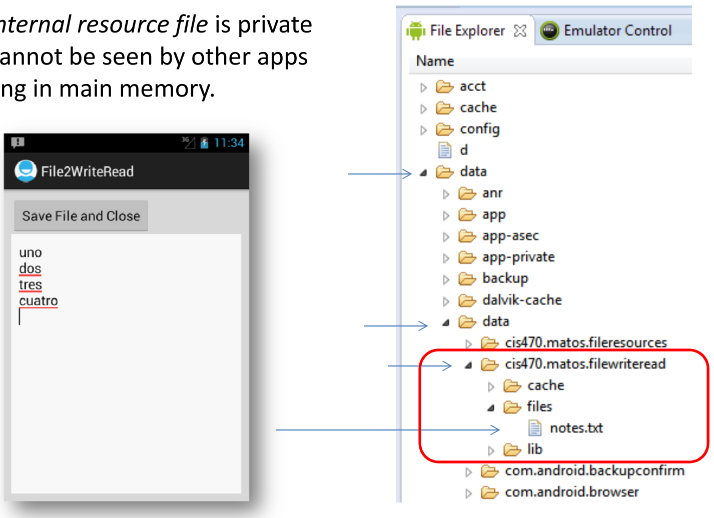


uno
dos
tres
cuatro

Android Files

Example 2: (Internal Storage) Read/Write an Internal File.

The *internal resource file* is private and cannot be seen by other apps residing in main memory.



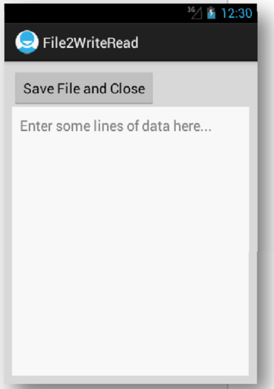
uno
dos
tres
cuatro

```
▷ acct
▷ cache
▷ config
  d
◢ data
  ▷ anr
  ▷ app
  ▷ app-asec
  ▷ app-private
  ▷ backup
  ▷ dalvik-cache
  ◢ data
    ▷ cis470.matos.fileresources
    ◢ cis470.matos.filewriteread
      ▷ cache
      ◢ files
          notes.txt
      ▷ lib
    ▷ com.android.backupconfirm
    ▷ com.android.browser
```

Android Files

Example2: Grab data from screen, save to file, retrieve from file.

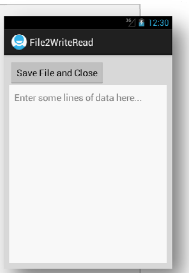
```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:background="#ffdddddd"
    android:padding="10dp"
    android:orientation="vertical" >

    <Button android:id="@+id/btnFinish"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
         android:padding="10dp"
        android:text=" Save File and Close " />

    <EditText
        android:id="@+id/txtMsg"
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:padding="10dp"
        android:background="#ffffffff"
        android:gravity="top"
        android:hint="Enter some lines of data here..."  />

</LinearLayout>
```



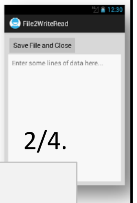
Android Files

Example 2: Grab data from screen, save to file, retrieve from file 1/4.

```
public class File2WriteRead extends Activity {

   private final static String FILE_NAME = "notes.txt";
   private EditText txtMsg;

   @Override
   public void onCreate(Bundle icicle) {
      super.onCreate(icicle);
      setContentView(R.layout.main);
      txtMsg = (EditText) findViewById(R.id.txtMsg);

      // deleteFile();  //keep for debugging

      Button btnFinish = (Button) findViewById(R.id.btnFinish);
      btnFinish.setOnClickListener(new Button.OnClickListener() {
         public void onClick(View v) {
            finish();
         }
      });
   }// onCreate
```



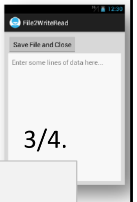
Android Files



Example 2: Grab data from screen, save to file, retrieve from file 2/4.

```
public void onStart() {
   super.onStart();
   try {
      InputStream inputStream = openFileInput(FILE_NAME);
      if (inputStream != null) {
         InputStreamReader inputStreamReader = new
                                             InputStreamReader(inputStream);
         BufferedReader reader = new BufferedReader(inputStreamReader);
         String str = "READING FROM EXISTING DISK\n";
         StringBuffer stringBuffer = new StringBuffer();

         while ((str = reader.readLine()) != null) {
            stringBuffer.append(str + "\n");
         }

         inputStream.close();
         txtMsg.setText(stringBuffer.toString());
      }
   } catch (java.io.FileNotFoundException e) {

   } catch (Throwable t) {
      Toast.makeText(this, "Exception: " + t.toString(), 1).show();
   }
}// onStart
```

Android Files



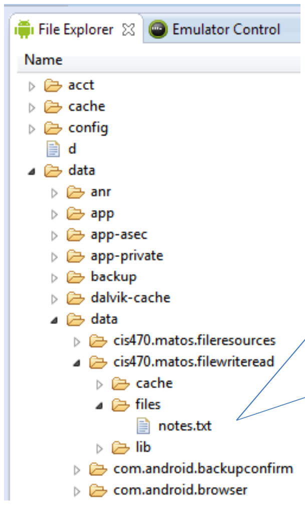
Example 2: Grab data from screen, save to file, retrieve from file 3/4.

```
public void onPause() {
   super.onPause();
   try {
      OutputStreamWriter out = new OutputStreamWriter(
                                      openFileOutput(FILE_NAME, 0));
      out.write(txtMsg.getText().toString());
      out.close();
   } catch (Throwable t) {
      txtMsg.setText( t.getMessage() );
   }
}// onPause
```

```
private void deleteFile() {
   String path = "/data/data/cis470.matos.filewriteread/files/" + FILE_NAME;
   File f1 = new File(path);
   Toast.makeText(getApplicationContext(), "Exists " + f1.exists() , 1).show();
   boolean success = f1.delete();
   if (!success){
     Toast.makeText(getApplicationContext(), "Deletion failed.", 1).show();
   }else{
      Toast.makeText(getApplicationContext(), "OK. File deleted.", 1).show();
   }
}
```

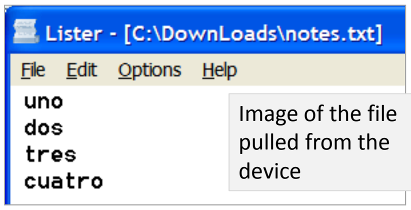
Android Files

In our example the **notes.txt** file is stored in the phone's internal memory under the name: **/data/data/cis470.matos.fileresources/files/notes.txt**



File Explorer | Emulator Control

```
Name
▷ acct
▷ cache
▷ config
  d
◢ data
  ▷ anr
  ▷ app
  ▷ app-asec
  ▷ app-private
  ▷ backup
  ▷ dalvik-cache
  ◢ data
    ▷ cis470.matos.fileresources
    ◢ cis470.matos.filewriteread
      ▷ cache
      ◢ files
          notes.txt
      ▷ lib
    ▷ com.android.backupconfirm
    ▷ com.android.browser
```



Lister - [C:\DownLoads\notes.txt]

File Edit Options Help

```
uno
dos
tres
cuatro
```

Image of the file pulled from the device

Android Files

Example 3: **(External Storage)**

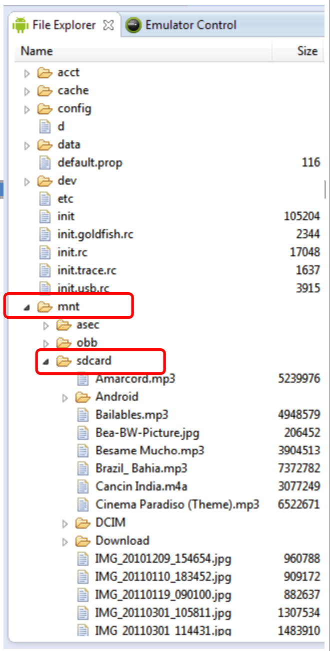
Reading/Writing to the External Device's **SD card**.

SD cards offer the advantage of a much larger capacity as well as portability (usually cards can be easily removed from one device and reused in another)

Android Files

Example 3: (External Storage)
Reading/Writing to the External Device's **SD card**.

Use **File Explorer** tool to locate files in your device (or emulator)



Name	Size
acct	
cache	
config	
d	
data	
default.prop	116
dev	
etc	
init	105204
init.goldfish.rc	2344
init.rc	17048
init.trace.rc	1637
init.usb.rc	3915
mnt	
asec	
obb	
sdcard	
Amarcord.mp3	5239976
Android	
Bailables.mp3	4948579
Bea-BW-Picture.jpg	206452
Besame Mucho.mp3	3904513
Brazil_ Bahia.mp3	7372782
Cancin India.m4a	3077249
Cinema Paradiso (Theme).mp3	6522671
DCIM	
Download	
IMG_20101209_154654.jpg	960788
IMG_20110110_183452.jpg	909172
IMG_20110119_090100.jpg	882637
IMG_20110301_105811.jpg	1307534
IMG_20110301_114431.jpg	1483910

Android Files

WARNING: Reading/Writing to the Device's **SD card**.

When you deal with external files you need to request permission to read and write to the SD card. Add the following clauses to your AndroidManifest.xml

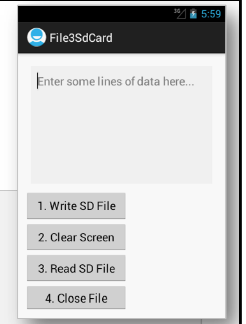
```
<uses-permission
        android:name="android.permission.READ_EXTERNAL_STORAGE"/>

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

Android Files

Example 3: Reading/Writing to the Device's SD card.

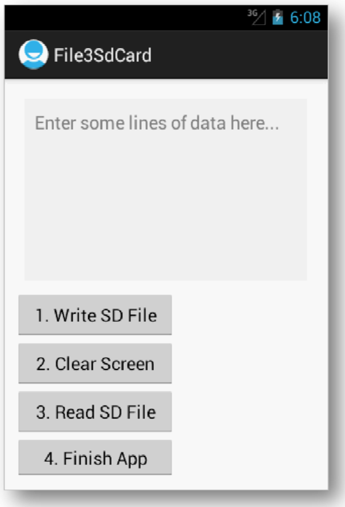
```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    android:id="@+id/widget28"
    android:padding="10dp"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="vertical" >

    <EditText
        android:id="@+id/txtData"
        android:layout_width="match_parent"
        android:layout_height="180dp"
        android:layout_margin="10dp"
        android:background="#55dddddd"
        android:padding="10dp"
        android:gravity="top"
        android:hint=
       "Enter some lines of data here..."
        android:textSize="18sp" />
    <Button
        android:id="@+id/btnWriteSDFile"
        android:layout_width="160dp"
        android:layout_height="wrap_content"
        android:text="1. Write SD File" />
```

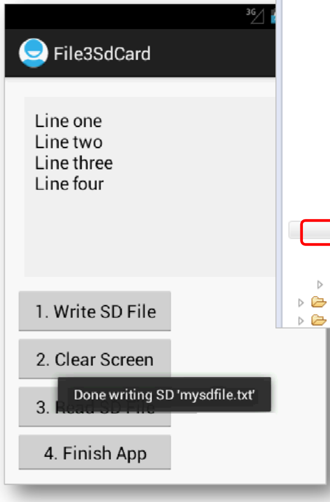
```
     <Button
         android:id="@+id/btnClearScreen"
         android:layout_width="160dp"
         android:layout_height="wrap_content"
         android:text="2. Clear Screen" />
      <Button
         android:id="@+id/btnReadSDFile"
         android:layout_width="160dp"
         android:layout_height="wrap_content"
         android:text="3. Read SD File" />
      <Button
         android:id="@+id/btnFinish"
         android:layout_width="160dp"
         android:layout_height="wrap_content"
         android:text="4. Finish App" />
  </LinearLayout>
```



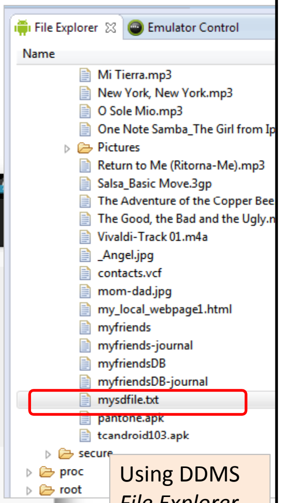
Android Files

Example 3: Reading/Writing to the Device's SD card.





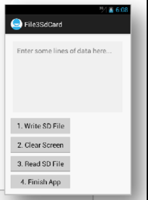
Done writing SD 'mysdfile.txt'



```
Mi Tierra.mp3
New York, New York.mp3
O Sole Mio.mp3
One Note Samba_The Girl from Ip
Pictures
Return to Me (Ritorna-Me).mp3
Salsa_Basic Move.3gp
The Adventure of the Copper Bee
The Good, the Bad and the Ugly.n
Vivaldi-Track 01.m4a
_Angel.jpg
contacts.vcf
mom-dad.jpg
my_local_webpage1.html
myfriends
myfriends-journal
myfriendsDB
myfriendsDB-journal
mysdfile.txt
pantone.apk
tcandroid103.apk
secure
proc
root
```

Using DDMS *File Explorer* panel to inspect the SD card.

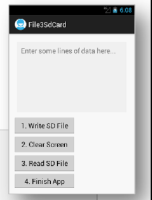
Android Files



Example 3: Reading/Writing to the Device's SD card.

```
public class File3SdCard extends Activity {
// GUI controls
EditText txtData;
Button btnWriteSDFile;
Button btnReadSDFile;
Button btnClearScreen;
Button btnFinish;

@Override
public void onCreate(Bundle savedInstanceState) {
     super.onCreate(savedInstanceState);
     setContentView(R.layout.main);

     // bind GUI elements with local controls
     txtData = (EditText) findViewById(R.id.txtData);
     txtData.setHint("Enter some lines of data here...");
```

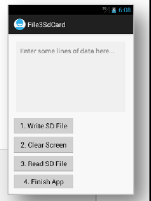
Android Files



Example 3: Reading/Writing to the Device's SD card.

```
     btnWriteSDFile = (Button) findViewById(R.id.btnWriteSDFile);

     btnWriteSDFile.setOnClickListener(new OnClickListener() {
          @Override
          public void onClick(View v) {
          // write on SD card file data from the text box
          try {
               File myFile = new File("mnt/sdcard/mysdfile.txt");
               myFile.createNewFile();
               FileOutputStream fOut = new FileOutputStream(myFile);
               OutputStreamWriter myOutWriter = new OutputStreamWriter(fOut);

               myOutWriter.append(txtData.getText());
               myOutWriter.close();
               fOut.close();
               Toast.makeText(getApplicationContext(),
                              "Done writing SD 'mysdfile.txt'",
                              Toast.LENGTH_SHORT).show();
          } catch (Exception e) {
               } Toast.makeText(getApplicationContext(),
                              e.getMessage(), Toast.LENGTH_SHORT).show();

          }// onClick
     }); // btnWriteSDFile
```

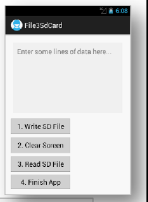
Android Files



Example 3: Reading/Writing to the Device's SD card.

```
btnReadSDFile = (Button) findViewById(R.id.btnReadSDFile);
btnReadSDFile.setOnClickListener(new OnClickListener() {
 @Override
 public void onClick(View v) {
 // write on SD card file data from the text box
 try {
       File myFile = new File("mnt/sdcard/mysdfile.txt");
       FileInputStream fIn = new FileInputStream(myFile);
       BufferedReader myReader = new BufferedReader(new InputStreamReader(fIn));
       String aDataRow = "";
       String aBuffer = "";
       while ((aDataRow = myReader.readLine()) != null) {
          aBuffer += aDataRow + "\n";
       }
       txtData.setText(aBuffer);
       myReader.close();
       Toast.makeText(getBaseContext(),
                     "Done reading SD 'mysdfile.txt'", 1).show();
       } catch (Exception e) {
           Toast.makeText(getBaseContext(), e.getMessage(), 1).show();
       }
 }// onClick
}); // btnReadSDFile
```

Android Files

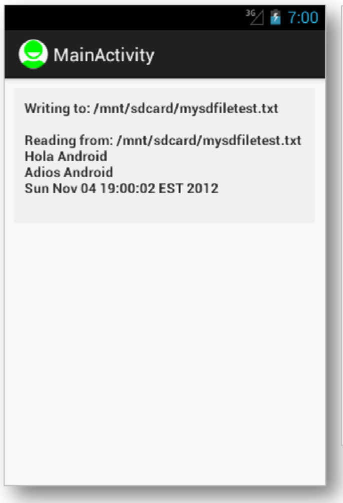


Example 3: Reading/Writing to the Device's SD card.

```
 btnClearScreen = (Button) findViewById(R.id.btnClearScreen);
 btnClearScreen.setOnClickListener(new OnClickListener() {
    @Override
    public void onClick(View v) {
         // clear text box
         txtData.setText("");
    }
 }); // btnClearScreen

 btnFinish = (Button) findViewById(R.id.btnFinish);
 btnFinish.setOnClickListener(new OnClickListener() {
    @Override
    public void onClick(View v) {
         finish();
    }
 }); // btnFinish

 }// onCreate

}// class
```

Android Files

Example 4: Reading/Writing to the Device's SD card through the Scanner and PrintWriter classes. 1/4



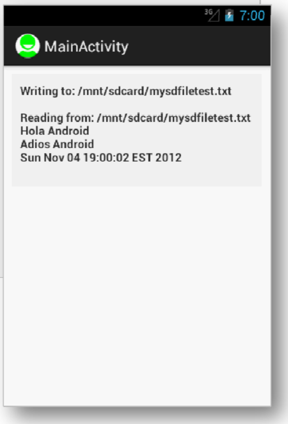
```
Writing to: /mnt/sdcard/mysdfiletest.txt

Reading from: /mnt/sdcard/mysdfiletest.txt
Hola Android
Adios Android
Sun Nov 04 19:00:02 EST 2012
```

```xml
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="vertical"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:layout_margin="10dp"
    >

<TextView
    android:layout_width="fill_parent"
    android:layout_height="wrap_content"
    android:padding="10dp"
    android:id="@+id/txtMsg"
    android:textStyle="bold"
    android:background="#77eeeeee"
    />
</LinearLayout>
```

Android Files

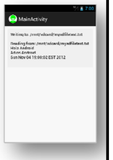
Example 4: Reading/Writing to the Device's SD card through the Scanner and PrintWriter classes. 2/4

```java
public class File4Scanner extends Activity  {

TextView txtMsg;

  @Override
  public void onCreate(Bundle savedInstanceState) {
      super.onCreate(savedInstanceState);
      setContentView(R.layout.main);
      txtMsg = (TextView) findViewById(R.id.txtMsg);

      testScannerFiles();

  }//onCreate
```



```
Writing to: /mnt/sdcard/mysdfiletest.txt

Reading from: /mnt/sdcard/mysdfiletest.txt
Hola Android
Adios Android
Sun Nov 04 19:00:02 EST 2012
```

Android Files


MainActivity

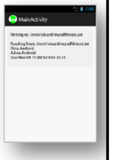
Writing to: /mnt/sdcard/mysdfiletest.txt

Reading from: /mnt/sdcard/mysdfiletest.txt
Hola Android
Adios Android
Sun Nov 04 15:00:02 EST 2012

Example 4: Reading/Writing to the Device's SD card through the Scanner and PrintWriter classes. 3/4

```
   private void testScannerFiles(){
   // Add to manifest the following permission request
   // <uses-permission android:name="android.permission.WRITE_EXTERNAL_STORAGE" />
      try {
         String SDcardPath = Environment.getExternalStorageDirectory().getPath();
         String mySDFileName = SDcardPath + "/" + "mysdfiletest.txt";

         txtMsg.setText("Writing to: " + mySDFileName);

         PrintWriter outfile= new PrintWriter( new FileWriter(mySDFileName) );

            outfile.println("Hola Android");
            outfile.println("Adios Android");
            outfile.println(new Date().toString());

            outfile.close();
```

Android Files


MainActivity

Writing to: /mnt/sdcard/mysdfiletest.txt

Reading from: /mnt/sdcard/mysdfiletest.txt
Hola Android
Adios Android
Sun Nov 04 15:00:02 EST 2012

Example 4: Reading/Writing to the Device's SD card through the Scanner and PrintWriter classes. 4/4

```
   // read SD-file,show records.
   // <uses-permission android:name="android.permission.READ_EXTERNAL_STORAGE" />

         Scanner infile= new Scanner(new FileReader(mySDFileName));
         String inString= "\n\nReading from: " + mySDFileName + "\n";

         while(infile.hasNextLine()) {
            inString += infile.nextLine() + "\n";
         }

         txtMsg.append(inString);
         infile.close();

      } catch (FileNotFoundException e) {
         txtMsg.setText( "Error: " + e.getMessage());
      } catch (IOException e) {
         txtMsg.setText( "Error: " + e.getMessage());
      }

   }//testScannerFiles

}//class
```

Files

Questions ?

Icon obtained from: http://www.iconseeker.com

Files

Appendix A.
Accessing a file in the SD card

```
String stringPath = Environment
                      .getExternalStorageDirectory()
                      .getAbsolutePath()
                      + "/myFileNameGoesHere.txt";
```