

Department of CSE

SSN College of Engineering

Vishakan Subramanian - 18 5001 196 - Semester VII

07 October 2021

UCS 1711 - Mobile Application Development Lab

Exercise 7: External Storage File I/O

Aim:

To develop a native application that reads and persistently writes content to a file stored in the external storage media of the device.

Code - External Storage: Main Activity:

```
1 package com.example.externalstorage;
2
3 import androidx.appcompat.app.AppCompatActivity;
4 import androidx.core.app.ActivityCompat;
5
6 import android.Manifest;
7 import android.os.Bundle;
8 import android.os.Environment;
9 import android.view.View;
10 import android.widget.Button;
11 import android.widget.EditText;
12 import android.widget.TextView;
13 import android.widget.Toast;
14
15 import java.io.BufferedReader;
16 import java.io.File;
17 import java.io.FileOutputStream;
18 import java.io.FileReader;
19
20 public class MainActivity extends AppCompatActivity {
21
22     @Override
23     protected void onCreate(Bundle savedInstanceState) {
24         super.onCreate(savedInstanceState);
25         setContentView(R.layout.activity_main);
26
27         final EditText writeFileText = findViewById(R.id.writeFileText);
28         final EditText readFileText = findViewById(R.id.readFileText);
29         final EditText writeContentsText = findViewById(R.id.
writeContentsText);
30         final TextView readContentsText = findViewById(R.id.
readContentsText);
31         final Button readButton = findViewById(R.id.readButton);
32         final Button writeButton = findViewById(R.id.writeButton);
33         final File sdCard = Environment.getExternalStorageDirectory();
34
35         //Request for the read/write permissions to the external storage
from the user
36         ActivityCompat.requestPermissions(this, new String[]
37             {Manifest.permission.READ_EXTERNAL_STORAGE, Manifest.
permission.WRITE_EXTERNAL_STORAGE
38             }, 1);
39
40         writeButton.setOnClickListener(new View.OnClickListener() {
41             @Override
42             public void onClick(View v) {
43                 String writeFileName = writeFileText.getText().toString();
```

```

44         String writeContents = writeContentsText.getText().
toString();
45
46         //File Write Logic
47         try {
48             File file = new File(getExternalFilesDir(null),
writeFileName);
49             FileOutputStream fileOutputStream = new
FileOutputStream(file);
50             fileOutputStream.write(writeContents.getBytes());
51             fileOutputStream.close();
52
53             Toast successToast = Toast.makeText(MainActivity.this,
"File Written Successfully!", Toast.LENGTH_SHORT);
54             successToast.show();
55         } catch (Exception e) {
56             Toast errorToast = Toast.makeText(MainActivity.this, e
.getMessage(), Toast.LENGTH_SHORT);
57             errorToast.show();
58         }
59     }
60 });
61
62     readButton.setOnClickListener(new View.OnClickListener() {
63         @Override
64         public void onClick(View v) {
65
66             String readFileName = readFileText.getText().toString();
67
68             //File Read Logic
69             try{
70                 String buffer, readContents = "";
71                 File file = new File(getExternalFilesDir(null),
readFileName);
72                 BufferedReader bufferedReader = new BufferedReader(new
FileReader(file));
73
74                 while((buffer = bufferedReader.readLine()) != null){
75                     //Read till the bufferedReader gets characters
76                     readContents += buffer;
77                 }
78
79                 readContentsText.setText(readContents);
80
81                 Toast successToast = Toast.makeText(MainActivity.this,
"File Read Successfully!", Toast.LENGTH_SHORT);
82                 successToast.show();
83
84             } catch (Exception e) {
85                 Toast errorToast = Toast.makeText(MainActivity.this, e
.getMessage(), Toast.LENGTH_SHORT);

```

```
86         errorToast.show();
87     }
88 }
89 });
90 }
91 }
```

Code - External Storage: Main Activity Layout:

```
1 <?xml version="1.0" encoding="utf-8"?>
2 <androidx.constraintlayout.widget.ConstraintLayout xmlns:android="http://
  schemas.android.com/apk/res/android"
3   xmlns:app="http://schemas.android.com/apk/res-auto"
4   xmlns:tools="http://schemas.android.com/tools"
5   android:layout_width="match_parent"
6   android:layout_height="match_parent"
7   tools:context=".MainActivity">
8
9   <TextView
10     android:id="@+id/textView"
11     android:layout_width="wrap_content"
12     android:layout_height="wrap_content"
13     android:layout_marginTop="20dp"
14     android:fontFamily="@font/chivo"
15     android:text="SD Card - Write"
16     android:textColor="?android:attr/textColorPrimary"
17     android:textSize="20sp"
18     android:textStyle="bold"
19     app:layout_constraintEnd_toEndOf="parent"
20     app:layout_constraintStart_toStartOf="parent"
21     app:layout_constraintTop_toTopOf="parent" />
22
23   <TextView
24     android:id="@+id/textView2"
25     android:layout_width="wrap_content"
26     android:layout_height="wrap_content"
27     android:layout_marginStart="10dp"
28     android:layout_marginTop="75dp"
29     android:fontFamily="@font/chivo"
30     android:text="Enter File Name:"
31     android:textColor="?android:attr/textColorPrimary"
32     android:textSize="16sp"
33     android:textStyle="bold"
34     app:layout_constraintStart_toStartOf="parent"
35     app:layout_constraintTop_toBottomOf="@+id/textView" />
36
37   <EditText
38     android:id="@+id/writeFileText"
39     android:layout_width="wrap_content"
40     android:layout_height="wrap_content"
41     android:layout_marginTop="55dp"
42     android:ems="10"
43     android:fontFamily="@font/chivo"
44     android:hint="File.txt"
45     android:inputType="textPersonName"
46     android:textColor="?android:attr/textColorPrimary"
```

```

47     app:layout_constraintEnd_toEndOf="parent "
48     app:layout_constraintStart_toEndOf="@+id/textView2 "
49     app:layout_constraintTop_toBottomOf="@+id/textView" />
50
51 <TextView
52     android:id="@+id/textView3 "
53     android:layout_width="wrap_content "
54     android:layout_height="wrap_content "
55     android:layout_marginStart="10dp"
56     android:layout_marginTop="50dp"
57     android:fontFamily="@font/chivo "
58     android:text="Enter Contents: "
59     android:textColor="?android:attr/textColorPrimary"
60     android:textSize="16sp"
61     android:textStyle="bold"
62     app:layout_constraintStart_toStartOf="parent "
63     app:layout_constraintTop_toBottomOf="@+id/textView2" />
64
65 <EditText
66     android:id="@+id/writeContentsText "
67     android:layout_width="wrap_content "
68     android:layout_height="wrap_content "
69     android:layout_marginTop="30dp"
70     android:ems="10 "
71     android:fontFamily="@font/chivo "
72     android:gravity="start|top"
73     android:hint="Hello World!"
74     android:inputType="textMultiLine"
75     android:textColor="?android:attr/textColorPrimary"
76     app:layout_constraintEnd_toEndOf="parent "
77     app:layout_constraintStart_toEndOf="@+id/textView2"
78     app:layout_constraintTop_toBottomOf="@+id/writeFileText" />
79
80 <TextView
81     android:id="@+id/textView4 "
82     android:layout_width="wrap_content "
83     android:layout_height="wrap_content "
84     android:layout_marginTop="30dp"
85     android:fontFamily="@font/chivo "
86     android:text="SD Card - Read"
87     android:textColor="?android:attr/textColorPrimary"
88     android:textSize="20sp"
89     android:textStyle="bold"
90     app:layout_constraintEnd_toEndOf="parent "
91     app:layout_constraintStart_toStartOf="parent "
92     app:layout_constraintTop_toBottomOf="@+id/writeButton" />
93
94 <TextView
95     android:id="@+id/textView5 "
96     android:layout_width="wrap_content "
97     android:layout_height="wrap_content "

```

```

98     android:layout_marginStart="10dp"
99     android:layout_marginTop="75dp"
100    android:fontFamily="@font/chivo"
101    android:text="Enter File Name:"
102    android:textColor="?android:attr/textColorPrimary"
103    android:textSize="16sp"
104    android:textStyle="bold"
105    app:layout_constraintStart_toStartOf="parent"
106    app:layout_constraintTop_toBottomOf="@+id/textView4" />
107
108    <EditText
109        android:id="@+id/readFileText"
110        android:layout_width="wrap_content"
111        android:layout_height="wrap_content"
112        android:layout_marginTop="55dp"
113        android:ems="10"
114        android:fontFamily="@font/chivo"
115        android:hint="File.txt"
116        android:inputType="textPersonName"
117        android:textColor="?android:attr/textColorPrimary"
118        app:layout_constraintEnd_toEndOf="parent"
119        app:layout_constraintStart_toEndOf="@+id/textView5"
120        app:layout_constraintTop_toBottomOf="@+id/textView4" />
121
122    <TextView
123        android:id="@+id/textView6"
124        android:layout_width="wrap_content"
125        android:layout_height="wrap_content"
126        android:layout_marginStart="10dp"
127        android:layout_marginTop="50dp"
128        android:fontFamily="@font/chivo"
129        android:text="File Contents:"
130        android:textColor="?android:attr/textColorPrimary"
131        android:textSize="16sp"
132        android:textStyle="bold"
133        app:layout_constraintStart_toStartOf="parent"
134        app:layout_constraintTop_toBottomOf="@+id/textView5" />
135
136    <TextView
137        android:id="@+id/readContentsText"
138        android:layout_width="200dp"
139        android:layout_height="wrap_content"
140        android:layout_marginTop="50dp"
141        android:fontFamily="@font/chivo"
142        android:textColor="?android:attr/textColorPrimary"
143        android:textSize="16sp"
144        app:layout_constraintEnd_toEndOf="parent"
145        app:layout_constraintStart_toEndOf="@+id/textView5"
146        app:layout_constraintTop_toBottomOf="@+id/readFileText" />
147
148    <Button

```

```

149     android:id="@+id/readButton"
150     android:layout_width="wrap_content"
151     android:layout_height="wrap_content"
152     android:fontFamily="@font/chivo"
153     android:text="Read"
154     android:textColor="@color/design_default_color_on_primary"
155     android:textSize="16sp"
156     android:textStyle="bold"
157     app:layout_constraintBottom_toBottomOf="parent"
158     app:layout_constraintEnd_toEndOf="parent"
159     app:layout_constraintStart_toStartOf="parent"
160     app:layout_constraintTop_toBottomOf="@+id/readContentsText" />
161
162 <Button
163     android:id="@+id/writeButton"
164     android:layout_width="wrap_content"
165     android:layout_height="wrap_content"
166     android:layout_marginTop="30dp"
167     android:fontFamily="@font/chivo"
168     android:text="Write"
169     android:textSize="16sp"
170     android:textStyle="bold"
171     app:layout_constraintEnd_toEndOf="parent"
172     app:layout_constraintStart_toStartOf="parent"
173     app:layout_constraintTop_toBottomOf="@+id/writeContentsText" />
174
175 </androidx.constraintlayout.widget.ConstraintLayout>

```


Code - External Storage: Android Manifest XML:

```
1 <?xml version="1.0" encoding="utf-8"?>
2 <manifest xmlns:android="http://schemas.android.com/apk/res/android"
3     package="com.example.externalstorage">
4
5     <!--Permissions required for file I/O -->
6     <uses-permission android:name="android.permission.
7         WRITE_EXTERNAL_STORAGE"/>
8     <uses-permission android:name="android.permission.
9         READ_EXTERNAL_STORAGE"/>
10    <uses-permission android:name="android.permission.
11        MANAGE_EXTERNAL_STORAGE"/>
12
13    <application
14        android:allowBackup="true"
15        android:icon="@mipmap/ic_launcher"
16        android:label="@string/app_name"
17        android:roundIcon="@mipmap/ic_launcher_round"
18        android:supportsRtl="true"
19        android:theme="@style/Theme.ExternalStorage">
20        <activity
21            android:name=".MainActivity"
22            android:exported="true">
23            <intent-filter>
24                <action android:name="android.intent.action.MAIN" />
25
26                <category android:name="android.intent.category.LAUNCHER"
27            />
28            </intent-filter>
29        </activity>
30        <meta-data
31            android:name="preloaded_fonts"
32            android:resource="@array/preloaded_fonts" />
33    </application>
34</manifest>
```

Output: Main Screen:

Figure 1: Output: Main Screen.

The screenshot shows an Android application interface. At the top, there is a status bar with the time 9:51, a settings icon, a notification icon, and signal/battery indicators. Below the status bar is a purple header bar with the text "ExternalStorage". The main content area has a white background. It starts with the title "SD Card - Write" in bold. Below this, there are two input fields: "Enter File Name:" with the text "File.txt" and "Enter Contents:" with the text "Hello World!". Below these fields is a purple button with the text "WRITE". The next section is titled "SD Card - Read" in bold. Below this, there is an input field "Enter File Name:" with the text "File.txt" and a label "File Contents:" below it. Below these is a purple button with the text "READ". At the bottom of the screen is a black navigation bar with three icons: a back arrow, a home circle, and a recent apps square.

9:51

ExternalStorage

SD Card - Write

Enter File Name: File.txt

Enter Contents: Hello World!

WRITE

SD Card - Read

Enter File Name: File.txt

File Contents:

READ

Output: File Write:

Figure 2: Output: File Write.

The screenshot shows an Android application interface. At the top, a status bar displays the time 9:53, a settings icon, a file icon, and signal/battery indicators. Below the status bar is a purple header bar with the text "ExternalStorage". The main content area has a white background. It starts with the title "SD Card - Write" in bold. Below this, there are two input fields: "Enter File Name:" with the text "Hello.txt" and "Enter Contents:" with the text "Welcome to this File I/O Demo!". A purple button labeled "WRITE" is positioned below the input fields. Below the "WRITE" button is the title "SD Card - Read" in bold. Underneath, there is an "Enter File Name:" field with the text "File.txt" and a "File Contents:" label. A purple button labeled "READ" is located below the "File Contents:" label. At the bottom of the screen is a black navigation bar with three icons: a back arrow, a home circle, and a recent apps square.

9:53

ExternalStorage

SD Card - Write

Enter File Name: Hello.txt

Enter Contents: Welcome to this File I/O Demo!

WRITE

SD Card - Read

Enter File Name: File.txt

File Contents:

READ

Output: File Read:

Figure 3: Output: File Read.

The screenshot shows an Android application interface. At the top, a status bar displays the time 9:53, a settings icon, a file icon, and signal/battery indicators. Below the status bar is a purple header bar with the text "ExternalStorage". The main content area has a white background. It features two sections: "SD Card - Write" and "SD Card - Read". Each section contains a label, a text input field, and a button. In the "SD Card - Write" section, the "Enter File Name:" field contains "Hello.txt" and the "Enter Contents:" field contains "Welcome to this File I/O Demo!". A blue "WRITE" button is positioned below these fields. In the "SD Card - Read" section, the "Enter File Name:" field contains "Hello.txt" and the "File Contents:" field contains "Welcome to this File I/O Demo!". A blue "READ" button is positioned below these fields. At the bottom of the screen is a black navigation bar with three icons: a back arrow, a home circle, and a recent apps square.

9:53

ExternalStorage

SD Card - Write

Enter File Name:

Enter Contents:

WRITE

SD Card - Read

Enter File Name:

File Contents:

READ

Learning Outcome:

- I learnt how to set application permissions for **READ, WRITE & MANAGE EXTERNAL STORAGE** using the `AndroidManifest.xml` file.
- I learnt how to obtain permissions from the user through the UI using `requestPermissions()` method under the **ActivityCompat** class.
- I learnt how to do **File Write & File Read** using **File**, **FileOutputStream** and **BufferedReader** objects.
- I understood about the different types of exceptions that can be thrown by the usage of methods under these objects, like **FileNotFoundException & IOException**.
- I understood how Android fine-grains its app permissions to get access to various resources like the SD Card, Location etc.
- I implemented the **File I/O** successfully and was able to view the created files via the File Explorer as well, which was persistently created under the **Android/data/app-package-name** directory.