

62. Accessing Cloud Storage using the Android Storage Access Framework

Recent years have seen the wide adoption of remote storage services (otherwise known as “cloud storage”) to store user files and data. Driving this growth are two key factors. One is that most mobile devices now provide continuous, high speed internet connectivity, thereby making the transfer of data fast and affordable. The second factor is that, relative to traditional computer systems (such as desktops and laptops) these mobile devices are constrained in terms of internal storage resources. A high specification Android tablet today, for example, typically comes with 128Gb of storage capacity. When compared with a mid-range laptop system with a 750Gb disk drive, the need for the seamless remote storage of files is a key requirement for many mobile applications today.

In recognition of this fact, Google introduced the Storage Access Framework as part of the Android 4.4 SDK. This chapter will provide a high level overview of the storage access framework in preparation for the more detail oriented tutorial contained in the next chapter, entitled [*An Android Storage Access Framework Example*](#).

62.1 The Storage Access Framework

From the perspective of the user, the Storage Access Framework provides an intuitive user interface that allows the user to browse, select, delete and create files hosted by storage services (also referred to as *document providers*) from within Android applications. Using this browsing interface (also referred to as the *picker*), users can, for example, browse through the files (such as documents, audio, images and videos) hosted by their chosen document providers. Figure 62-1, for example, shows the picker user interface displaying a collection of files hosted by a document provider service:

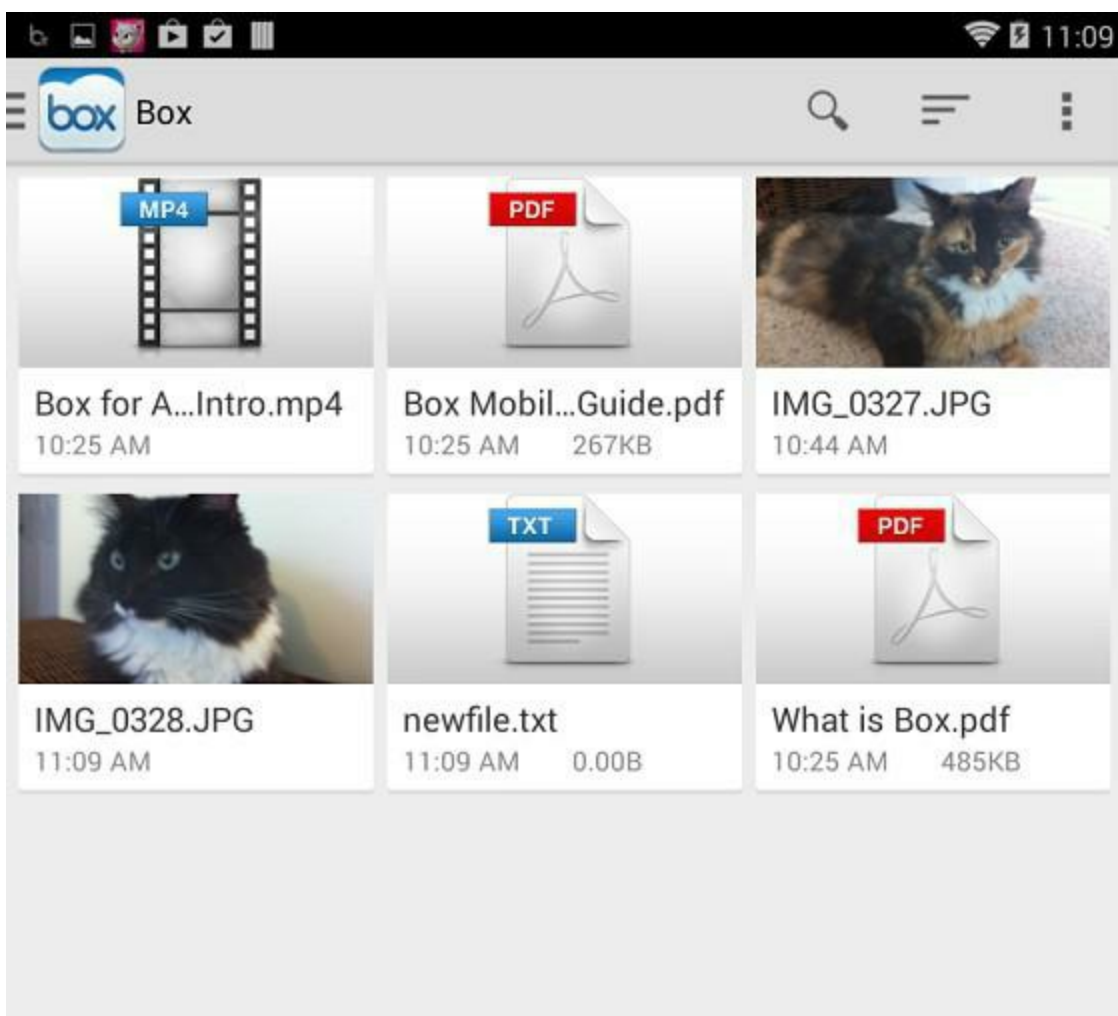


Figure 62-1

Document providers can range from cloud-based services to local document providers running on the same device as the client application. At the time of writing, the most prominent document providers compatible with the Storage Access Framework are Box and, unsurprisingly, Google Drive. It is highly likely that other cloud storage providers and application developers will soon also provide services that conform to the Android Storage Access Framework. Figure 62-2, for example, illustrates some document provider options listed by the picker interface:

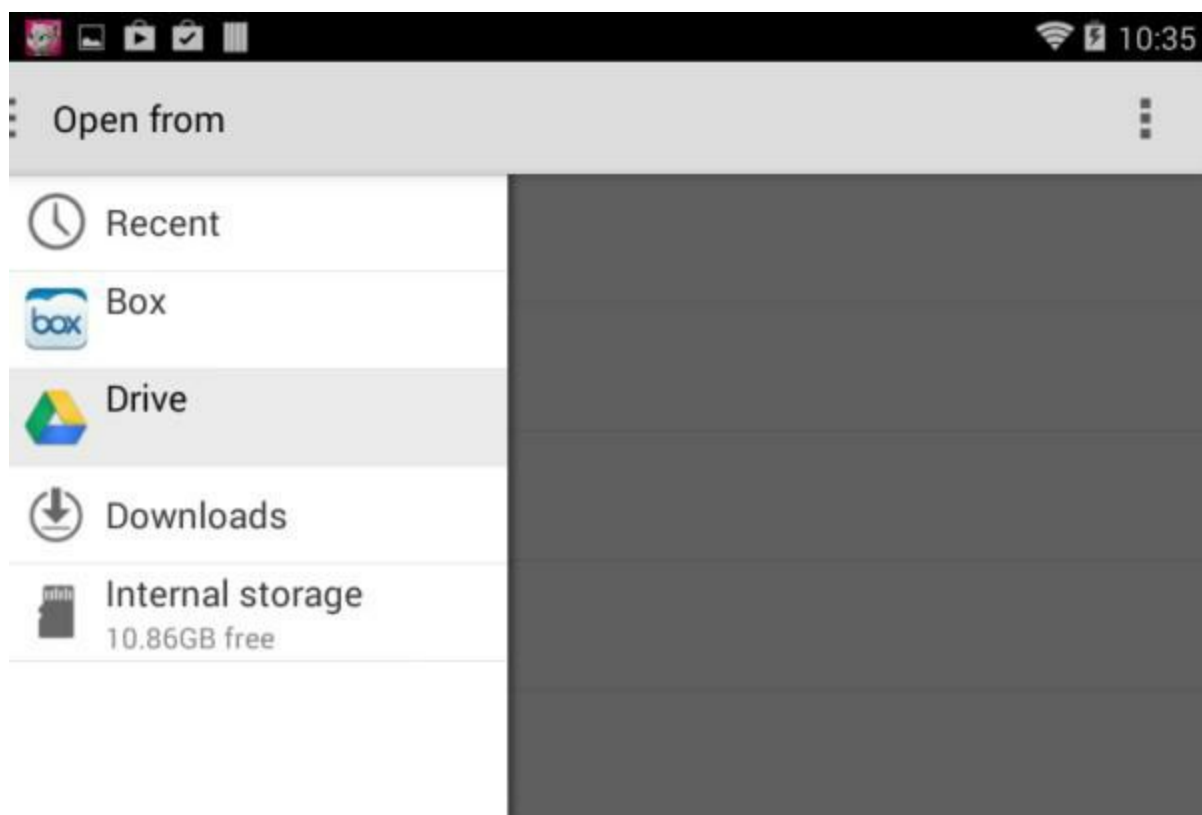


Figure 62-2

As shown in the above figure, in addition to cloud based document providers the picker also provides access to internal storage on the device, providing a range of file storage options to the application user.

Through a set of Intents included with Android 4.4, Android application developers can incorporate these storage capabilities into applications with just a few lines of code. A particularly compelling aspect of the Storage Access Framework from the point of view of the developer is that the underlying document provider selected by the user is completely transparent to the application. Once the storage functionality has been implemented using the framework within an application, it will work with all document providers without any code modifications.

62.2 Working with the Storage Access Framework

Android 4.4 introduced a new set of Intents designed to integrate the features of the Storage Access Framework into Android applications. These intents display the Storage Access Framework picker user interface to the user and return the results of the interaction to the application via a call to the *onActivityResult()* method of the activity that launched the intent. When the *onActivityResult()* method is called, it is passed the Uri of the selected file together with a value indicating the success or otherwise of the operation.

The Storage Access Framework intents can be summarized as follows:

- **ACTION_OPEN_DOCUMENT** – Provides the user with access to the picker user interface so that files may be selected from the document providers configured on the device. Selected files are passed back to the application in the form of Uri objects.
- **ACTION_CREATE_DOCUMENT** – Allows the user to select a document provider, a location on that provider's storage and a file name for a new file. Once selected, the file is created by the Storage Access Framework and the Uri of that file returned to the application for further processing.

62.3 Filtering Picker File Listings

The files listed within the picker user interface when an intent is started may be filtered using a variety of options. Consider, for example, the following code to start an `ACTION_OPEN_DOCUMENT` intent:

```
private static final int OPEN_REQUEST_CODE = 41;

Intent intent = new Intent(Intent.ACTION_OPEN_DOCUMENT);
startActivityForResult(intent, OPEN_REQUEST_CODE);
```

When executed, the above code will cause the picker user interface to be displayed, allowing the user to browse and select any files hosted by available document providers. Once a file has been selected by the user, a reference to that file will be provided to the application in the form of a `Uri` object. The application can then open the file using the `openFileDescriptor(Uri, String)` method. There is some risk, however, that not all files listed by a document provider can be opened in this way. The exclusion of such files within the picker can be achieved by modifying the intent using the `CATEGORY_OPENABLE` option. For example:

```
private static final int OPEN_REQUEST_CODE = 41;

Intent intent = new Intent(Intent.ACTION_OPEN_DOCUMENT);
intent.addCategory(Intent.CATEGORY_OPENABLE);
startActivityForResult(intent, OPEN_REQUEST_CODE);
```

When the picker is now displayed, files which cannot be opened using the `openFileDescriptor()` method will be listed but not selectable by the user.

Another useful approach to filtering allows the files available for selection to be restricted by file type. This involves specifying the types of the files the application is able to handle. An image editing application might, for example, only want to provide the user with the option of selecting image files from the document providers. This is achieved by configuring the intent object with the MIME types of the files that are to be selectable by the user. The following code, for example, specifies that only image files are suitable for selection in the picker:

```
Intent intent = new Intent(Intent.ACTION_OPEN_DOCUMENT);

intent.addCategory(Intent.CATEGORY_OPENABLE);
intent.setType("image/*");
startActivityForResult(intent, OPEN_REQUEST_CODE);
```

This could be further refined to limit selection to JPEG images:

```
intent.setType("image/jpeg");
```

Alternatively, an audio player app might only be able to handle audio files:

```
intent.setType("audio/*");
```

The audio app might be limited even further in only supporting the playback of MP4 based audio files:

```
intent.setType("audio/mp4");
```

A wide range of MIME type settings are available for use when working with the Storage Access Framework, the more common of which can be found listed online at:

62.4 Handling Intent Results

When an intent returns control to the application, it does so by calling the *onActivityResult()* method of the activity which started the intent. This method is passed the request code that was handed to the intent at launch time, a result code indicating whether or not the intent was successful and a result data object containing the Uri of the selected file. The following code, for example, might be used as the basis for handling the results from the ACTION_OPEN_DOCUMENT intent outlined in the previous section:

```
public void onActivityResult(int requestCode, int resultCode,
    Intent resultData) {

    Uri currentUri = null;

    if (resultCode == Activity.RESULT_OK)
    {
        if (requestCode == OPEN_REQUEST_CODE)
        {
            if (resultData != null) {
                currentUri = resultData.getData();
                readFileContent(currentUri);
            }
        }
    }
}
```

The above method verifies that the intent was successful, checks that the request code matches that for a file open request and then extracts the Uri from the intent data. The Uri can then be used to read the content of the file.

62.5 Reading the Content of a File

The exact steps required to read the content of a file hosted by a document provider will depend to a large extent on the type of the file. The steps to read lines from a text file, for example, differ from those for image or audio files.

An image file can be assigned to a Bitmap object by extracting the file descriptor from the Uri object and then decoding the image into a BitmapFactory instance. For example:

```
ParcelFileDescriptor pFileDescriptor =
    getContentResolver().openFileDescriptor(uri, "r");

FileDescriptor fileDescriptor =
    pFileDescriptor.getFileDescriptor();

Bitmap image = BitmapFactory.decodeFileDescriptor(fileDescriptor);

pFileDescriptor.close();

myImageView.setImageBitmap(image);
```

Note that the file descriptor is opened in “r” mode. This indicates that the file is to be opened for reading. Other options are “w” for write access and “rwt” for read and write access, where existing content in the file is truncated by the new content.

Reading the content of a text file requires slightly more work and the use of an `InputStream` object. The following code, for example, reads the lines from a text file:

```
InputStream inputStream = getContentResolver().openInputStream(uri);

BufferedReader reader = new BufferedReader(new InputStreamReader(
    inputStream));

String readline;

while ((readline = reader.readLine()) != null) {
    // Do something with each line in the file
}
inputStream.close();
```

62.6 Writing Content to a File

Writing to an open file hosted by a document provider is similar to reading with the exception that an output stream is used instead of an input stream. The following code, for example, writes text to the output stream of the storage based file referenced by the specified Uri:

```
try{
    ParcelFileDescriptor pFileDescriptor = this.getContentResolver().
        openFileDescriptor(uri, "w");

    FileOutputStream fileOutputStream =
        new FileOutputStream(pFileDescriptor.getFileDescriptor());

    String textContent = "Some sample text";
    fileOutputStream.write(textContent.getBytes());
    fileOutputStream.close();
    pFileDescriptor.close();
} catch (FileNotFoundException e) {
    e.printStackTrace();
} catch (IOException e) {
    e.printStackTrace();
}
```

First, the file descriptor is extracted from the Uri, this time requesting write permission to the target file. The file descriptor is subsequently used to obtain a reference to the file's output stream. The content (in this example, some text) is then written to the output stream before the file descriptor and output stream are closed.

62.7 Deleting a File

Whether a file can be deleted from storage depends on whether or not the file's document provider supports deletion of the file. Assuming deletion is permitted, it may be performed on a designated Uri as follows:

```
if (DocumentsContract.deleteDocument(getContentResolver(), uri))
    // Deletion was successful
else
    // Deletion failed
```

62.8 Gaining Persistent Access to a File

When an application gains access to a file via the Storage Access Framework, the access will remain valid until the Android device on which the application is running is restarted. Persistent access to a

specific file can be obtained by “taking” the necessary permissions for the Uri. The following code, for example, persists read and write permissions for the file referenced by the *fileUri* Uri instance:

```
final int takeFlags = intent.getFlags()
    & (Intent.FLAG_GRANT_READ_URI_PERMISSION
    | Intent.FLAG_GRANT_WRITE_URI_PERMISSION);

getContentResolver().takePersistableUriPermission(fileUri, takeFlags);
```

Once the permissions for the file have been taken by the application, and assuming the Uri has been saved by the application, the user should be able to continue accessing the file after a device restart without the user having to reselect the file from the picker interface.

If, at any time, the persistent permissions are no longer required, they can be released via a call to the *releasePersistableUriPermission()* method of the content resolver:

```
final int releaseFlags = intent.getFlags()
    & (Intent.FLAG_GRANT_READ_URI_PERMISSION
    | Intent.FLAG_GRANT_WRITE_URI_PERMISSION);

getContentResolver().releasePersistableUriPermission(fileUri,
    releaseFlags);
```

62.9 Summary

It is interesting to consider how perceptions of storage have changed in recent years. Once synonymous with high capacity internal hard disk drives, the term “storage” is now just as likely to refer to storage space hosted remotely in the cloud and accessed over an internet connection. This is increasingly the case with the wide adoption of resource constrained, “always-connected” mobile devices with minimal internal storage capacity.

The Android Storage Access Framework provides a simple mechanism for both users and application developers to seamlessly gain access to files stored in the cloud. Through the use of a set of intents introduced into Android 4.4 and a built-in user interface for selecting document providers and files, comprehensive cloud based storage can now be integrated into Android applications with a minimal amount of coding.

63. An Android Storage Access Framework Example

As previously discussed, the Storage Access Framework considerably eases the process of integrating cloud based storage access into Android applications. Consisting of a picker user interface and a set of new intents, access to files stored on document providers such as Google Drive and Box can now be built into Android applications with relative ease. With the basics of the Android Storage Access Framework covered in the preceding chapter, this chapter will work through the creation of an example application which uses the Storage Access Framework to store and manage files.

63.1 About the Storage Access Framework Example

The Android application created in this chapter will take the form of a rudimentary text editor designed to create and store text files remotely onto a cloud based storage service. In practice, the example will work with any cloud based document storage provider that is compatible with the Storage Access Framework, though for the purpose of this example the use of Google Drive is assumed.

In functional terms, the application will present the user with a multi-line text view into which text may be entered and edited, together with a set of buttons allowing storage based text files to be created, opened and saved.

63.2 Creating the Storage Access Framework Example

Create a new project in Android Studio, entering *StorageDemo* into the Application name field and *ebookfrenzy.com* as the Company Domain setting before clicking on the *Next* button.

On the form factors screen, enable the *Phone and Tablet* option and set the minimum SDK setting to API 19: Android 4.4 (KitKat). Continue to proceed through the screens, requesting the creation of an Empty Activity named *StorageDemoActivity* with a corresponding layout named *activity_storage_demo*.

63.3 Designing the User Interface

The user interface will need to be comprised of three Button views and a single EditText view. Within the Project tool window, navigate to the *activity_storage_demo.xml* layout file located in *app -> res -> layout* and double-click on it to load it into the Layout Editor tool. With the tool in Design mode, select and delete the *Hello World!* TextView object.

Drag and position a Button widget in the top left-hand corner of the layout so that both the left and top dotted margin guidelines appear before dropping the widget in place. Position a second Button such that the center and top margin guidelines appear. The third Button widget should then be placed so that the top and right-hand margin guidelines appear.

Change the text properties on the three buttons to “New”, “Open” and “Save” respectively. Next, position a Plain Text widget so that it is centered horizontally and positioned beneath the center Button so that the user interface layout matches that shown in Figure 63-1. Use the Infer Constraints button in the Layout Editor toolbar to add any missing constraints.

Select the Plain Text widget in the layout, delete the current text property setting so that the field is initially blank and set the ID to *fileText*, remembering to extract all the string properties to resource values:

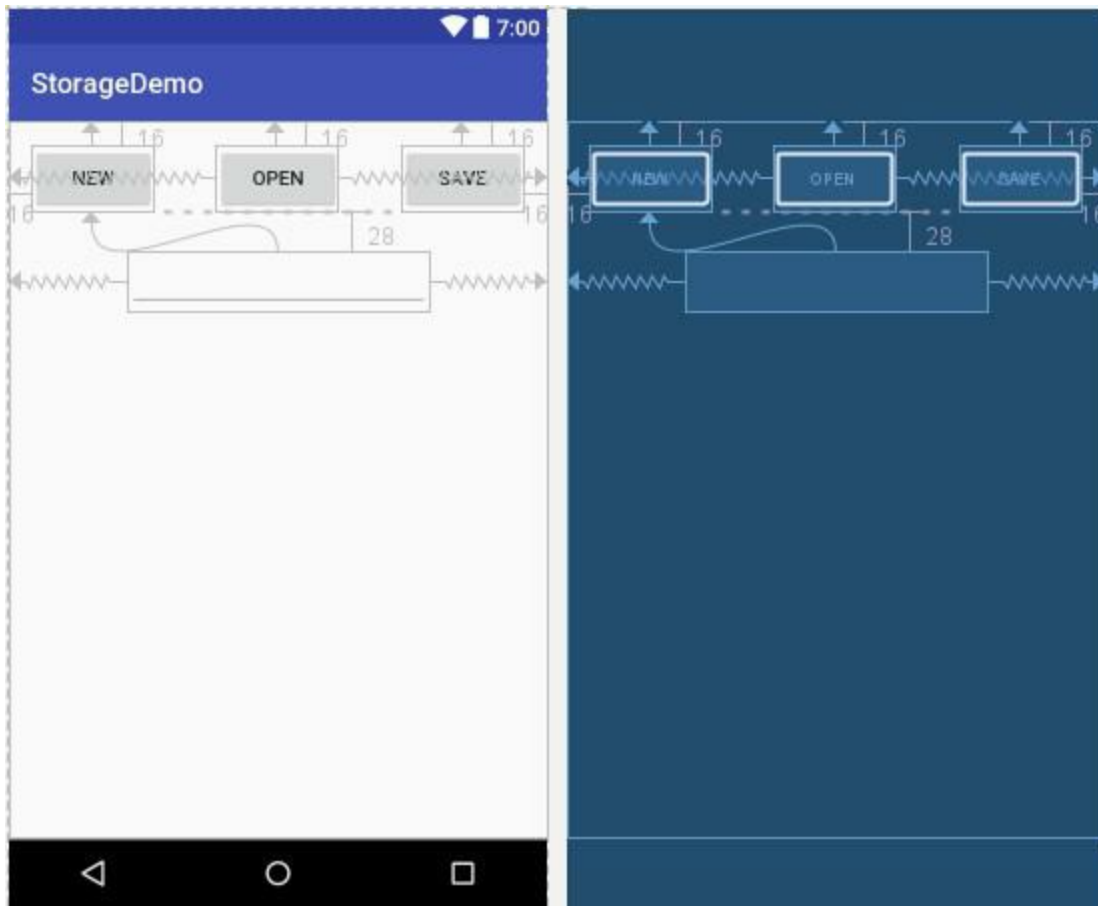


Figure 63-1

Using the Properties tool window, configure the `onClick` property on the Button widgets to call methods named *newFile*, *openFile* and *saveFile* respectively.

63.4 Declaring Request Codes

Working with files in the Storage Access Framework involves triggering a variety of intents depending on the specific action to be performed. Invariably this will result in the framework displaying the storage picker user interface so that the user can specify the storage location (such as a directory on Google Drive and the name of a file). When the work of the intent is complete, the application will be notified by a call to a method named *onActivityResult()*.

Since all intents from a single activity will result in a call to the same *onActivityResult()* method, a mechanism is required to identify which intent triggered the call. This can be achieved by passing a request code through to the intent when it is launched. This code is then passed on to the *onActivityResult()* method by the intents, enabling the method to identify which action has been requested by the user. Before implementing the `onClick` handlers to create, save and open files, the first step is to declare some request codes for these three actions.

Locate and load the *StorageDemoActivity.java* file into the editor and declare constant values for the three actions to be performed by the application. Also, add some code to obtain a reference to the multiline `EditText` object which will be referenced in later methods:

```
package com.ebookfrenzy.storagedemo;
```

```

import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.widget.EditText;

public class StorageDemoActivity extends AppCompatActivity {

    private static EditText textView;

    private static final int CREATE_REQUEST_CODE = 40;
    private static final int OPEN_REQUEST_CODE = 41;
    private static final int SAVE_REQUEST_CODE = 42;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_storage_demo);

        textView = (EditText) findViewById(R.id.fileText);
    }
}

```

63.5 Creating a New Storage File

When the New button is selected, the application will need to trigger an *ACTION_CREATE_DOCUMENT* intent configured to create a file with a plain-text MIME type. When the user interface was designed, the New button was configured to call a method named *newFile()*. It is within this method that the appropriate intent needs to be launched.

Remaining in the *StorageDemoActivity.java* file, implement this method as follows:

```

package com.ebookfrenzy.storagedemo;

import android.app.Activity;
import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.widget.EditText;
import android.content.Intent;
import android.view.View;

public class StorageDemoActivity extends AppCompatActivity {

    private static EditText textView;

    private static final int CREATE_REQUEST_CODE = 40;
    private static final int OPEN_REQUEST_CODE = 41;
    private static final int SAVE_REQUEST_CODE = 42;

    .
    .
    .

    public void newFile(View view)
    {
        Intent intent = new Intent(Intent.ACTION_CREATE_DOCUMENT);
    }
}

```

```

        intent.addCategory(Intent.CATEGORY_OPENABLE);
        intent.setType("text/plain");
        intent.putExtra(Intent.EXTRA_TITLE, "newfile.txt");

        startActivityForResult(intent, CREATE_REQUEST_CODE);
    }
    .
    .
}

```

This code creates a new `ACTION_CREATE_INTENT` Intent object. This intent is then configured so that only files that can be opened with a file descriptor are returned (via the `Intent.CATEGORY_OPENABLE` category setting).

Next the code specifies that the file to be opened is to have a plain text MIME type and a placeholder filename is provided (which can be changed by the user in the picker interface). Finally, the intent is started, passing through the previously declared `CREATE_REQUEST_CODE`.

When this method is executed and the intent has completed the assigned task, a call will be made to the application's `onActivityResult()` method and passed, amongst other arguments, the Uri of the newly created document and the request code that was used when the intent was started. Now is an ideal opportunity to begin to implement this method.

63.6 The `onActivityResult()` Method

The `onActivityResult()` method will be shared by all of the intents that will be called during the lifecycle of the application. In each case, the method will be passed a request code, a result code and a set of result data which contains the Uri of the storage file. The method will need to be implemented such that it checks for the success of the intent action, identifies the type of action performed and extracts the file Uri from the results data. At this point in the tutorial, the method only needs to handle the creation of a new file on the selected document provider, so modify the `StorageDemoActivity.java` file to add this method as follows:

```

public void onActivityResult(int requestCode, int resultCode,
                             Intent resultData) {

    if (resultCode == Activity.RESULT_OK)
    {
        if (requestCode == CREATE_REQUEST_CODE)
        {
            if (resultData != null) {
                textView.setText("");
            }
        }
    }
}

```

The code in this method is largely straightforward. The result of the activity is checked and, if successful, the request code is compared to the `CREATE_REQUEST_CODE` value to verify that the user is creating a new file. That being the case, the edit text view is cleared of any previous text to signify the creation of a new file.

Compile and run the application and select the New button. The Storage Access Framework should subsequently display the “Save to” storage picker user interface as illustrated in Figure 63-2.

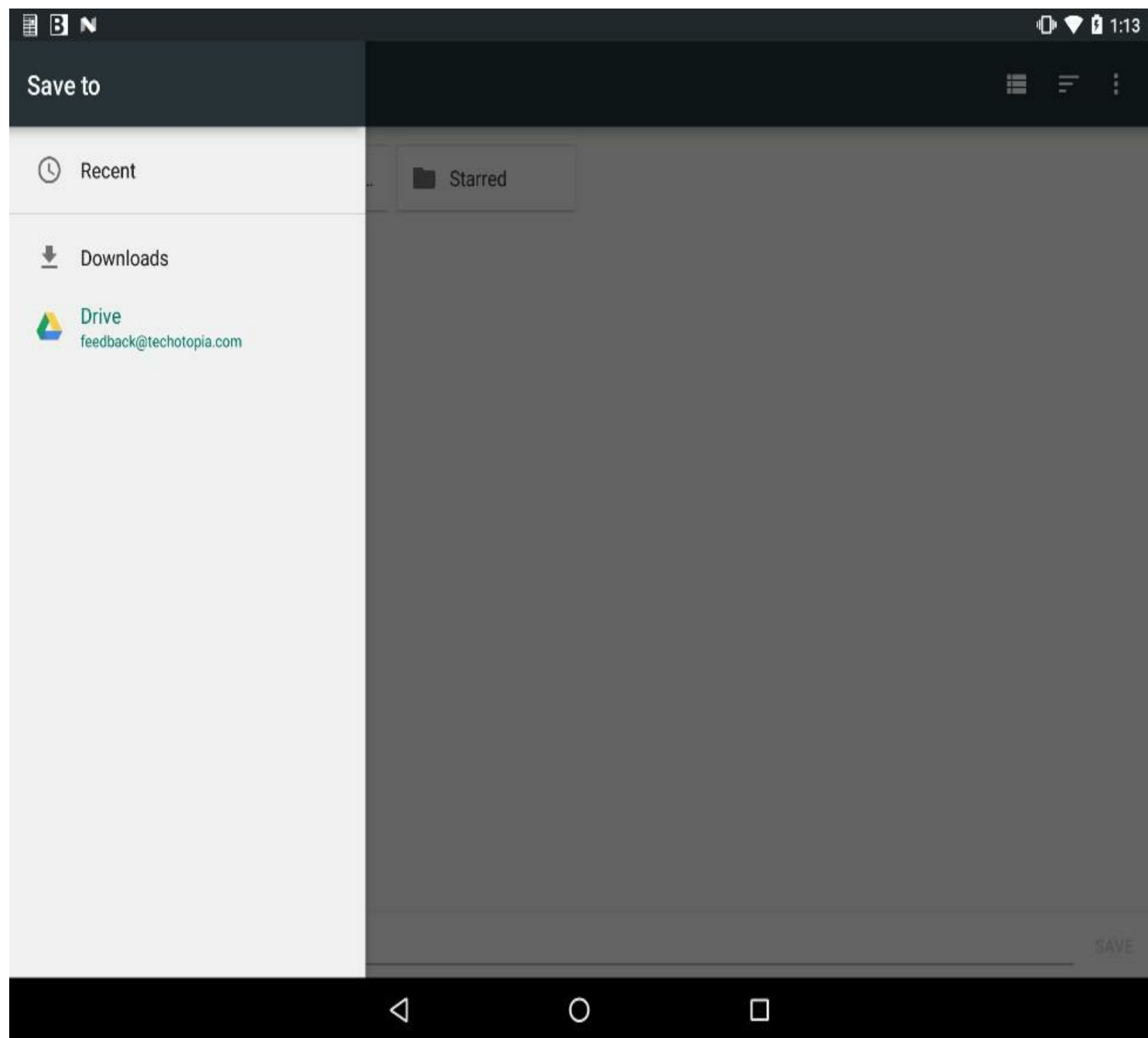


Figure 63-2

From this menu, select the *Drive* option followed by *My Drive* and navigate to a suitable location on your Google Drive storage into which to save the file. In the text field at the bottom of the picker interface, change the name from “newfile.txt” to a suitable name (but keeping the *.txt* extension) before selecting the *Save* option.

Once the new file has been created, the app should return to the main activity and a notification will appear within the notifications panel which reads “1 file uploaded”.

1 file uploaded.
july.txt



ADD PEOPLE

SHARE LINK

Figure 63-3

At this point, it should be possible to log into your Google Drive account in a browser window and find the newly created file in the requested location. In the event that the file is missing, make sure that the Android device on which the application is running has an active internet connection. Access to Google Drive on the device may also be verified by running the Google *Drive* app, which is installed by default on many Android devices, and available for download from the Google Play store.

63.7 Saving to a Storage File

Now that the application is able to create new storage based files, the next step is to add the ability to save any text entered by the user to a file. The user interface is configured to call the *saveFile()* method when the Save button is selected by the user. This method will be responsible for starting a new intent of type *ACTION_OPEN_DOCUMENT* which will result in the picker user interface appearing so that the user can choose the file to which the text is to be stored. Since we are only working with plain text files, the intent needs to be configured to restrict the user's selection options to existing files that match the text/plain MIME type. Having identified the actions to be performed by the *saveFile()* method, this can now be added to the *StorageDemoActivity.java* class file as follows:

```
public void saveFile(View view)
{
    Intent intent = new Intent(Intent.ACTION_OPEN_DOCUMENT);
    intent.addCategory(Intent.CATEGORY_OPENABLE);
    intent.setType("text/plain");

    startActivityForResult(intent, SAVE_REQUEST_CODE);
}
```

Since the *SAVE_REQUEST_CODE* was passed through to the intent, the *onActivityResult()* method must now be extended to handle save actions:

```
package com.ebookfrenzy.storagedemo;

import android.app.Activity;
import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.widget.EditText;
WOW! eBook
www.wowebook.org
```

```

import android.content.Intent;
import android.view.View;
import android.net.Uri;

public class StorageDemoActivity extends AppCompatActivity {
    .
    .
    public void onActivityResult(int requestCode, int resultCode,
        Intent resultData) {

        Uri currentUri = null;

        if (resultCode == Activity.RESULT_OK)
        {
            if (requestCode == CREATE_REQUEST_CODE)
            {
                if (resultData != null) {
                    textView.setText("");
                }
            } else if (requestCode == SAVE_REQUEST_CODE) {

                if (resultData != null) {
                    currentUri =
                        resultData.getData();
                    writeFileContent(currentUri);
                }
            }
        }
    }
}

```

The method now checks for the save request code, extracts the Uri of the file selected by the user in the storage picker and calls a method named *writeFileContent()*, passing through the Uri of the file to which the text is to be written. Remaining in the *StorageDemoActivity.java* file, implement this method now so that it reads as follows:

```

package com.ebookfrenzy.storagedemo;

import java.io.FileNotFoundException;
import java.io.FileOutputStream;
import java.io.IOException;

import android.app.Activity;
import android.support.v7.app.AppCompatActivity;
import android.os.Bundle;
import android.widget.EditText;
import android.content.Intent;
import android.view.View;
import android.net.Uri;
import android.os.ParcelFileDescriptor;

public class StorageDemoActivity extends AppCompatActivity {
    .
    .
    private void writeFileContent(Uri uri)
    {

```

```

        try{
            ParcelFileDescriptor pfd =
                this.getContentResolver().
                    openFileDescriptor(uri, "w");

            FileOutputStream fileOutputStream =
                new FileOutputStream(
                    pfd.getFileDescriptor());

            String textContent =
                textView.getText().toString();

            fileOutputStream.write(textContent.getBytes());

            fileOutputStream.close();
            pfd.close();
        } catch (FileNotFoundException e) {
            e.printStackTrace();
        } catch (IOException e) {
            e.printStackTrace();
        }
    }
}

```

The method begins by obtaining and opening the file descriptor from the Uri of the file selected by the user. Since the code will need to write to the file, the descriptor is opened in write mode (“w”). The file descriptor is then used as the basis for creating an output stream that will enable the application to write to the file.

The text entered by the user is extracted from the edit text object and written to the output stream before both the file descriptor and stream are closed. Code is also added to handle any IO exceptions encountered during the file writing process.

With the new method added, compile and run the application, enter some text into the text view and select the *Save* button. From the picker interface, locate the previously created file from the Google Drive storage to save the text to that file. Return to your Google Drive account in a browser window and select the text file to display the contents. The file should now contain the text entered within the StorageDemo application on the Android device.

63.8 Opening and Reading a Storage File

Having written the code to create and save text files, the final task is to add some functionality to open and read a file from the storage. This will involve writing the *openFile()* onClick event handler method and implementing it so that it starts an ACTION_OPEN_DOCUMENT intent:

```

public void openFile(View view)
{
    Intent intent = new Intent(Intent.ACTION_OPEN_DOCUMENT);
    intent.addCategory(Intent.CATEGORY_OPENABLE);
    intent.setType("text/plain");
    startActivityForResult(intent, OPEN_REQUEST_CODE);
}

```

In this code, the intent is configured to filter selection to files which can be opened by the application.

When the activity is started, it is passed the open request code constant which will now need to be handled within the *onActivityResult()* method:

```
public void onActivityResult(int requestCode, int resultCode,
    Intent resultData) {

    Uri currentUri = null;

    if (resultCode == Activity.RESULT_OK)
    {

        if (requestCode == CREATE_REQUEST_CODE)
        {
            if (resultData != null) {
                textView.setText("");
            }
        } else if (requestCode == SAVE_REQUEST_CODE) {

            if (resultData != null) {
                currentUri = resultData.getData();
                writeFileContent(currentUri);
            }
        } else if (requestCode == OPEN_REQUEST_CODE) {

            if (resultData != null) {
                currentUri = resultData.getData();

                try {
                    String content =
                        readFileContent(currentUri);
                    textView.setText(content);
                } catch (IOException e) {
                    // Handle error here
                }
            }
        }
    }
}
```

The new code added above to handle the open request obtains the Uri of the file selected by the user from the picker user interface and passes it through to a method named *readFileContent()* which is expected to return the content of the selected file in the form of a String object. The resulting string is then assigned to the text property of the edit text view. Clearly, the next task is to implement the *readFileContent()* method:

```
package com.ebookfrenzy.storagedemo;

import java.io.FileNotFoundException;
import java.io.FileOutputStream;
import java.io.IOException;
import java.io.BufferedReader;
import java.io.InputStream;
import java.io.InputStreamReader;

import android.app.Activity;
import android.support.v7.app.AppCompatActivity;
```

```

import android.os.Bundle;
import android.widget.EditText;
import android.content.Intent;
import android.view.View;
import android.net.Uri;
import android.os.ParcelFileDescriptor;

public class StorageDemoActivity extends AppCompatActivity {
    .
    .
    .
        private String readFileContent(Uri uri) throws IOException {

            InputStream inputStream =
                getContentResolver().openInputStream(uri);
            BufferedReader reader =
                new BufferedReader(new InputStreamReader(
                    inputStream));
            StringBuilder stringBuilder = new StringBuilder();
            String currentline;
            while ((currentline = reader.readLine()) != null) {
                stringBuilder.append(currentline + "\n");
            }
            inputStream.close();
            return stringBuilder.toString();
        }
    .
    .
}

```

This method begins by extracting the file descriptor for the selected text file and opening it for reading. The input stream associated with the Uri is then opened and used as the input source for a `BufferedReader` instance. Each line within the file is then read and stored in a `StringBuilder` object. Once all the lines have been read, the input stream and file descriptor are both closed, and the file content is returned as a `String` object.

63.9 Testing the Storage Access Application

With the coding phase complete the application is now ready to be fully tested. Begin by launching the application on a physical Android device and selecting the “New” button. Within the resulting storage picker interface, select a Google Drive location and name the text file *storagedemo.txt* before selecting the Save option located to the right of the file name field.

When control returns to your application look for the file uploading notification, then enter some text into the text area before selecting the “Save” button. Select the previously created *storagedemo.txt* file from the picker to save the content to the file. On returning to the application, delete the text and select the “Open” button, once again choosing the *storagedemo.txt* file. When control is returned to the application, the text view should have been populated with the content of the text file.

It is important to note that the Storage Access Framework will cache storage files locally in the event that the Android device lacks an active internet connection. Once connectivity is re-established, however, any cached data will be synchronized with the remote storage service. As a final test of the application, therefore, log into your Google Drive account in a browser window, navigate to the *storagedemo.txt* file and click on it to view the content which should, all being well, contain the text

saved by the application.

63.10 **Summary**

This chapter has worked through the creation of an example Android Studio application in the form of a very rudimentary text editor designed to use cloud based storage to create, save and open files using the Android Storage Access Framework.