MODULE 12

ASYNCHRONOUS TASK

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Asynchronous Task

- To perform background operations
  - Computation that runs on a background thread
- And then to publish results on the UI thread

AsyncTask Class

- Used to perform asynchronous work
  - Performs the blocking operations in a worker thread
  - Then publishes the results on the UI thread
  - Without requiring to handle threads and/or handlers
- Enables proper and easy use of the UI thread
- Should ideally be used for short operations (a few seconds)

AsyncTask Steps

- Step 1: **onPreExecute ( )**
  - Invoked on the UI thread before the task is executed
  - Normally used to setup the task
    - E.g, showing a progress bar in the user interface

AsyncTask Steps

- Step 2 : **doInBackground (Params...)**
  - Invoked on the background thread
  - Immediately after *onPreExecute()* finishes executing
  - To perform computation that can take a long time
  - The parameters of the asynchronous task are passed to this step
  - The result of the computation must be returned
    - And will be passed back to onPostExecute(Result)
  - Can also use **publishProgress(Progress...)**
    - To publish one or more units of progress
    - These values are published on the UI thread
      - In the *onProgressUpdate(Progress...)* step

AsyncTask Steps

- Steps 3: **onProgressUpdate(Progress...)**
  - Invoked on the UI thread
  - After a call to *publishProgress(Progress...)*
    - The timing of the execution is undefined
  - Used to display any form of progress in the user interface
    - While the background computation is still executing
    - E.g, to animate a progress bar or to show logs in a text field

AsyncTask Steps

- Steps 4: **onPostExecute(Result)**
  - Invoked on the UI thread
  - After the background computation finishes
  - The result of the background computation is passed to this step
    - As a parameter

AsyncTask Steps

- Do not call manually
  - onPreExecute()
  - doInBackground(Params...)
  - onProgressUpdate(Progress...)
  - onPostExecute(Result)

AsyncTask Generic Types

- 3 generic types
  - **Params**
    - The type of the parameters sent to the task upon execution
  - **Progress**
    - The type of the progress units published during the background computation
  - **Result**
    - The type of the result of the background computation
- Not all types used by an asynchronous task
  - To mark a type as unused: use the type Void

Using AsyncTask Class

- Create a subclass of AsyncTask class
  - Override at least **doInBackground(Params...)** method
    - Runs in a pool of background threads
    - Result will be automatically passed to onPostExecute method
  - Override most often **onPostExecute(Result)** method
    - Delivers the result from doInBackground()
    - Runs in the UI thread ⇨ to update UI

Using AsyncTask Class

- Run the task
  - Create an instance of the AsyncTask subclass in the UI thread
  - Call **execute(Params...)** on this instance from the UI thread
    - The task can be executed only once
      - An exception will be thrown if a second execution is attempted

Using AsyncTask Class

- E.g,

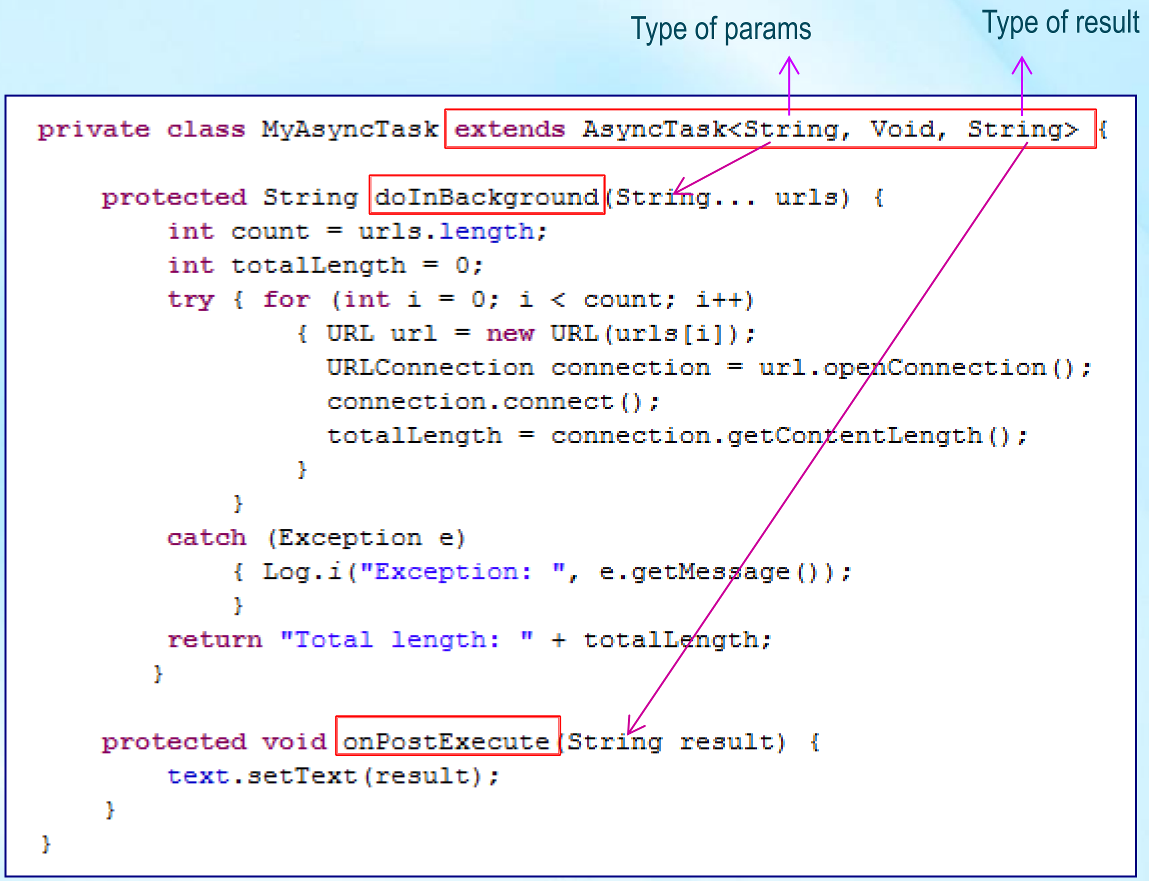
```
public class MainActivity extends Activity {

   private TextView text;
   private Button button;

   @Override
   protected void onCreate(Bundle savedInstanceState) {
       super.onCreate(savedInstanceState);
       setContentView(R.layout.activity_main);
       text = (TextView) this.findViewById(R.id.editTextID);
       button = (Button) this.findViewById(R.id.buttonID);
       button.setOnClickListener(new OnClickListener()
       { public void onClick (View arg0)
       {    String url1 = "...";
            String url2 = "...";
            String url3 = "...";
            new MyAsyncTask().execute(url1, url2, url3);
       }});
   }
```

UI to be updated after async task is finished

Run the AsyncTask

Variable number of arguments

Using AsyncTask Class



```
private class MyAsyncTask extends AsyncTask<String, Void, String> {

    protected String doInBackground(String... urls) {
        int count = urls.length;
        int totalLength = 0;
        try { for (int i = 0; i < count; i++)
                { URL url = new URL(urls[i]);
                  URLConnection connection = url.openConnection();
                  connection.connect();
                  totalLength = connection.getContentLength();
                }
            }
        catch (Exception e)
            { Log.i("Exception: ", e.getMessage());
            }
        return "Total length: " + totalLength;
      }

    protected void onPostExecute(String result) {
        text.setText(result);
    }
}
```

Using AsyncTask Class

```java
private class MyAsyncTask extends AsyncTask<String, Void, String> {

    protected String doInBackground(String... urls) {
        int count = urls.length;
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        try { for (int i = 0; i < count; i++)
                { URL url = new URL(urls[i]);
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            }
        catch (Exception e)
            { Log.i("Exception: ", e.getMessage());
            }
        return "Total length: " + totalLength;
      }

    protected void onPostExecute(String result) {
        text.setText(result);
     }
}
```

Variable arguments

Update of the UI

Using AsyncTask Class

- All callback calls are synchronized

  ↳ The following operations are safe

  - Set member fields in the *constructor* or *onPreExecute()* and refer to them in *doInBackground(Params...)*
  - Set member fields in *doInBackground(Params...)* and refer to them in

    onProgressUpdate(Progress...)

    onPostExecute(Result)

Cancelling an Asynchronous Task

- By invoking **cancel(boolean)**
- Will cause subsequent calls to **isCancelled()** to return true
- After *doInBackground* returns
  - **onCancelled(Object)** will be invoked
  - instead of *onPostExecute(Object)*

Webography

- http://developer.android.com/reference/android/os/AsyncTask.html
- http://developer.android.com/guide/components/processes-and-threads.html