

# Android Process and Threads

# Today's class:

Concepts  
(Lecture)

- What is a process? Thread?
- In Android?

Problem  
(code)

- What is the limitation of the main thread?
- Creating the problem scenario.

Back-to-Concepts  
(lecture)

- Running on UI thread.
- Async Task

Solution  
(code: all)

- Create the problem scenario
- Use Async Task

# Concepts

# Program vs. Process

A **program** is a set of instructions + data stored in an executable image.

A **process** is a program “in action”

- Program counter
- CPU registers
- Stacks
- States

For more details:

<http://www.tldp.org/LDP/tlk/kernel/processes.html>

# Program vs. Process

## Tea Making Recipe:

1. *Add water in pan.*
2. *Add sugar, tea leaves, spices.*
3. *Bring to boil and simmer.*
4. *Add milk.*
5. *Bring to boil and simmer.*
6. *Strain tea in teapot.*

Program or Process?

# Program vs. Process

## Process:



1. Add water in pan.
2. Add sugar, tea leaves, spices.
3. Bring to boil and simmer.
4. Add milk.
5. Bring to boil and simmer.
6. Strain tea in teapot.



## Process:

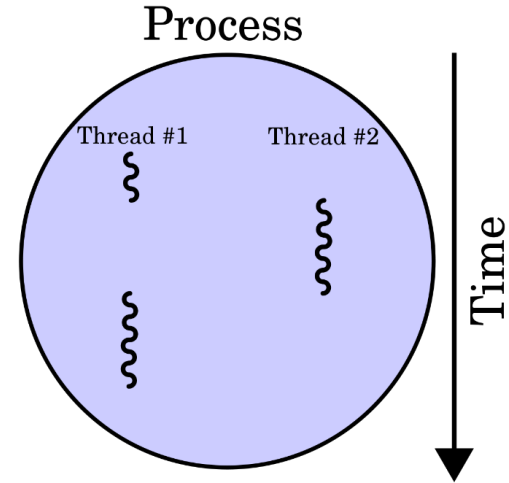


1. Add water in pan.
2. Add sugar, tea leaves, spices.
3. Bring to boil and simmer.
4. Add milk.
5. Bring to boil and simmer.
6. Strain tea in teapot.



# Thread

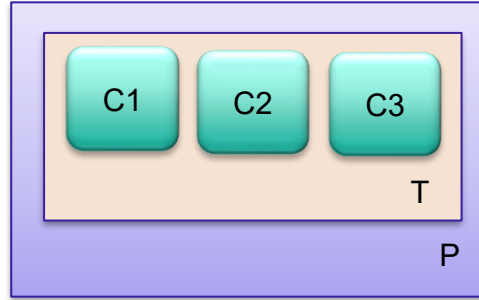
- A **Thread** is a flow of execution inside a process.
- Threads in a process share the same **virtual memory** address space.



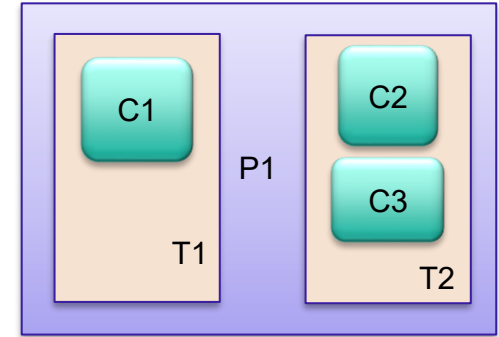
# Android Processes and Threads

## Default Behavior:

- All components of an App run in the same thread (the main/UI thread) and the same process.



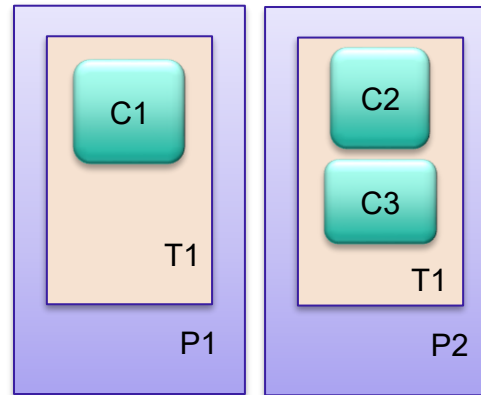
Default



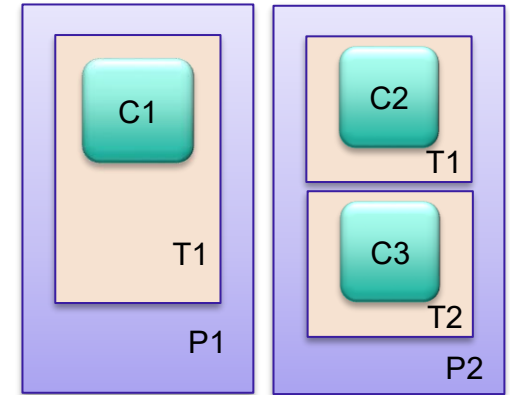
Multiple threads in same process

## However, you can:

- Arrange for components to run in different processes.
- Create multiple threads per process.



Multiple processes with single thread in each



Multiple processes with multi threads



# Process creation and removal


- **Creation:** When the first component of an App is run and there is currently no process for that App.
- **Removal:** Remove old processes to reclaim memory for new or more important processes.

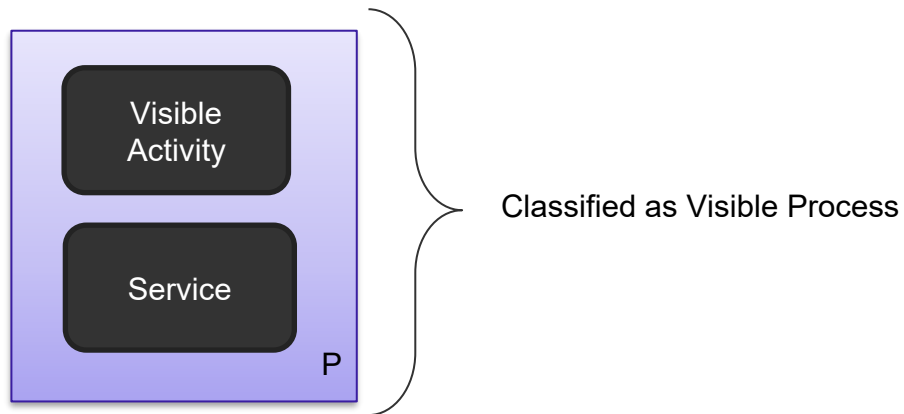
Which process  
should be killed?



# Process Hierarchy

- From High to Low Priority

Priority	Type	Description
1	Foreground	On-going interactions; activity, service, broadcast
2	Visible	Not in the foreground, but visible
3	Service	Playing music, downloading stuffs
4	Background	onStop() called, not visible, LRU kill
5	Empty	Lowest priority  Kill them first



# Base Thread

- Act much like usual Java Threads
- Can't act directly on external User Interface objects
  - Throws the Exception CalledFromWrongThreadException: Only the original thread that created a view hierarchy can touch its views"
- Can't be stopped by executing destroy() nor stop()
  - Uses instead interrupt() or join() (by case)
- Two main ways of having a Thread execute application code:
  - Providing **a new class that extends Thread and overriding its run()** method
  - Providing **a new Thread instance with a Runnable object** during its creation
  - In both cases, the start() method must be called to actually execute the new Thread.

# Base Thread: example1

## overriding run()

```
protected void startDownloadThread() {  
    Thread t = new Thread() {  
        public void run() {  
            mResult = "This is new result";  
        }  
    };  
    t.start();  
}
```

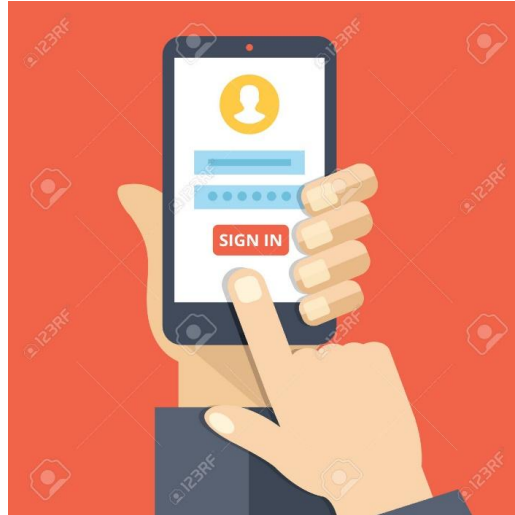
# Base Thread: example2

## Thread instance with a Runnable

```
class Multi3 implements Runnable{  
    public void run(){  
        System.out.println("thread is running...");  
    }  
  
    public static void main(String args[]){  
        Multi3 m1 = new Multi3();  
        // Using the constructor Thread(Runnable r)  
        Thread t1 = new Thread(m1);  
        t1.start();  
    }  
}
```

# Main Thread

- Created when an App is launched
- Often called the **UI thread**



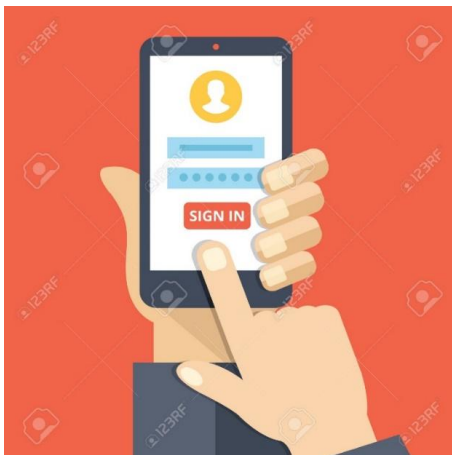
# **Problem**

## Keeping Apps Responsive

# Problem: keeping an App responsive

- **Testing the limitation of the UI thread:**

- How big a task we **should** do in UI thread?
- How big a task we **can** do in UI thread?
- What is the **alternative**?
- What is the **limitation of this alternative**?

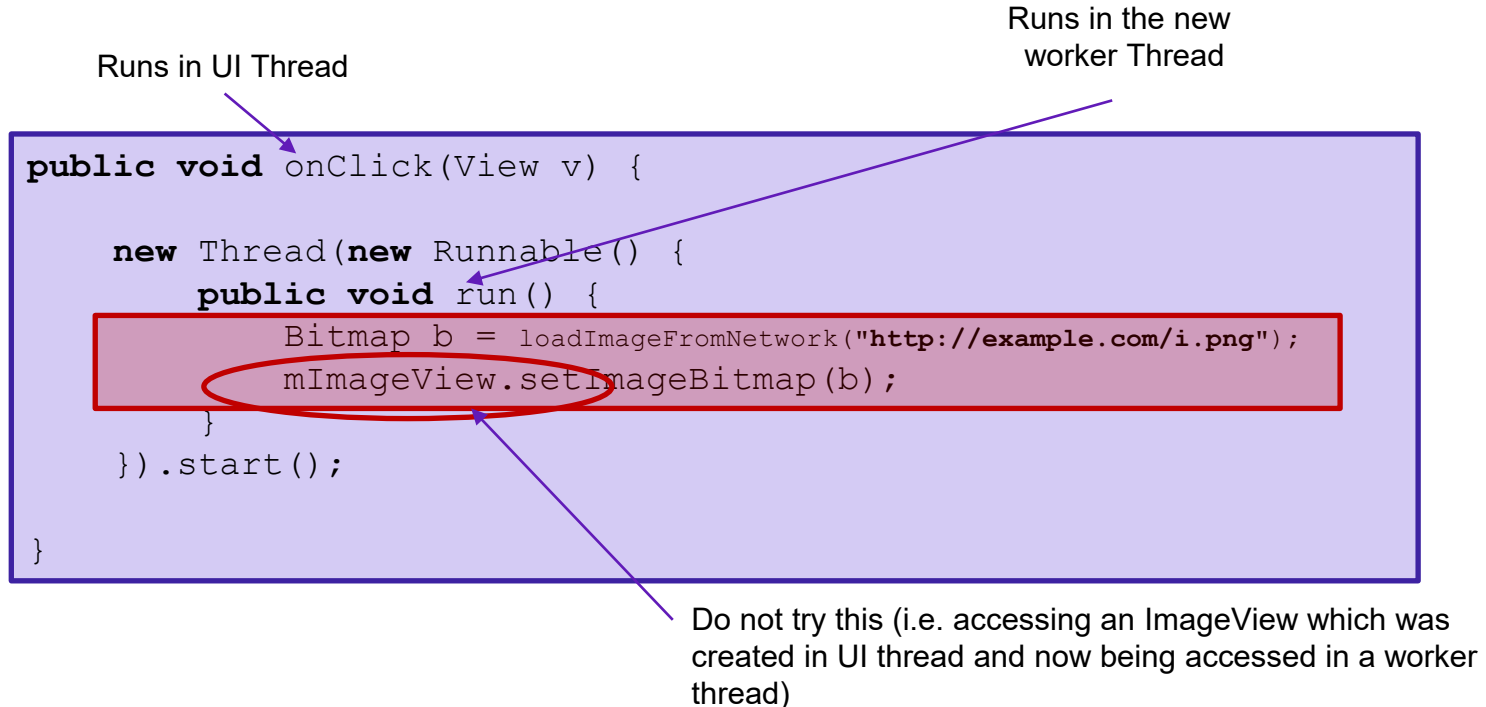


```
void clickEventHandler(View button)
{
    //what is my limit?
    //Let's experiment!
}
```



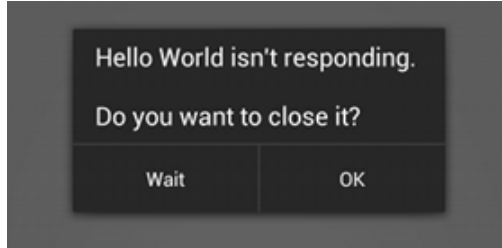
# Worker Thread

- Used to make UI thread light-weight, responsive.
- **Limitation:** Cannot access UI toolkit elements (e.g. views declared in UI thread) from another thread.



# So ... two lessons to remember

- Do not block the UI thread



**Caution:** Don't run long running (5 sec+) task in the UI thread

- Do not access the Android UI toolkit from outside the UI thread.

```
public void onClick(View v) {  
    new Thread(new Runnable() {  
        public void run() {  
            Bitmap b = loadImageFromNetwork("http://example.com/i.png");  
            mImageView.setImageBitmap(b);  
        }  
    }).start();  
}
```

# Solutions

# Solution 1. Handler: Consider UI Thread

- ❖ A main thread *Handler* object
  - Schedules messages and runnable to be executed at some point in the future

# Handler Object: Post example

```
public class MainActivity extends AppCompatActivity {
    Handler mHandler;

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

        mHandler = new Handler();

        new Thread(new Runnable() {
            @Override
            public void run() {
                // perform long running task here
                mHandler.post(new Runnable() {
                    @Override
                    public void run() {
                        mProgressBar.setProgress(currentProgressCount);
                    }
                });
            }
        }).start();
    }
}
```

# Handler Object: Post Delayed example

```
public class MainActivity extends AppCompatActivity {
    Handler mHandler;

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

        mHandler = new Handler();

        new Thread(new Runnable() {
            @Override
            public void run() {
                // perform long running task here
                mHandler.postDelay(new Runnable() {
                    @Override
                    public void run() {
                        mProgressBar.setProgress(currentProgressCount);
                    }
                }, 1000);
            }
        }).start();
    }
}
```

## Solution 2. Handler: Consider UI Thread

- ❖ posting **Runnable** objects to the main view
  - To add an action into a queue performed on a different thread

# Posting *Runnable* objects

## Access UI Thread from Other Threads

- Use one of these three:
  - **Activity.runOnUiThread** (Runnable)
  - **View.post** (Runnable)
  - **View.postDelayed** (Runnable, long)

```
public void onClick(View v) {  
    new Thread(new Runnable() {  
        public void run() {  
            final Bitmap bitmap =  
                loadImageFromNetwork("http://example.com/image.png");  
            mImageView.post(new Runnable() {  
                public void run() {  
                    mImageView.setImageBitmap(bitmap);  
                }  
            });  
        }  
    }).start();  
}
```



## Solution 3. Async Task

- Performs the blocking operations in a worker thread, and publishes the results on the UI thread using different built-in methods.

```
public void onClick(View v) {  
    new DownloadImageTask().execute("http://example.com/image.png");  
}  
  
private class DownloadImageTask extends AsyncTask<String, Void, Bitmap> {  
    /** The system calls this to perform work in a worker thread and  
     * delivers it the parameters given to AsyncTask.execute() */  
    protected Bitmap doInBackground(String... urls) {  
        return loadImageFromNetwork(urls[0]);  
    }  
  
    /** The system calls this to perform work in the UI thread and delivers  
     * the result from doInBackground() */  
    protected void onPostExecute(Bitmap result) {  
        mImageView.setImageBitmap(result);  
    }  
}
```

**Runs in worker  
Thread**

**Runs in UI  
Thread**

<http://developer.android.com/reference/android/os/AsyncTask.html>

# AsyncTask

- Created on the UI thread (any worker thread can be created from UI thread)
- Can be executed only once
- Long running tasks run on a background thread and result is published on the UI thread
- Extended as `AsyncTask<Void, Void, Void>`
  - The three types used by an asynchronous task are the following
    - 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

# AsyncTask

- Go through 4 steps:
  - **onPreExecute()**: invoked on the UI thread immediately after the execution of the task is started
  - **doInBackground(Param ...)**: invoked on the background thread immediately after onPreExecute() finishes executing
  - **onProgressUpdate(Progress...)**: invoked on the UI thread after a call to publishProgress(Progress...)
  - **onPostExecute(Result)**: invoked on the UI thread after the background computation finishes

# AsyncTask example

```
private class DownloadFilesTask extends AsyncTask<URL, Integer, Long> {  
    protected Long doInBackground(URL... urls) {  
        int count = urls.length;  
        long totalSize = 0;  
        for (int i = 0; i < count; i++) {  
            totalSize += Downloader.downloadFile(urls[i]);  
            publishProgress((int) ((i / (float) count) * 100));  
            // Escape early if cancel() is called  
            if (isCancelled()) break;  
        }  
        return totalSize;  
    }  
  
    protected void onProgressUpdate(Integer... progress) {  
        setProgressPercent(progress[0]);  
    }  
  
    protected void onPostExecute(Long result) {  
        showDialog("Downloaded " + result + " bytes");  
    }  
}  
  
new DownloadFilesTask().execute(url1, url2, url3);
```

## Solution 4. Executor and MainLooper (Preferable)

- Performs the blocking/long running operations in a worker thread (executor), and publishes the results on the UI thread (MainLooper).

```
ExecutorService executor = Executors.newSingleThreadExecutor();
Handler handler = new Handler(Looper.getMainLooper());

executor.execute(() -> {
    final Bitmap bitmap = loadImageFromNetwork(http://example.com/image.png);
    handler.post(() -> {
        mImageView.setImageBitmap(bitmap);
    });
});
```

Runs in  
worker  
Thread

Runs in UI  
Thread

```

private void downloadFilesTask(){
    ExecutorService executor = Executors.newSingleThreadExecutor();
    Handler handler = new Handler(Looper.getMainLooper());
    isDownloading = true;
    executor.execute(() -> {
        URL url = new URL(fileUrl);
        urlConnection = (HttpURLConnection) url.openConnection();
        urlConnection.connect();
        InputStream inputStream = urlConnection.getInputStream();
        FileOutputStream fileOutputStream = parent.openFileOutput(fileName, Context.MODE_PRIVATE);
        long totalSize = urlConnection.getContentLength();
        int MEGABYTE = 1024 * 128;
        byte[] buffer = new byte[MEGABYTE];
        long bufferLength;
        long downloaded = 0;
        lastProgress = 0;
        while ((bufferLength = inputStream.read(buffer)) > 0) {
            downloaded += bufferLength;
            int progress = (int) ((downloaded * 100) / totalSize);
            handler.post(() -> {
                selectedTxtProgress.setText(progress + "%");
                selectedProgressBar.setProgress(progress);
            });
            fileOutputStream.write(buffer, 0, (int) bufferLength);
        }
        fileOutputStream.close();
        urlConnection.disconnect();
        handler.post(() -> {
            Toast.makeText(parent, "Download is completed", Toast.LENGTH_LONG).show();
        });
    });
}

```

# Different Types of Executor

- **Executors.newCachedThreadPool()** — An `ExecutorService` with a thread pool that creates new threads as required but reuses previously created threads as they become available.
- **Executors.newFixedThreadPool(int numThreads)** — An `ExecutorService` that has a thread pool with a fixed number of threads. The `numThreads` parameter is the maximum number of threads that can be active in the `ExecutorService` at any one time. If the number of requests submitted to the pool exceeds the pool size, requests are queued until a thread becomes available.
- **Executors.newScheduledThreadPool(int numThreads)** — A `ScheduledExecutorService` with a thread pool that is used to run tasks periodically or after a specified delay.
- **Executors.newSingleThreadExecutor()** — An `ExecutorService` with a single thread. Tasks submitted will be executed one at a time and in the order submitted.
- **Executors.newSingleThreadScheduledExecutor()** — An `ExecutorService` that uses a single thread to execute tasks periodically or after a specified delay.

# Revisiting Multithreading in Android



```
public void onClick(View v) {  
    new Thread(new Runnable() {  
        public void run() {  
            Bitmap b = loadImageFromNetwork();  
            mImageView.setImageBitmap(b);  
        }  
    }).start();  
}
```

- Violate the single thread model: the Android UI toolkit is not thread-safe and must always be manipulated on the UI thread.
- In this piece of code, the ImageView is manipulated on a worker thread, which can cause really weird problems. Tracking down and fixing such bugs can be difficult and time-consuming

```
public void onClick(View v) {  
    new Thread(new Runnable() {  
        public void run() {  
            final Bitmap b = loadImageFromNetwork();  
            mImageView.post(new Runnable() {  
                public void run() {  
                    mImageView.setImageBitmap(b);  
                }  
            });  
        }  
    }).start();  
}
```

- Classes and methods also tend to make the code more complicated and more difficult to read.
- It becomes even worse when our implemented complex operations that require frequent UI updates

```
public void onClick(View v) {  
    new DownloadImageTask().execute("http://example.com/image.png");  
}  
  
private class DownloadImageTask extends AsyncTask {  
    protected Bitmap doInBackground(String... urls) {  
        return loadImageFromNetwork(urls[0]);  
    }  
  
    protected void onPostExecute(Bitmap result) {  
        mImageView.setImageBitmap(result);  
    }  
}
```

# Cancel Task

- `DownloadFilesTask dft = new DownloadFilesTask().execute(url1, url2, url3);`
- `dft.cancel(true);`

# Summary

- Executing a long running **blocking task** inside the click event **freezes the UI**.
- Starting a **new thread** to do the blocking task solves the responsiveness problem, but the new thread **cannot access UI elements** declared in UI thread.
- **Async Task** solves all the problems. It executes **doInBackground()** on a worker thread and **onPostExecute()** on the UI thread.

## Example 2. Progress Bar – Using Message Passing

### Layout 1/2

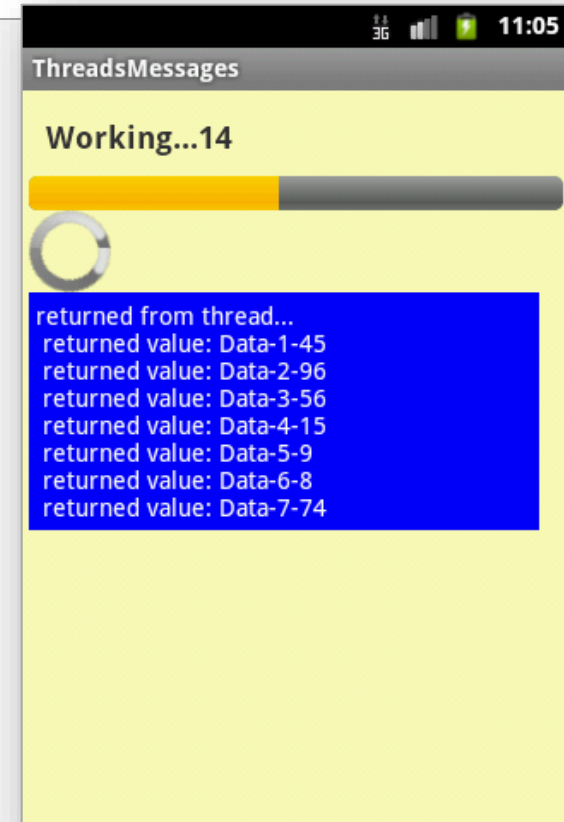
The main thread displays a horizontal and a circular *progress bar widget* showing the progress of a slow background operation. Some random data is periodically sent from the background thread and the messages are displayed in the main view.

```
<?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="#44ffff00"
    android:orientation="vertical"
    android:padding="4dp" >

    <TextView
        android:id="@+id/txtWorkProgress"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:padding="10dp"
        android:text="Working ...."
        android:textSize="18sp"
        android:textStyle="bold" />

    <ProgressBar
        android:id="@+id/progress1"
        style="?android:attr/progressBarStyleHorizontal"
        android:layout_width="match_parent"
        android:layout_height="wrap_content" />

    <ProgressBar
        android:id="@+id/progress2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content" />
```



## Example 2. Progress Bar – Using Message Passing

### Layout 2/2

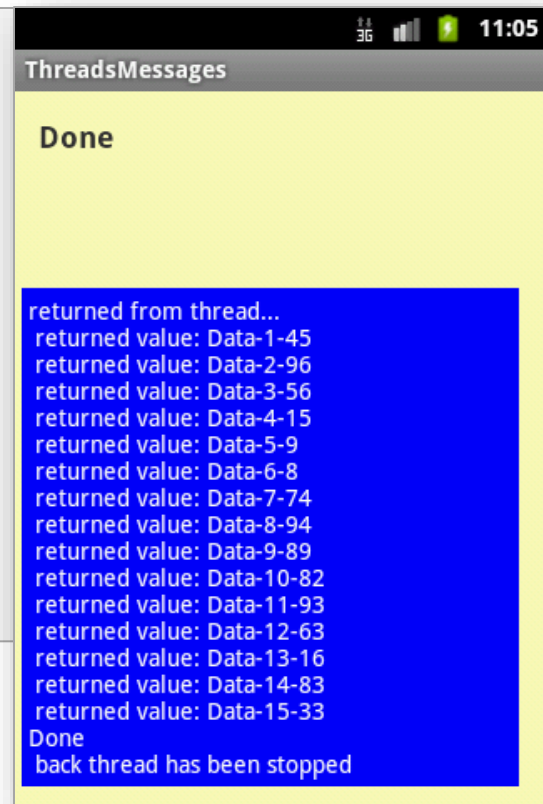
The main thread displays a horizontal and a circular *progress bar widget* showing the progress of a slow background operation. Some random data is periodically sent from the background thread and the messages are displayed in the main view.

```
<ScrollView
    android:layout_width="match_parent"
    android:layout_height="wrap_content" >

    <TextView
        android:id="@+id/txtReturnedValues"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_margin="7dp"
        android:background="#ff0000ff"
        android:padding="4dp"
        android:text="returned from thread..."
        android:textColor="@android:color/white"
        android:textSize="14sp" />

</ScrollView>

</LinearLayout>
```



## Example 2. Progress Bar – Using Message Passing

### Activity 1/5

The main thread displays a horizontal and a circular *progress bar widget* showing the progress of a slow background operation. Some random data is periodically sent from the background thread and the messages are displayed in the main view.

```
public class ThreadsMessages extends Activity {

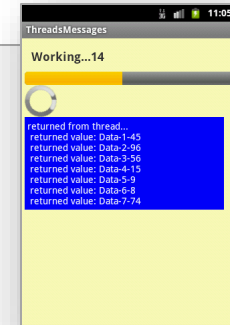
    ProgressBar bar1;
    ProgressBar bar2;

    TextView msgWorking;
    TextView msgReturned;

    // this is a control var used by backg. threads
    boolean isRunning = false;

    // lifetime (in seconds) for background thread
    final int MAX_SEC = 30;

    //String globalStrTest = "global value seen by all threads ";
    int globalIntTest = 0;
```





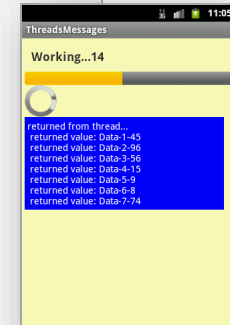
# Example 2. Progress Bar – Using Message Passing

Activity 4/5

```
public void onStart() {
    super.onStart();
    // this code creates the background activity where busy work is done
    Thread background = new Thread(new Runnable() {
        public void run() {
            try {
                for (int i = 0; i < MAX_SEC && isRunning; i++) {
                    //try a Toast method here (it will not work!)
                    //fake busy busy work here
                    → Thread.sleep(1000); //one second at a time

                    // this is a locally generated value between 0-100
                    Random rnd = new Random();
                    int localData = (int) rnd.nextInt(101);
                    //we can see and change (global) class variables
                    String data = "Data-" + globalIntTest + "-" + localData;
                    globalIntTest++;
                    //request a message token and put some data in it
                    → Message msg = handler.obtainMessage(1, (String)data);

                    // if thread is still alive send the message
                    → if (isRunning) {
                        handler.sendMessage(msg);
                    }
                }
            }
        }
    });
}
```



# Example 2. Progress Bar – Using Message Passing

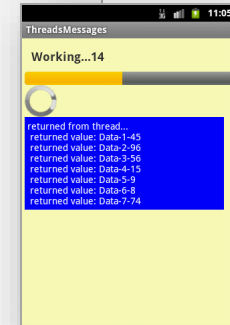
Activity 5/5

```
catch (Throwable t) {
    // just end the background thread
    isRunning = false;
}
}); // Tread

isRunning = true;
background.start();

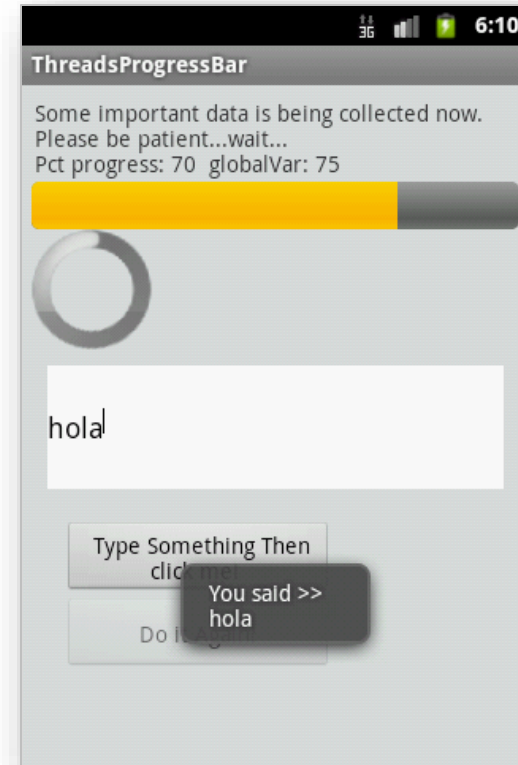
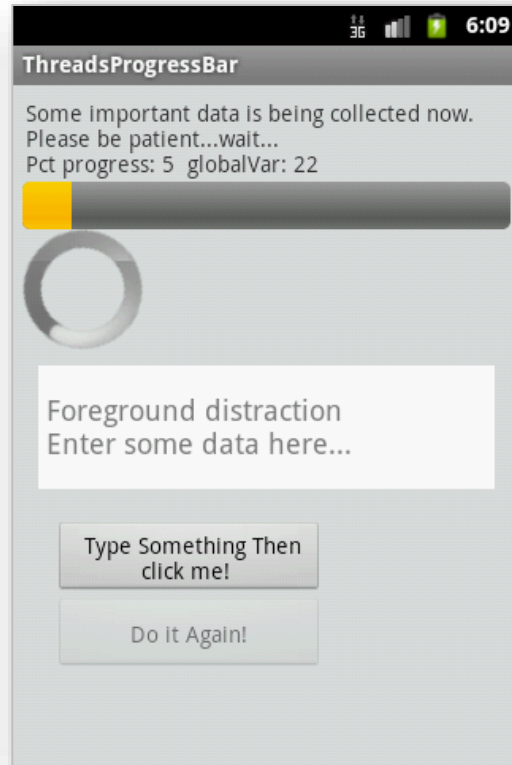
} // onStart

public void onStop() {
    super.onStop();
    isRunning = false;
} // onStop
} // class
```



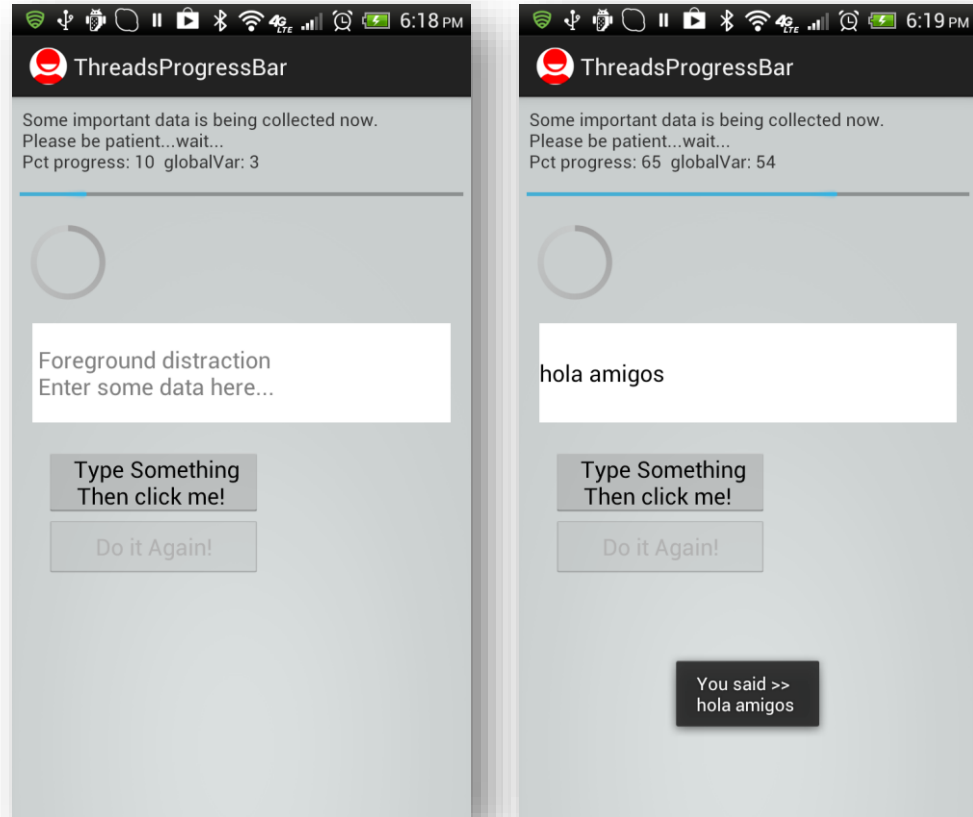
## Example 3. Using Handler `post(...)` Method

We will try the same problem presented earlier (a slow background task and a responsive foreground UI) this time using the **posting mechanism** to execute foreground *runnables*.



## Example 3. Using Handler post(...) Method

We will try the same problem presented earlier (a slow background task and a responsive foreground UI) this time using the **posting mechanism** to execute foreground *runnables*.



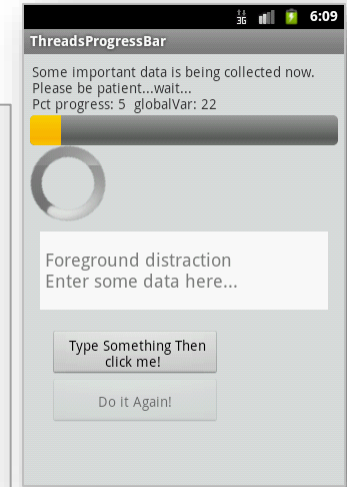
## Example 3. Using post - layout: main.xml

```
<?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="#22002222"
    android:orientation="vertical"
    android:padding="6dp" >

    <TextView
        android:id="@+id/lblTopCaption"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:padding="2dp"
        android:text=
            "Some important data is been collected now. Patience please..."
    />

    <ProgressBar
        → android:id="@+id/myBarHor"
        style="?android:attr/progressBarStyleHorizontal"
        android:layout_width="match_parent"
        android:layout_height="30dp" />

    <ProgressBar
        → android:id="@+id/myBarCir"
        style="?android:attr/progressBarStyleLarge"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content" />
```



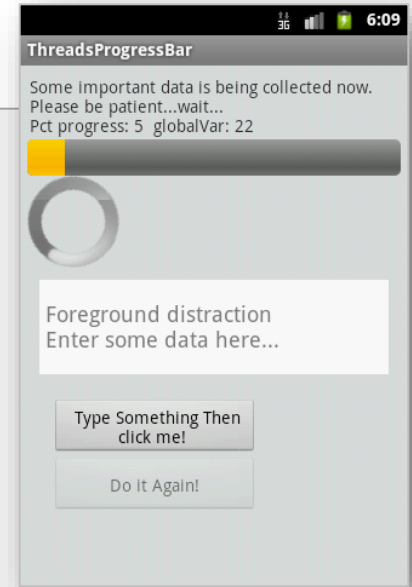
## Example 3. Using post - layout: main.xml

```
<EditText
    android:id="@+id/txtBox1"
    android:layout_width="match_parent"
    android:layout_height="78dp"
    android:layout_margin="10dp"
    android:background="#ffffff"
    android:textSize="18sp" />

<Button
    android:id="@+id/btnDoSomething"
    android:layout_width="170dp"
    android:layout_height="wrap_content"
    android:layout_marginLeft="20dp"
    android:layout_marginTop="10dp"
    android:padding="4dp"
    android:text=" Type Something Then click me! " />

<Button
    android:id="@+id/btnDoItAgain"
    android:layout_width="170dp"
    android:layout_height="wrap_content"
    android:layout_marginLeft="20dp"
    android:padding="4dp"
    android:text=" Do it Again! " />
```

```
</LinearLayout>
```



# Example 3. Using post - Main Activity

1/5

```
public class ThreadsPosting extends Activity {
    ProgressBar myBarHorizontal;
    ProgressBar myBarCircular;

    TextView lblTopCaption;
    EditText txtDataBox;
    Button btnDoSomething;
    Button btnDoItAgain;
    int progressStep = 5;

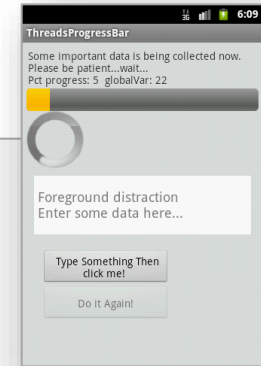
    int globalVar = 0;
    int accum = 0;

    long startingMills = System.currentTimeMillis();
    boolean isRunning = false;
    String PATIENCE = "Some important data is being collected now. "
        + "\nPlease be patient...wait... ";

    → Handler myHandler = new Handler();

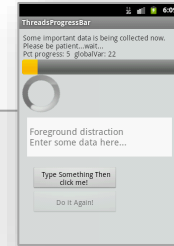
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        lblTopCaption = (TextView) findViewById(R.id.lblTopCaption);
    }
}
```



## Example 3. Using post - Main Activity

2/5



```
myBarHorizontal = (ProgressBar) findViewById(R.id.myBarHor);
myBarCircular = (ProgressBar) findViewById(R.id.myBarCir);

txtDataBox = (EditText) findViewById(R.id.txtBox1);
txtDataBox.setHint(" Foreground distraction\n Enter some data here...");

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

btnDoSomething = (Button) findViewById(R.id.btnDoSomething);
btnDoSomething.setOnClickListener(new OnClickListener() {
    @Override
    public void onClick(View v) {
        Editable text = txtDataBox.getText();
        Toast.makeText(getApplicationContext(), "You said >> \n" + text, 1).show();
    } // onClick
}); // setOnClickListener

} // onCreate
```





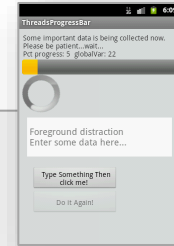
## Example 3. Using post - Main Activity

3/5

```
@Override
protected void onStart() {
    super.onStart();
    // prepare UI components
    txtDataBox.setText("");
    btnDoItAgain.setEnabled(false);

    // reset and show progress bars
    accum = 0;
    myBarHorizontal.setMax(100);
    myBarHorizontal.setProgress(0);
    myBarHorizontal.setVisibility(View.VISIBLE);
    myBarCircular.setVisibility(View.VISIBLE);

    // create background thread where the busy work will be done
    Thread myBackgroundThread = new Thread( backgroundTask, "backAlias1" );
    myBackgroundThread.start();
}
```



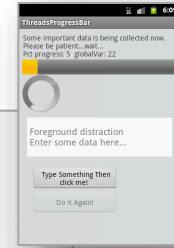
# Example 3. Using post - Main Activity

4/5

```
// FOREGROUND
// this foreground Runnable works on behave of the background thread
// updating the main UI which is unreachable to it
private Runnable foregroundRunnable = new Runnable() {
    @Override
    public void run() {
        try {
            // update UI, observe globalVar is changed in back thread
            lblTopCaption.setText( PATIENCE
                                + "\nPct progress: " + accum
                                + " globalVar: " + globalVar);

            // advance ProgressBar
            myBarHorizontal.incrementProgressBy(progressStep);
            accum += progressStep;

            // are we done yet?
            if (accum >= myBarHorizontal.getMax()) {
                lblTopCaption.setText("Background work is OVER!");
                myBarHorizontal.setVisibility(View.INVISIBLE);
                myBarCircular.setVisibility(View.INVISIBLE);
                btnDoItAgain.setEnabled(true);
            }
        } catch (Exception e) {
            Log.e("<<foregroundTask>>", e.getMessage());
        }
    }
}; // foregroundTask
```

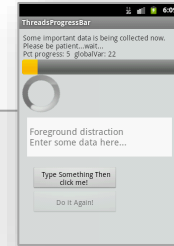


Foreground  
runnable is  
defined but not  
started !

Background  
thread will  
requests its  
execution later

# Example 3. Using post - Main Activity

5/5



```
// BACKGROUND
// this is the back runnable that executes the slow work

private Runnable backgroundTask = new Runnable() {
    @Override
    public void run() {
        // busy work goes here...
        try {
            for (int n = 0; n < 20; n++) {
                // this simulates 1 sec. of busy activity
                Thread.sleep(1000);
                // change a global variable from here...
                globalVar++;
                // try: next two UI operations should NOT work
                // Toast.makeText(getApplication(), "Hi ", 1).show();
                // txtDataBox.setText("Hi ");

                // wake up foregroundRunnable delegate to speak for you
                myHandler.post(foregroundRunnable);
            }
        } catch (InterruptedException e) {
            Log.e("<<foregroundTask>>", e.getMessage());
        }
    }
}

// run
}; // backgroundTask

// ThreadsPosting
```

Tell foreground  
runnable to do  
something for us...

# Assignment-2: Use SQLite

**Mandatory fields:** name, email, phone (home), and photo

You must check the validity of values in all fields

If any invalid value exists, user should be notified using a popup dialog with error message

If all are valid, then user will be asked to save

Pressing on 'Cancel' closes app without saving contact info

## Contact Form

Name

Email

Phone (Home)

Phone (Office)

Cancel

Save

Photo

Store the image after encoding the image to string using **base64** converting method (Search on google to get the example source code for encoding image to string)

Pressing on 'Save' shows a dialog with valid/invalid message

If all are valid, then stores contact info in SharedPreferences

Should show a successful message using Toast after saving

**END**