Lesson 22

Android Services

Victor Matos
Cleveland State University

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

Services

Android Services

A Service is an application component that runs in the background, not interacting with the user, for an **indefinite** period of time.

> Services, like other application objects (activitties, broadcast listeners…), run in the main thread of their hosting process.

This means that, if your service is going to do any CPU intensive (such as MP3 playback) or blocking (such as networking) operations, it *should spawn its own thread in which to do that work.*

Each service class must have a corresponding **<service>** declaration in its package's **AndroidManifest.xml**.

Taken from: http://developer.android.com/guide/components/services.html

Services

Android Services

- Services can be started with: startService() and bindService().
- Each startService call invokes the **onStart**() method of the service class, however the service is started only with the *first* call.
- Only one stopService() call is needed to stop the service, no matter how many times startService() was called.

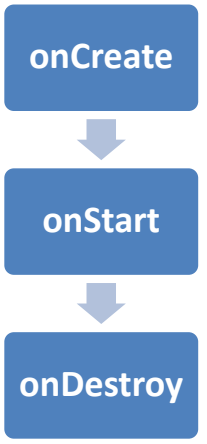
Taken from: http://developer.android.com/guide/components/services.html

Services

Service Life Cycle

Like an activity, a service has lifecycle methods that you can implement to monitor changes in its state. But they are fewer than the activity methods — only three — and they are public, not protected:

1. **void onCreate ()**
2. **void onStart (Intent intent)**
3. **void onDestroy ()**



Services

Service Life Cycle

The entire lifetime of a service happens between the time onCreate() is called and the time onDestroy() returns.

Like an activity, a service does its initial setup in onCreate(), and releases all remaining resources in onDestroy().

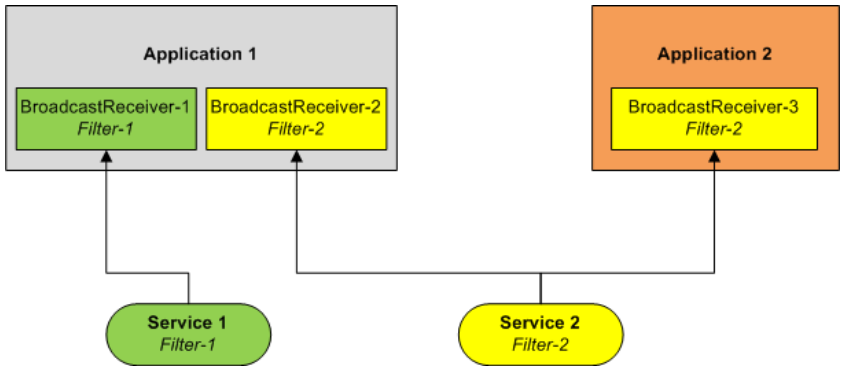
For example, a music playback service could create the thread where the music will be played in *onCreate*(), and then stop the thread in *onDestroy*().

Services

Broadcast Receiver Lifecycle

A Broadcast Receiver is an application class that listens for global Intents that are broadcasted to any one who bothers to listen, rather than being sent to a single target application/activity.

The system delivers a broadcast Intent to all interested broadcast receivers, which handle the Intent *sequentially*.



Services

Registering a Broadcast Receiver

- You can either *dynamically* register an instance of this class with **registerReceiver()**
- or statically publish an implementation through the **<receiver>** tag in your AndroidManifest.xml (see next example).

Services

Broadcast Receiver Lifecycle

A broadcast receiver has a single callback method:

```
void onReceive (Context context, Intent broadcastMsg)
```

1. When a broadcast message arrives for the receiver, Android calls its `onReceive()` method and passes it the Intent object containing the message.
2. The broadcast receiver is considered to be *active* only while it is executing its `onReceive()` method.
3. When `onReceive()` returns, it is inactive.

Services

Services, BroadcastReceivers and the AdroidManifest

The **manifest** of applications using Android Services must include:

1. A **<service>** entry for each service used in the application.
2. If the application defines a **BroadcastReceiver** as an independent class, it must include a **<receiver>** clause identifying the component.
   - In addition an **<intent-filter>** entry is needed to declare the actual filter the service and the receiver use.

See example

Services

Services, BroadcastReceivers and the AdroidManifest

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
      package="cis493.demos" android:versionCode="1" android:versionName="1.0.0">
    <uses-sdk android:minSdkVersion="10"  ></uses-sdk>

    <application android:icon="@drawable/icon" android:label="@string/app_name">

        <activity android:name=".MyServiceDriver2">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>

        <service android:name="MyService2" />

        <receiver android:name="MyBroadcastReceiver">
            <intent-filter>
                <action android:name = "matos.action.GOSERVICE2" />
            </intent-filter>
        </receiver>

    </application>
</manifest>
```


Services

Types of Broadcasts

There are two major classes of broadcasts that can be received:

1. **Normal broadcasts** (sent with **sendBroadcast**) are completely *asynchronous*. All receivers of the broadcast are run in an *undefined* order, often at the same time.
2. **Ordered broadcasts** (sent with **sendOrderedBroadcast**) are delivered to one receiver at a time. As each receiver executes in turn, it can propagate a result to the next receiver, or it can completely abort the broadcast (**abortBroadcast()**)so that it won't be passed to other receivers.
   - Ordering receivers for execution can be controlled with the **android:priority** attribute of the matching *intent-filter*;
   - Receivers with the *same priority* will be run in an *arbitrary order*.

Services

Example: Main Steps – The Main Activity

Assume main activity *MyService3Driver* wants to interact with a service called *MyService3*. The main activity is responsible for the following tasks:

1. Start the service called *MyService3*.

```
Intent intentMyService = new Intent(this, MyService3.class);
ComponentName service = startService(intentMyService);
```

2. Define corresponding receiver's filter and register local receiver

```
IntentFilter mainFilter = new IntentFilter("matos.action.GOSERVICE3");
BroadcastReceiver receiver = new MyMainLocalReceiver();
registerReceiver(receiver, mainFilter);
```

3. Implement local receiver and override its main method

```
public void onReceive(Context localContext, Intent callerIntent)
```

Services

Example: Main Steps – The Service

The Service uses its *onStart* method to do the following:

1. Create an Intent with the appropriate broadcast filter (any number of receivers could match it).

```
Intent myFilteredResponse = new Intent("matos.action.GOSERVICE3");
```

2. Prepare the extra data ('myServiceData') to be sent with the intent to the receiver(s)

```
Object msg = some user data goes here;
myFilteredResponse.putExtra("myServiceData", msg);
```

3. Release the intent to all receivers matching the filter

```
sendBroadcast(myFilteredResponse);
```


Services

Example: Steps – The Driver (again)

The main activity is responsible for cleanly terminating the service. Do the following

1. Assume `intentMyService` is the original Intent used to start the service. Calling the termination of the service is accomplished by the method

```
stopService(new Intent(intentMyService) );
```

2. Use the service's onDestroy method to assure that all of its running threads are terminated and the receiver is unregistered.

```
unregisterReceiver(receiver);
```


Services

Example 1. A very Simple Service

The main application starts a service. The service prints lines on the **LogCat** until the main activity stops the service. No **IPC** occurs in the example.

```
public class TestMyService1 extends Activity implements OnClickListener {

    TextView txtMsg;
    ComponentName service;
    Intent intentMyService1;

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);

        setContentView(R.layout.main);
        txtMsg = (TextView) findViewById(R.id.txtMsg);
        findViewById(R.id.btnStopService).setOnClickListener(this);

        intentMyService1 = new Intent(this, MyService1.class);
        service =  startService(intentMyService1);

        txtMsg.setText("MyService1 started\n (see LogCat)");

    }
```

Services

Example 1. A very Simple Service

The main application starts a service. The service prints lines on the **LogCat** until the main activity stops the service. No **IPC** occurs in the example.

```
@Override
public void onClick(View v) {
    // assume:  v.getid == R.id.btnStopService
    try {
        stopService(intentMyService1);

        txtMsg.setText("After stopping Service: \n" + service.getClassName());

    } catch (Exception e) {
     Toast.makeText(this, e.getMessage(), 1).show();
    }

  }//onClick

}//class
```

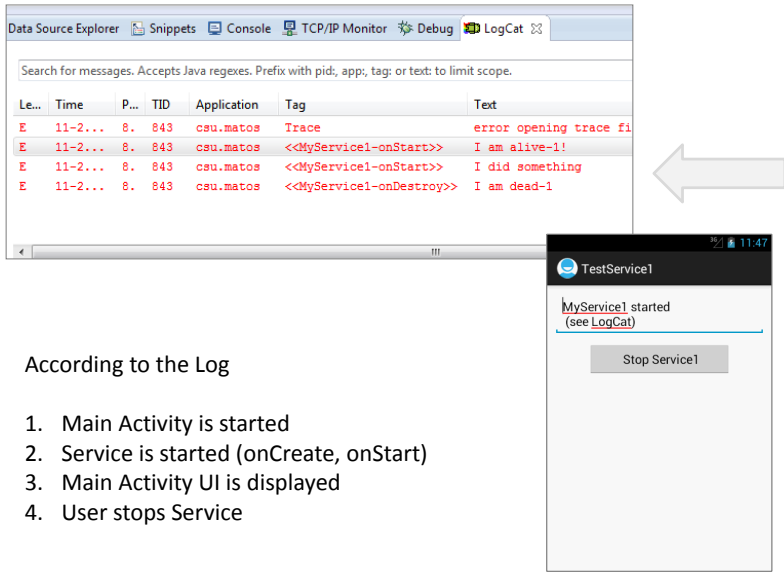
Services

Example 1. *cont.*

```
//non CPU intensive service running the main task in its main thread
package cis.matos;
import . . .
public class MyService1 extends Service {

        @Override
        public IBinder onBind(Intent arg0) {
                return null;
        }

        @Override
        public void onCreate() {
                super.onCreate();
        }

        @Override
        public void onStart(Intent intent, int startId) {
                Log.e ("<<MyService1-onStart>>", "I am alive-1!");
                Log.e ("<<MyService1-onStart>>", "I did something");
        }

        @Override
        public void onDestroy() {
                Log.e ("<<MyService1-onDestroy>>", "I am dead-1");
        }
}//MyService1
```

Services

Example 1. *cont.*



According to the Log

1. Main Activity is started
2. Service is started (onCreate, onStart)
3. Main Activity UI is displayed
4. User stops Service

Services

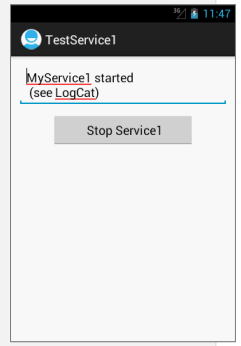
Example 1. *cont.* *Manifest*

```
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="csu.matos"
    android:versionCode="1"
    android:versionName="1.0" >

    <uses-sdk
        android:minSdkVersion="8"
        android:targetSdkVersion="15" />

    <application
        android:icon="@drawable/ic_launcher"    android:label="@string/app_name"
        android:theme="@style/AppTheme" >
        <activity
            android:name=".TestMyService1"
            android:label="@string/title_activity_test_service1" >
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />

                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
        <service android:name="MyService1" />
    </application>
</manifest>
```


Services

Example 1. *cont.* *Layout*

```
<?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:orientation="vertical" >

    <EditText
        android:id="@+id/txtMsg"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:inputType="none"
        android:layout_margin="10dp" />


    <Button
        android:id="@+id/btnStopService"
        android:layout_width="204dp"
        android:layout_height="wrap_content"
        android:layout_gravity="center"
        android:text=" Stop Service1" />

</LinearLayout>
```



Services

Example 2. A More Interesting Activity-Service Interaction

1. The main activity starts the *service* and registers a *receiver*.
2. The service is slow, therefore it runs in a parallel thread its time consuming task.
3. When done with a computing cycle, the service adds a message to an intent.
4. The *intent* is broadcasted using the filter: matos.action.GOSERVICE3.
5. A *BroadcastReceiver* (defined inside the main Activity) uses the previous filter and catches the message (displays the contents on the main UI).
6. At some point the main activity stops the service and finishes executing.

Services

Example 2. Layout

```
<?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:orientation="vertical" >
    <Button
        android:id="@+id/btnStopService"
        android:layout_width="151dip"
        android:layout_height="wrap_content"
        android:layout_gravity="center"
        android:text="Stop Service" />
    <ScrollView
        android:layout_width="match_parent"
        android:layout_height="wrap_content" >

        <TextView
            android:id="@+id/txtMsg"
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:inputType="none" />
    </ScrollView>
</LinearLayout>
```

Services

Example 2. Manifest

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="cis493.demos"
    android:versionCode="1"
    android:versionName="1.0.0" >

    <uses-sdk android:minSdkVersion="10" >
    </uses-sdk>

    <application
        android:icon="@drawable/ic_launcher"
        android:label="@string/app_name"
        android:theme="@android:style/Theme.Holo.Light">

        <activity
            android:name=".MyServiceDriver3"
            android:label="@string/app_name" >
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />

                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>

        <service android:name="MyService3" >
        </service>
    </application>

</manifest>
```


Services

Example 2. Main Activity 1 of 3

```
public class MyServiceDriver3 extends Activity implements OnClickListener {
    TextView txtMsg;
    ComponentName service;
    Intent intentMyService3;
    BroadcastReceiver receiver;

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

        intentMyService3 = new Intent(this, MyService3.class);
        service = startService(intentMyService3);

        txtMsg.setText("MyService3 started - (see LogCat)");
        findViewById(R.id.btnStopService).setOnClickListener(this);

       // register & define filter for local listener
       IntentFilter mainFilter = new IntentFilter("matos.action.GOSERVICE3");
       receiver = new MyMainLocalReceiver();
       registerReceiver(receiver, mainFilter);

    }//onCreate
```

Example 2. Main Activity 2 of 3

```
   public void onClick(View v) {
      // assume:  v.getId() == R.id.btnStopService
      try {

         stopService(intentMyService3);

         txtMsg.setText("After stoping Service: \n" + service.getClassName() );
      } catch (Exception e) {
         e.printStackTrace();
      }
   }

   @Override
   protected void onDestroy() {
      super.onDestroy();
      try {
         stopService(intentMyService3);
         unregisterReceiver(receiver);

      } catch (Exception e) {

         Log.e ("MAIN3-DESTROY>>>", e.getMessage() );
      }
      Log.e ("MAIN3-DESTROY>>>" , "Adios" );
   }
```


Example 2. Main Activity 3 of 3

```
   public class MyMainLocalReceiver extends BroadcastReceiver {

      @Override
      public void onReceive(Context localContext, Intent callerIntent) {

         String serviceData = callerIntent.getStringExtra("service3Data");

         Log.e ("MAIN>>>", "Data received from Service3: " + serviceData);

         String now = "\nService3Data: > " + serviceData;

         txtMsg.append(now);
      }

   }//MyMainLocalReceiver

}//MyServiceDriver3
```

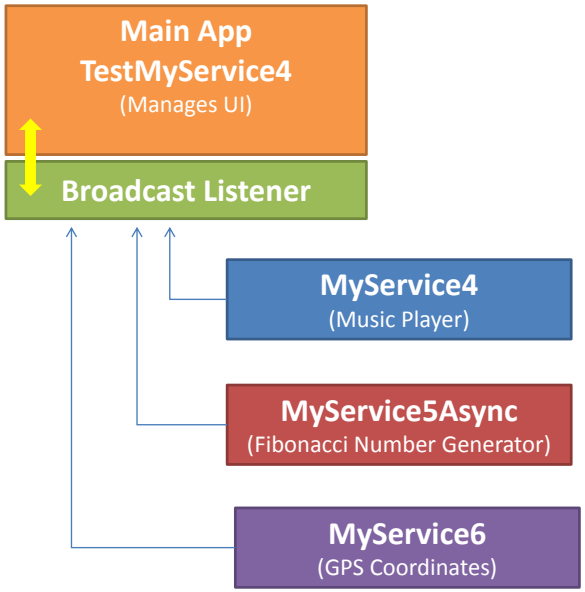

Example 2. Service 1 of 2

```
public class MyService3 extends Service {
  boolean isRunning = true;

  @Override
  public IBinder onBind(Intent arg0) {
    return null;
  }

  @Override
  public void onCreate() {
    super.onCreate();
  }

  @Override
  public void onStart(Intent intent, int startId) {
    Log.e ("<<MyService3-onStart>>", "I am alive-3!");

    Thread serviceThread = new Thread ( new Runnable(){
      public void run() {
        for(int i=0; (i< 120) & isRunning; i++) {
          try {
            //fake that you are very busy here
            Thread.sleep(1000);
            Intent intentDataForMyClient = new Intent("matos.action.GOSERVICE3");
            String msg = "data-item-" + i;
```


Example 2. Service 2 of 2

```
            intentDataForMyClient.putExtra("service3Data", msg);
            sendBroadcast(intentDataForMyClient);

          } catch (Exception e) {
            e.printStackTrace();
          }
        }//for

      }//run

    });
    serviceThread.start();

  }//onStart

  @Override
  public void onDestroy() {
    super.onDestroy();
    Log.e ("<<MyService3-onDestroy>>", "I am Dead-3");
    isRunning = false;
  }//onDestroy

}//MyService3
```

Example 3. An App Connected to Multiple Services



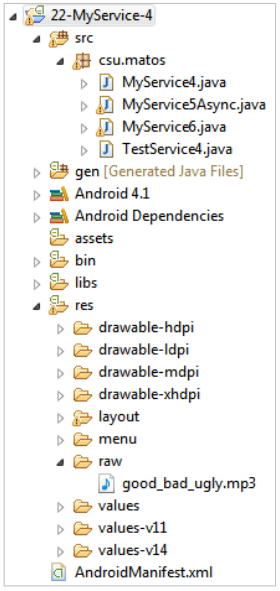
Example 3. An App Connected to Multiple Services

In this applicatiopn the Main Activity starts three services:

1. **MyService4**: A music player whose input is an mp3 resource file stored in **res/raw**.
2. **MyService5Async**: A service producing Fibonacci numbers in the 20-50 range. The task of number generation is implemented inside an AsyncTask. The efficiency of this Fibonacci implementation is $O(2^n)$ [intentionally slow!]
3. **MyService6**: The service returns GPS coordinates. Two methods are used to obtain the current location (a) a quick Network-provider based reading (coarse location) , and (b) a more precise but slower Satellite reading (fine location).

The Main Application defines and registers a **BroadcastReceiver** capable of attending messages matching any of the three filters used by the broadcasting services above. Received results are displayed on the user's screen.

Example 3. An App Connected to Multiple Services



Example 3. MainActivity: TestMyService4.java

```
package csu.matos;
import . . .

public class TestService4 extends Activity implements OnClickListener {
  TextView txtMsg;
  Intent intentCallService4;
  Intent intentCallService5;
  Intent intentCallService6;
  BroadcastReceiver receiver;

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

    findViewById(R.id.btnStart4).setOnClickListener(this);
    findViewById(R.id.btnStop4).setOnClickListener(this);

    findViewById(R.id.btnStart5).setOnClickListener(this);
    findViewById(R.id.btnStop5).setOnClickListener(this);

    findViewById(R.id.btnStart6).setOnClickListener(this);
    findViewById(R.id.btnStop6).setOnClickListener(this);
```

Services

Example 3. MainActivity: TestMyService4.java

```
    Log.e("MAIN", "Main started");

    // get ready to invoke execution of background services
    intentCallService4 = new Intent(this, MyService4.class);
    intentCallService5 = new Intent(this, MyService5Async.class);
    intentCallService6 = new Intent(this, MyService6.class);

    // register local listener & define triggering filter
    IntentFilter filter5 = new IntentFilter("matos.action.GOSERVICE5");
    IntentFilter filter6 = new IntentFilter("matos.action.GPSFIX");

    receiver = new MyEmbeddedBroadcastReceiver();
    registerReceiver(receiver, filter5);
    registerReceiver(receiver, filter6);


  }// onCreate
```


Services

Example 3. MainActivity: TestMyService4.java

```
  @Override
  public void onClick(View v) {

    if (v.getId() == R.id.btnStart4) {
      Log.e("MAIN", "onClick: starting service4");
      startService(intentCallService4);
    } else if (v.getId() == R.id.btnStop4) {
      Log.e("MAIN", "onClick: stopping service4");
      stopService(intentCallService4);
    } else if (v.getId() == R.id.btnStart5) {
      Log.e("MAIN", "onClick: starting service5");
      startService(intentCallService5);
    } else if (v.getId() == R.id.btnStop5) {
      Log.e("MAIN", "onClick: stopping service5");
      stopService(intentCallService5);
    } else if (v.getId() == R.id.btnStart6) {
      Log.e("MAIN", "onClick: starting service6");
      startService(intentCallService6);
    } else if (v.getId() == R.id.btnStop6) {
      Log.e("MAIN", "onClick: stopping service6");
      stopService(intentCallService6);
    }
  }// onClick
```


Services

Example 3. MainActivity: TestMyService4.java

```
  public class MyEmbeddedBroadcastReceiver extends BroadcastReceiver {
    @Override
    public void onReceive(Context context, Intent intent) {
      Log.e("MAIN>>>", "ACTION: " + intent.getAction());

      if (intent.getAction().equals("matos.action.GOSERVICE5")) {
        String service5Data = intent.getStringExtra("MyService5DataItem");
        Log.e("MAIN>>>", "Data received from Service5: " + service5Data);
        txtMsg.append("\nService5Data: > " + service5Data);

      } else if (intent.getAction().equals("matos.action.GPSFIX")) {
        double latitude = intent.getDoubleExtra("latitude", -1);
        double longitude = intent.getDoubleExtra("longitude", -1);
        String provider = intent.getStringExtra("provider");
        String service6Data = provider
                 + " lat: " + Double.toString(latitude)
                 + " lon: " + Double.toString(longitude);
        Log.e("MAIN>>>", "Data received from Service6: " + service6Data);
        txtMsg.append("\nService6Data: > " + service6Data);
      }

    }//onReceive
  }// MyEmbeddedBroadcastReceiver
}// TestService4 class
```


Services

Example 3. MyService4 – A Music Player

```
package csu.matos;
import . . .

public class MyService4 extends Service {
  public static boolean boolIsServiceCreated = false;
  MediaPlayer player;

  @Override
  public IBinder onBind(Intent intent) {
    return null;
  }

  @Override
  public void onCreate() {
    Toast.makeText(this, "MyService4 Created", Toast.LENGTH_LONG).show();
    Log.e("MyService4", "onCreate");

    boolIsServiceCreated = true;
    player = MediaPlayer.create(getApplicationContext(),
                                R.raw.good_bad_ugly);
  }
```

Example 3. MyService4 – A Music Player

```
  @Override
  public void onDestroy() {
    Toast.makeText(this, "MyService4 Stopped", Toast.LENGTH_LONG).show();
    Log.e("MyService4", "onDestroy");
    player.stop();
    player.release();
    player = null;
  }

  @Override
  public void onStart(Intent intent, int startid) {
    if (player.isPlaying())
      Toast.makeText(this, "MyService4 Already Started " + startid,
          Toast.LENGTH_LONG).show();
    else
      Toast.makeText(this, "MyService4 Started " + startid,
          Toast.LENGTH_LONG).show();

    Log.e("MyService4", "onStart");
    player.start();
  }
}
```


Example 3. MyService5Async – A Slow Fibonacci Number Gen.

```
package csu.matos;
import . . .

public class MyService5Async extends Service {
  boolean isRunning = true;

  private Handler handler = new Handler() {
    @Override
    public void handleMessage(Message msg) {
      super.handleMessage(msg);
      Log.e("MyService5Async-Handler", "Handler got from MyService5Async: "
            + (String)msg.obj);
    }
  };

  @Override
  public IBinder onBind(Intent arg0) {
    return null;
  }

  @Override
  public void onCreate() {
    super.onCreate();
  }
```


Example 3. MyService5Async – A Slow Fibonacci Number Gen.

```
  @Override
  public void onStart(Intent intent, int startId) {
    Log.e ("<<MyService5Async-onStart>>", "I am alive-5Async!");
    // we place the slow work of the service in an AsynTask
    // so the response we send our caller who run
    // a "startService(...)" method gets a quick OK from us.

    new ComputeFibonacciRecursivelyTask().execute(20, 50);
  }//onStart

  // this recursive evaluation of Fibonacci numbers is exponential O(2^n)
  // for large n values it should be very time-consuming!
  public Integer fibonacci(Integer n){
    if ( n==0 || n==1 )
      return 1;
    else
      return fibonacci(n-1) + fibonacci(n-2);
  }

  @Override
  public void onDestroy() {
    //super.onDestroy();
    Log.e ("<<MyService5Async-onDestroy>>", "I am dead-5-Async");
    isRunning = false;
  }//onDestroy
```


Example 3. MyService5Async – A Slow Fibonacci Number Gen.

```
  public class ComputeFibonacciRecursivelyTask extends AsyncTask <
                                                  Integer, Integer, Integer > {
    @Override
    protected Integer doInBackground(Integer... params) {
      for (int i=params[0]; i<params[1]; i++){
        Integer fibn = fibonacci(i);
        publishProgress(i, fibn);
      }
      return null;
    }

    @Override
    protected void onProgressUpdate(Integer... values) {
      super.onProgressUpdate(values);
      Intent intentFilter5 = new Intent("matos.action.GOSERVICE5");
      String data = "dataItem-5-fibonacci-AsyncTask"
                  + values[0] + ": " + values[1];
      intentFilter5.putExtra("MyService5DataItem", data);
      sendBroadcast(intentFilter5);
      // (next id not really needed!!! - we did the broadcasting already)
      Message msg = handler.obtainMessage(5, data);
      handler.sendMessage(msg);
    }
  }// ComputeFibonacciRecursivelyTask
}//MyService5
```

Example 3. MyService6 – A GPS Service broadcasting locations.

```
package csu.matos;
Import . . .

public class MyService6 extends Service {

  String GPS_FILTER = "matos.action.GPSFIX";

  Thread serviceThread;
  LocationManager lm;
  GPSListener myLocationListener;

  @Override
  public IBinder onBind(Intent arg0) {
    return null;
  }

  @Override
  public void onCreate() {
    super.onCreate();
  }
```


Example 3. MyService6 – A GPS Service broadcasting locations.

```
  @Override
  public void onStart(Intent intent, int startId) {
    Log.e("<<MyGpsService-onStart>>", "I am alive-GPS!");

    serviceThread = new Thread(new Runnable() {
      public void run() {

        getGPSFix_Version1();    // uses NETWORK provider

        getGPSFix_Version2();    // uses GPS chip provider

      }// run

    });

    serviceThread.start();

  }// onStart
```


Example 3. MyService6 – A GPS Service broadcasting locations.

```
  public void getGPSFix_Version1() {

        // Get the location manager
        LocationManager locationManager = (LocationManager)
                                  getSystemService(Context.LOCATION_SERVICE);
        // work with best provider
        Criteria criteria = new Criteria();
        String provider = locationManager.getBestProvider(criteria, false);
        Location location = locationManager.getLastKnownLocation(provider);
        if ( location != null ){
          // capture location data sent by current provider
        double latitude = location.getLatitude();
        double longitude = location.getLongitude();

        // assemble data bundle to be broadcasted
        Intent myFilteredResponse = new Intent(GPS_FILTER);
        myFilteredResponse.putExtra("latitude", latitude);
        myFilteredResponse.putExtra("longitude", longitude);
        myFilteredResponse.putExtra("provider", provider);
        Log.e(">>GPS_Service<<", provider + " =>Lat:" + latitude
              + " lon:" + longitude);
        // send the location data out
        sendBroadcast(myFilteredResponse);
        }
  }
```


Example 3. MyService6 – A GPS Service broadcasting locations.

```
  public void getGPSFix_Version2() {
    try {
      Looper.prepare();
      // try to get your GPS location using the
      // LOCATION.SERVIVE provider
      lm = (LocationManager) getSystemService(Context.LOCATION_SERVICE);

      // This listener will catch and disseminate location updates
      myLocationListener = new GPSListener();
      // define update frequency for GPS readings
      long minTime = 2000; // 2 seconds
      float minDistance = 5; // 5 meter
      // request GPS updates
      lm.requestLocationUpdates(LocationManager.GPS_PROVIDER, minTime,
          minDistance, myLocationListener);
      Looper.loop();

    } catch (Exception e) {
      e.printStackTrace();
    }

  }
```

Example 3. MyService6 – A GPS Service broadcasting locations.

```
@Override
public void onDestroy() {
  super.onDestroy();
  Log.e("<<MyGpsService-onDestroy>>", "I am dead-GPS");
  try {
    lm.removeUpdates(myLocationListener);
    isRunning = false;
  } catch (Exception e) {
    Toast.makeText(getApplicationContext(), e.getMessage(), 1).show();
  }
}// onDestroy
```


Example 3. MyService6 – A GPS Service broadcasting locations.

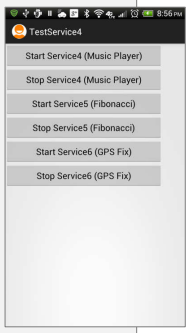
```
  private class GPSListener implements LocationListener {
    public void onLocationChanged(Location location) {
      // capture location data sent by current provider
      double latitude = location.getLatitude();
      double longitude = location.getLongitude();
      // assemble data bundle to be broadcasted
      Intent myFilteredResponse = new Intent(GPS_FILTER);
      myFilteredResponse.putExtra("latitude", latitude);
      myFilteredResponse.putExtra("longitude", longitude);
      myFilteredResponse.putExtra("provider", location.getProvider());
      Log.e(">>GPS_Service<<", "Lat:" + latitude + " lon:" + longitude);
      // send the location data out
      sendBroadcast(myFilteredResponse);
    }

    public void onProviderDisabled(String provider) {
    }

    public void onProviderEnabled(String provider) {
    }

    public void onStatusChanged(String provider, int status, Bundle extras) {
    }
  };// GPSListener class
}// MyService3
```


Example 3. Manifest

```
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="csu.matos"   android:versionCode="1"    android:versionName="1.0" >
    <uses-sdk
        android:minSdkVersion="8"   android:targetSdkVersion="15" />

    <uses-permission android:name="android.permission.ACCESS_COARSE_LOCATION" />
    <uses-permission android:name="android.permission.ACCESS_FINE_LOCATION" />

    <application
        android:icon="@drawable/ic_launcher"
        android:label="@string/app_name"   android:theme="@style/AppTheme" >
        <activity
            android:name=".TestService4"
            android:label="@string/title_activity_test_service4"
              android:screenOrientation="portrait">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
        <service android:name=".MyService4"/>
        <service android:name=".MyService5Async" />
        <service android:name=".MyService6" />
    </application>
</manifest>
```


Example 3. Layout

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent" >

    <LinearLayout
        xmlns:android="http://schemas.android.com/apk/res/android"
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:orientation="vertical" >

        <Button
            android:id="@+id/btnStart4"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:ems="15"
            android:text="Start Service4 (Music Player)" />

        <Button
            android:id="@+id/btnStop4"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:ems="15"
            android:text="Stop Service4 (Music Player)" />
```



Example 3. Layout

```
        <Button
            android:id="@+id/btnStart5"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:ems="15"
            android:text="Start Service5 (Fibonacci)" />

        <Button
            android:id="@+id/btnStop5"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:ems="15"
            android:text="Stop Service5 (Fibonacci)" />

        <Button
            android:id="@+id/btnStart6"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:ems="15"
            android:text="Start Service6 (GPS Fix)" />

        <Button
            android:id="@+id/btnStop6"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:ems="15"
            android:text="Stop Service6 (GPS Fix)" />
```


Example 3. Layout

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

            <TextView
                android:id="@+id/txtMsg"
                android:layout_width="match_parent"
                android:layout_height="wrap_content"
                android:layout_margin="5dp" />

        </ScrollView>

    </LinearLayout>

</LinearLayout>
```


Services

Questions