Embedded Systems Programming - PA8001

http://bit.ly/15mmqf7 Lecture 12

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A Multi-Threaded Server

```
public class EchoServer {
public static void main(String[] args) {
  int port = 4443;
  ServerSocket serverSocket = new ServerSocket(port);
  System.err.println("Started server on port " + port);
  while (true) {
    Socket clientSocket = serverSocket.accept();
    System.err.println("Connected to a new client");
    new Thread(new OneClientConnection(clientSocket)).
                     start():
```

OneClientConnection

```
public void run() {
in = new Scanner(new BufferedInputStream(clientSocket.ge
out = new PrintWriter(clientSocket.getOutputStream(), tru
String s;
int i = 0;
while(in.hasNextLine()){
  s = in.nextLine();
  System.err.println(s);
  out.println("["+i+"] " + s);
  i++:
```



Services

Applications might need to do work even when the user is not interacting with the app.

Services: to be created and started from other components by passing Intents.

Run in the background and do not provide a UI.

May generate Notifications to start an Activity (with a UI)



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Services or worker threads?

Worker thread: to increase interaction with the use, while performing something time consuming



The launcher Activity

- A button to start a Service to handle a TCP connection.
- 2. The Activity finishes directly after calling the Service.
- 3. An Intent is passed to the method that starts the service.
- 4. All this is done in the listener for the button.

- 1. Runs in the main thread.
- We have to define the methods that are used by the system:
 - void onCreate()

 - ▶ void onDestroy()
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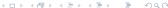
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Activities and Services of an app run in the same main thread. If we want to do things in other threads we have to do it explicitly.

We would also like the worker thread of a Service to be very much like the main thread: doing nothing but waiting for messages to work on.

- 1. Every thread in android can be associated with a Looper (listens to messages)
- 2. We can associate Handlers to Loopers: they can receive messages that are put in a queue and dealt with in order
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A Service with a ServiceHandler

The following is the program structure we suggest for a Service that can be asked to do several things.

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```
private final class ServiceHandler extends Handler{
public ServiceHandler(Looper looper){
  super(looper);
}
// override handleMessage:
public void handleMessage(Message msg){
  // Normally we would do some work here!
  // switch on msg.what (integer)
  // to distinguish between different things to do!
```





A Service with a ServiceHandler (ctd.)

onCreate starts a HandlerThread and associates a ServiceHandler to its Looper

```
public class TheService extends Service{
private Looper mServiceLooper;
private ServiceHandler mServiceHandler;
public void onCreate() {
  HandlerThread thread =
    new HandlerThread("TheServiceWorkerThread",
                      Process.THREAD_PRIORITY_BACKGROUND);
  thread.start();
  mServiceLooper = thread.getLooper();
  mServiceHandler = new ServiceHandler(mServiceLooper);
```



A Service with a ServiceHandler (ctd.)

onStartCommand just sends messages to the ServiceHandler



How does a Service start an Activity?

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Instead they should produce a Notification that the user can select in order to start an Activity.



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An application with two Activities and a Service

Check the code we distribute with this lecture!



