

# Mobile Application Development

Higher Diploma in Science in Computer Science

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Produced  
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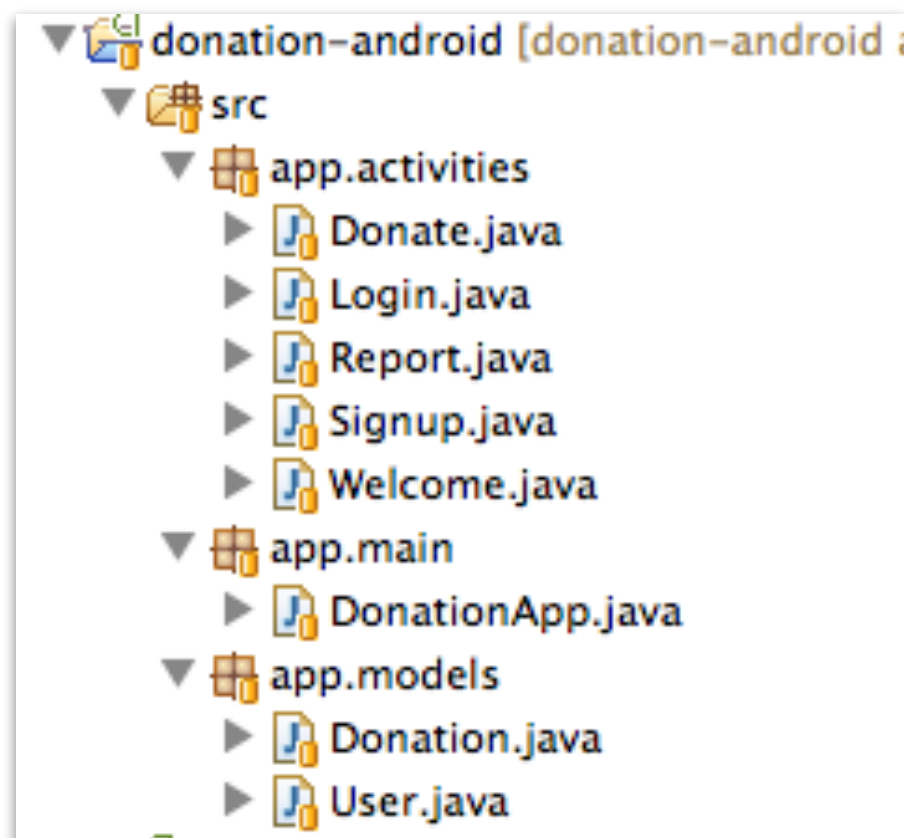


# Android <-> Play (2) - Concurrency

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# donation-android project v2

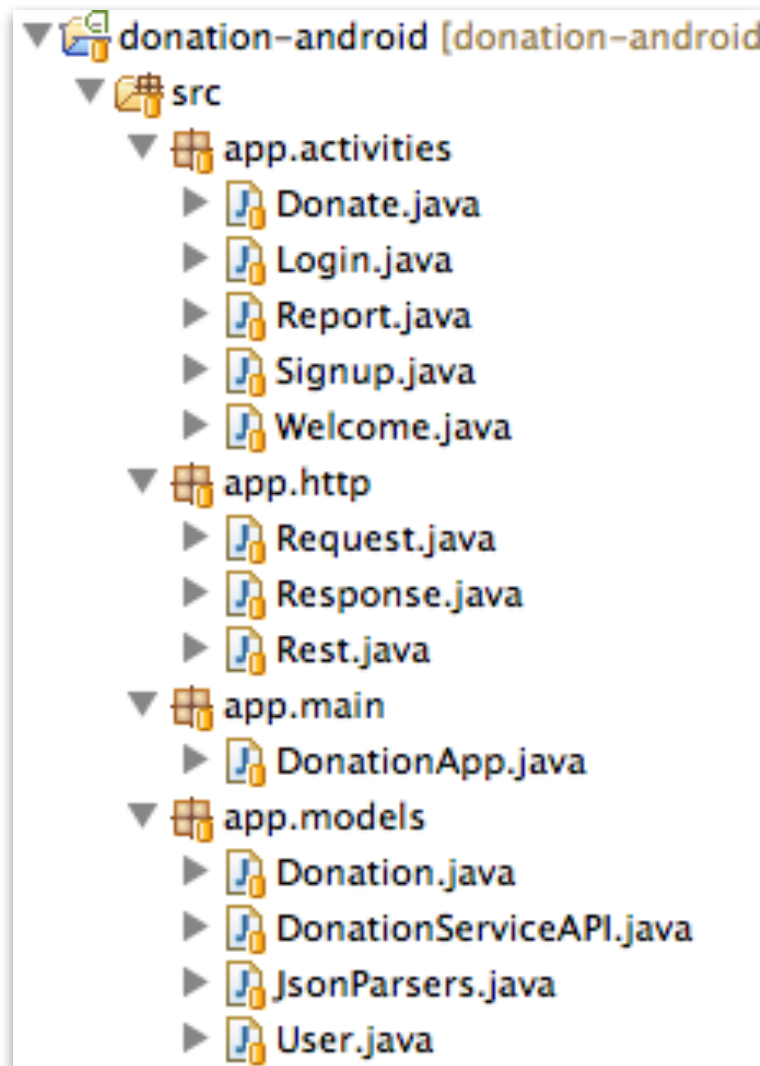
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- **activities**
  - display and handler all UI
- **main**
  - retain application wide data structures (users + donations)
- **models**
  - core information models for the application

# donation-android Project v3

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- **activities**

- display and handle all UI

- **main**

- retain application wide data structures (users + donations)

- **models**

- Gateway object for accessing donation-service application
- Local copies of core information models for the application (download from donation-play)
- Parsers (transformers) for converting objects into format suitable for upload/download to/from donation-service

- **http**

- General purpose classes to support asynchronous http request/response to/from donation-service

# HTTP Requests

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- A HTTP request is inherently indeterminate and subject to various error conditions:
  - The URL may be incorrect
  - The Network may be slow or intermittent
  - The DNS may be slow
  - The service itself may be slow
  - The service may crash, or return incorrect or badly formatted results
- For all of these reasons, Android does not permit HTTP requests to be performed directly in Activities
- In order to connect to a web service for any reason, you must initiate another *'Thread of Execution'*

# Concurrency

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- Concurrency is the ability to run several programs or several parts of a program in parallel.
- If a time consuming task can be performed asynchronously or in parallel, this improves the throughput and the interactivity of the program.
- A modern computer has several CPU's or several cores within one CPU. The ability to leverage these multi-cores can be the key for a successful high-volume application.

# Process & Threads

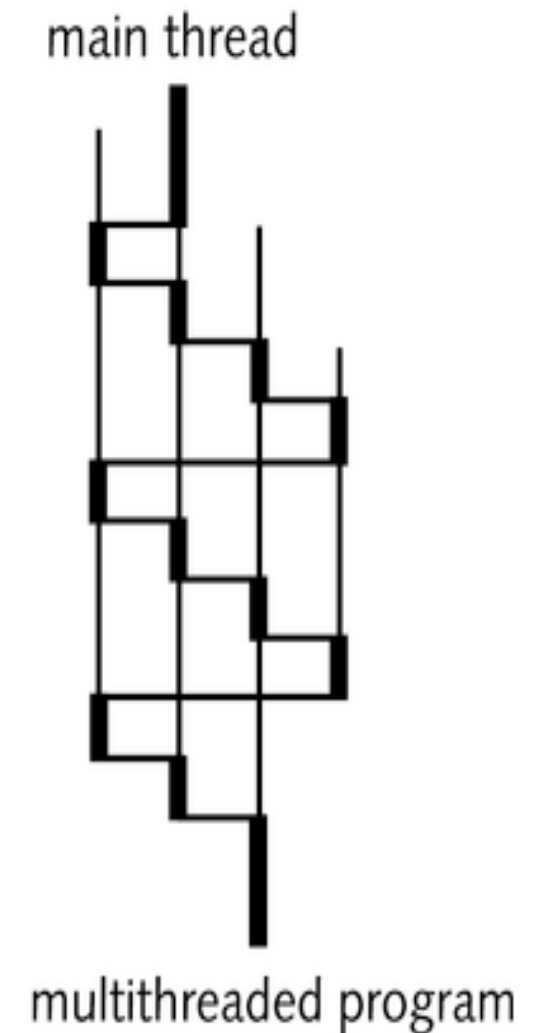
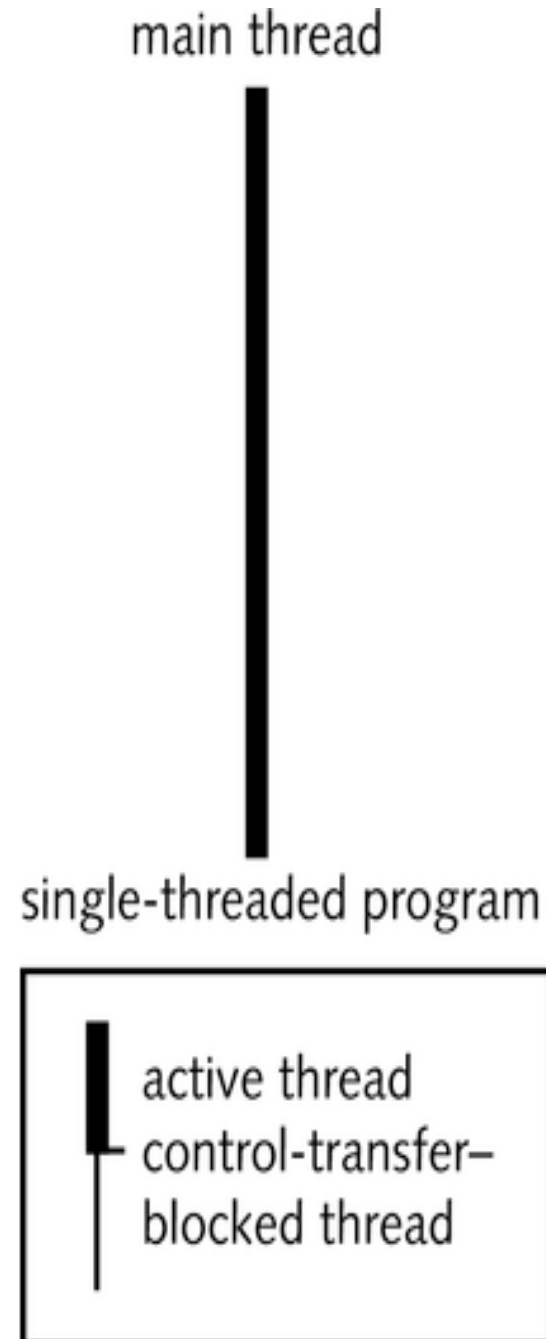
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- A process runs independently and isolated of other processes.
  - It cannot directly access shared data in other processes.
  - The resources of the process, e.g. memory and CPU time, are allocated to it via the operating system.
- A thread is a lightweight process.
  - It has its own call stack, but can access shared data of other threads in the same process. Every thread has its own memory cache.
  - If a thread reads shared data it stores this data in its own memory cache.
  - A thread can re-read the shared data.

# Java Programs & Threads

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- A Java application runs by default in one process.
- Within a Java application you work with several threads to achieve parallel processing or asynchronous behavior.





# Android Processes and Threads

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- When an application starts the Android system starts a new Linux process for the application with a single thread of execution.
- By default, all components of the same application run in the same process and thread (called the "main" thread).
- However, you can arrange for different components in your application to run in separate processes, and you can create additional threads for any process.

# Android Threads

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- When an application is launched, the system creates a thread of execution for the application, called “the main thread.”
- This thread is very important because it is in charge of dispatching events to the appropriate user interface widgets, including drawing events.
- It is also the thread in which your application interacts with components from the Android UI toolkit (components from the `android.widget` and `android.view` packages).
- As such, the main thread is also sometimes called the “UI thread”.

# Main (UI) Threads

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- The system does not create a separate thread for each instance of a component.
- All components that run in the same process are instantiated in the UI thread, and system calls to each component are dispatched from that thread.
- Consequently, methods that respond to system callbacks (such as `onKeyDown()` to report user actions or a lifecycle callback method) always run in the UI thread of the process.

# Blocking the Main Thread

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- If everything is happening in the UI thread, performing long operations such as network access or database queries will block the whole UI.
- When the thread is blocked, no events can be dispatched, including drawing events.
- From the user's perspective, the application appears to hang.
- If the UI thread is blocked for more than a few seconds (about 5 seconds currently) the user is presented with the infamous "application not responding" (ANR) dialog.

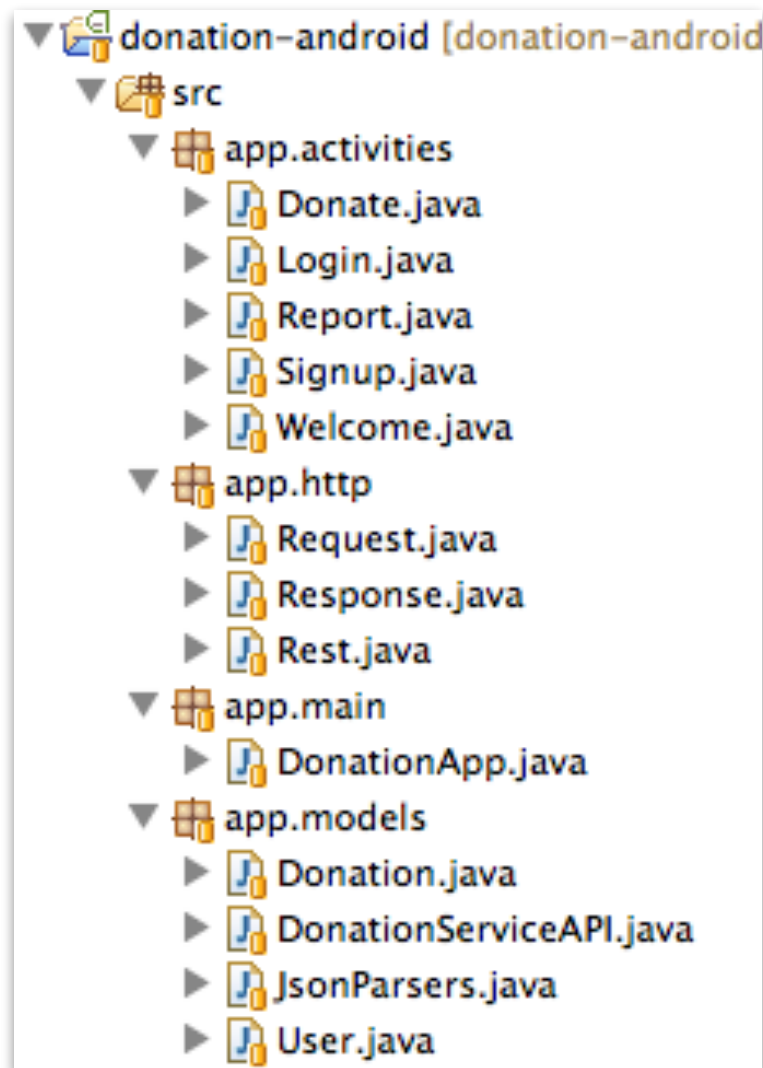
# Android AsyncTask Class

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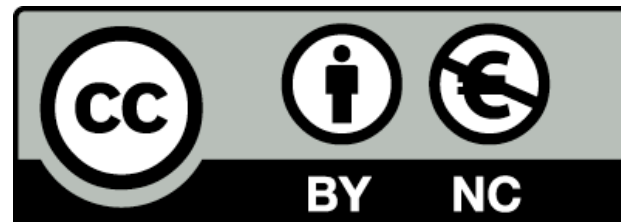
- AsyncTask allows you to perform asynchronous work on your user interface.
- It performs the blocking operations in a **worker thread** and then publishes the results on the UI thread.
- You subclass AsyncTask and implement the doInBackground() callback method, which runs in a pool of background threads.
- To update your UI, you implement onPostExecute(), which delivers the result from doInBackground() and runs in the UI thread, so you can safely update your UI..

# donation-android Project v3

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- **http**
  - General purpose classes to support **asynchronous** http request/response to/from donation-service
  - These requests are performed in a separate thread of execution



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Some of this material is adapted from  
<http://www.vogella.com/articles/JavaConcurrency/article.html>  
An excellent source for well structured tutorials and explanations of all thing related ot Java, Eclipse and Android development



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