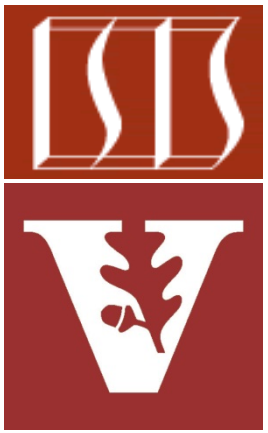
Android Concurrency: Evaluation Android's Concurrency Frameworks



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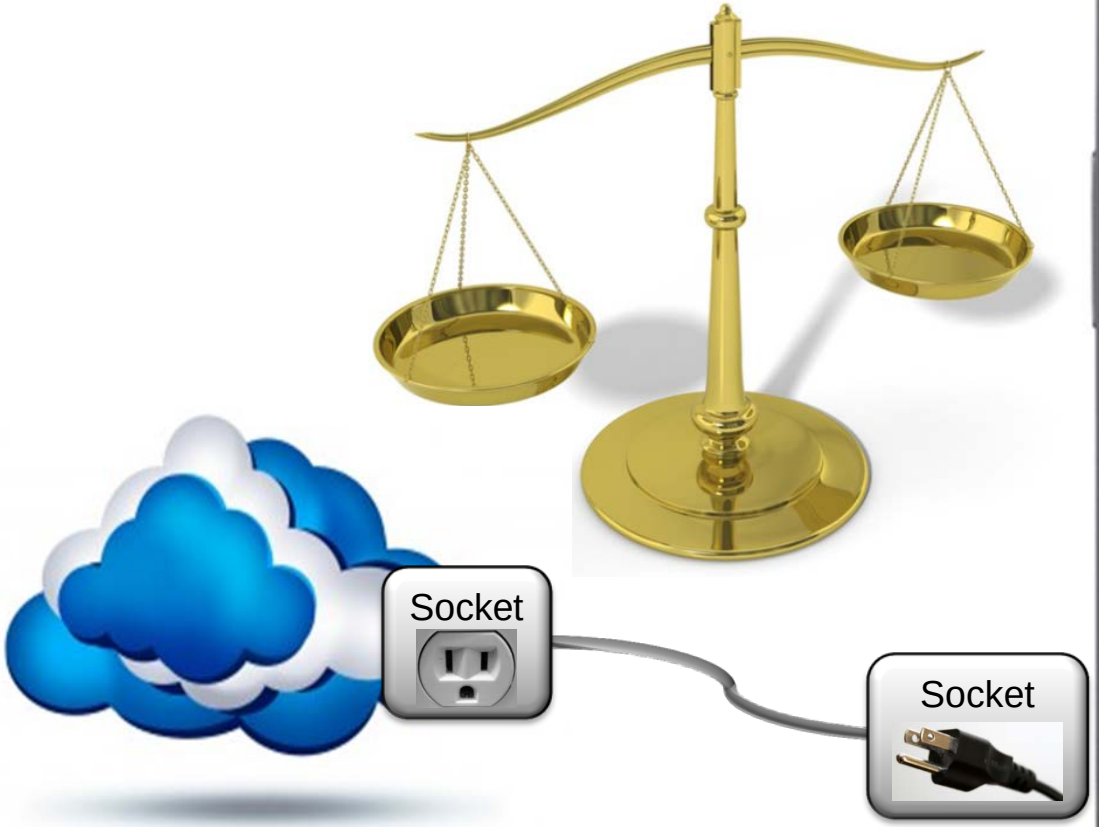
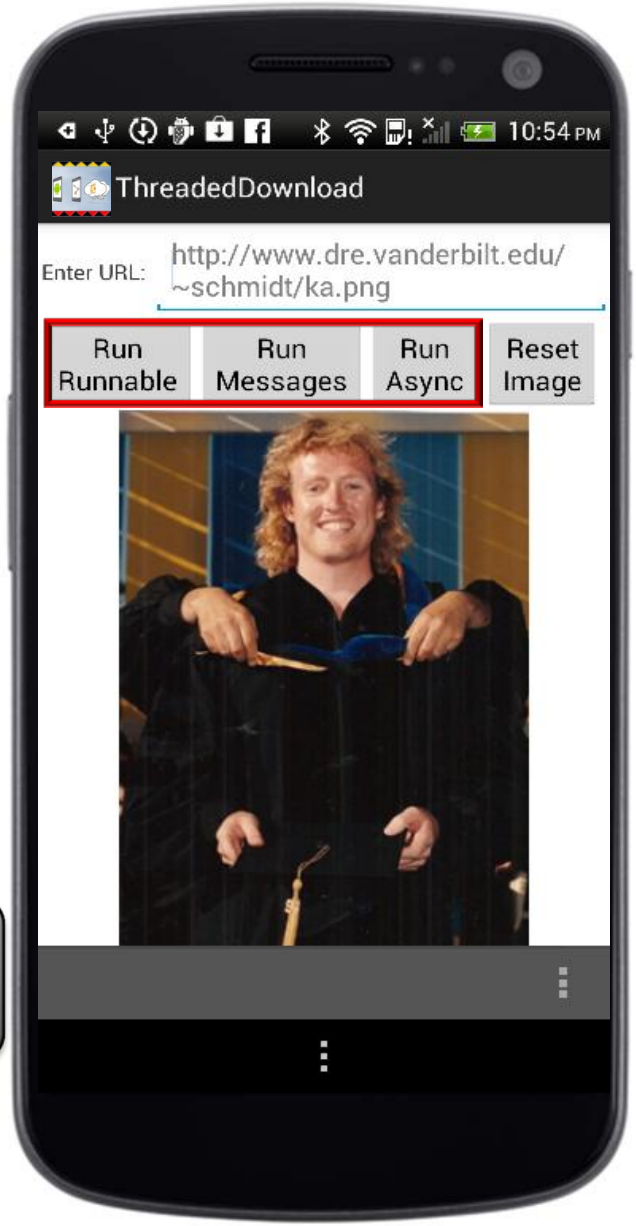
Learning Objectives in this Part of the Module

- Understand how to evaluate the Android concurrency frameworks along several dimensions to select the appropriate framework for your applications





Evaluating ThreadedDownloads Solutions (Part 1)

Evaluating ThreadedDownloads Solutions

	Async Task	Posting Runnables	Sending Messages
Usability (Simple)	□□□	□□□	□□
Usability (Complex)	□□□	□	□□
Scalability	□□□	□	□
Flexibility	□□	□	□□□
Efficiency	□□	□□□	□□□

Evaluating ThreadedDownloads Solutions

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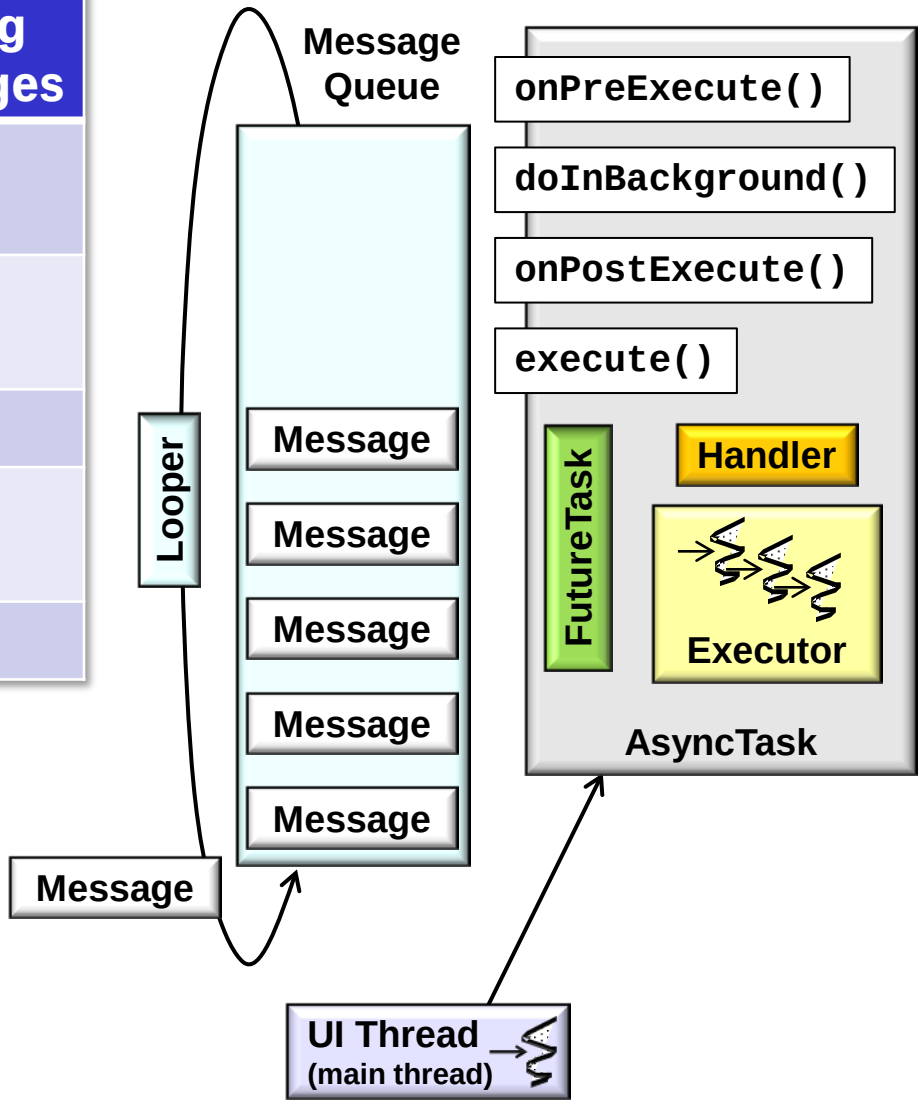
- Simplifies development of both simply & more complicated concurrent applications



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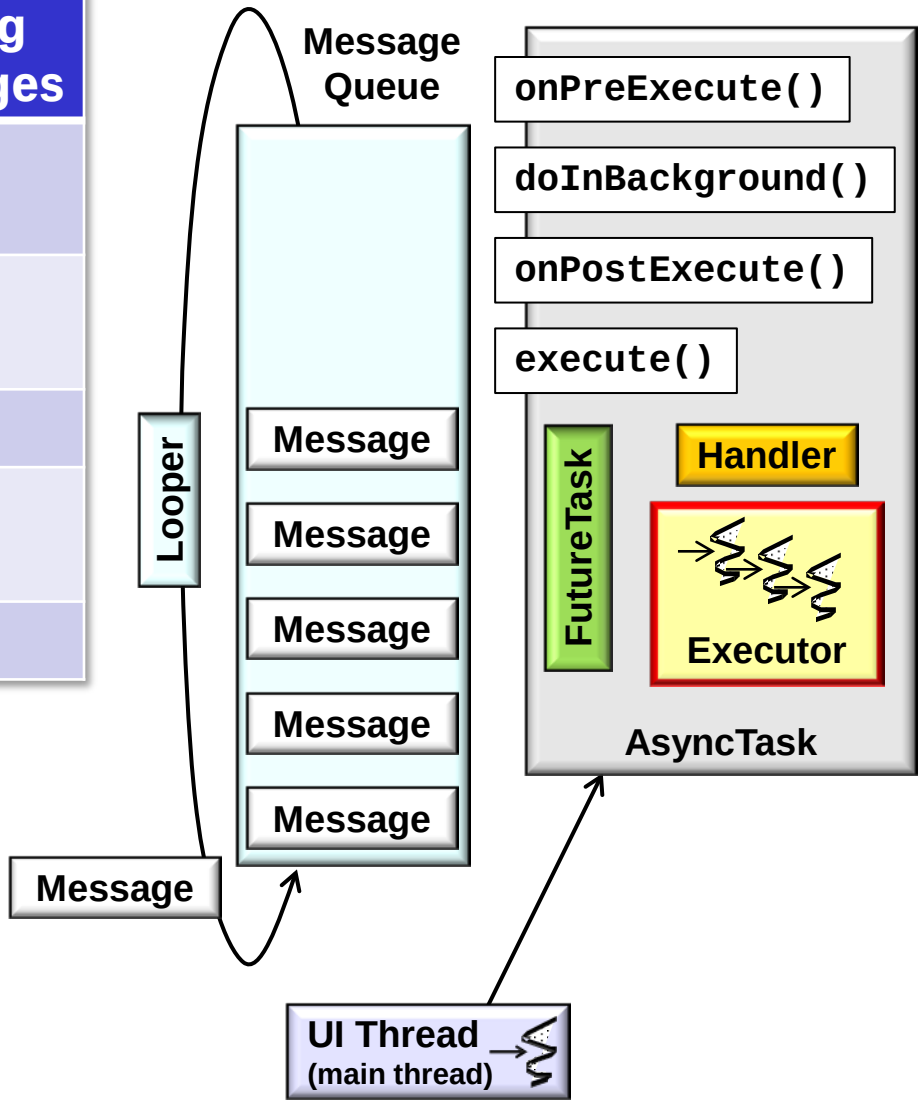
- Enables relatively transparent scalability via its Thread Pool Executor



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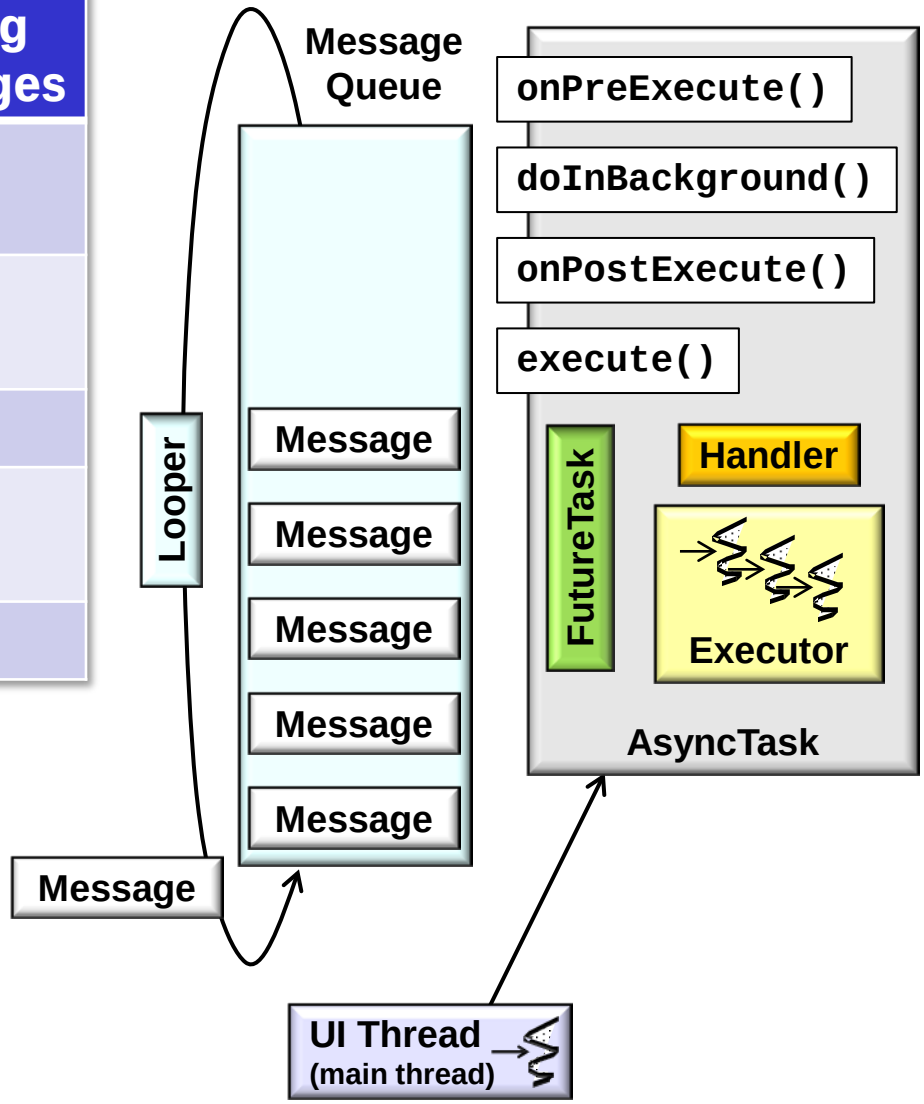
- Only intended for interactions between UI Thread & background Threads
  - But not interactions between background Threads



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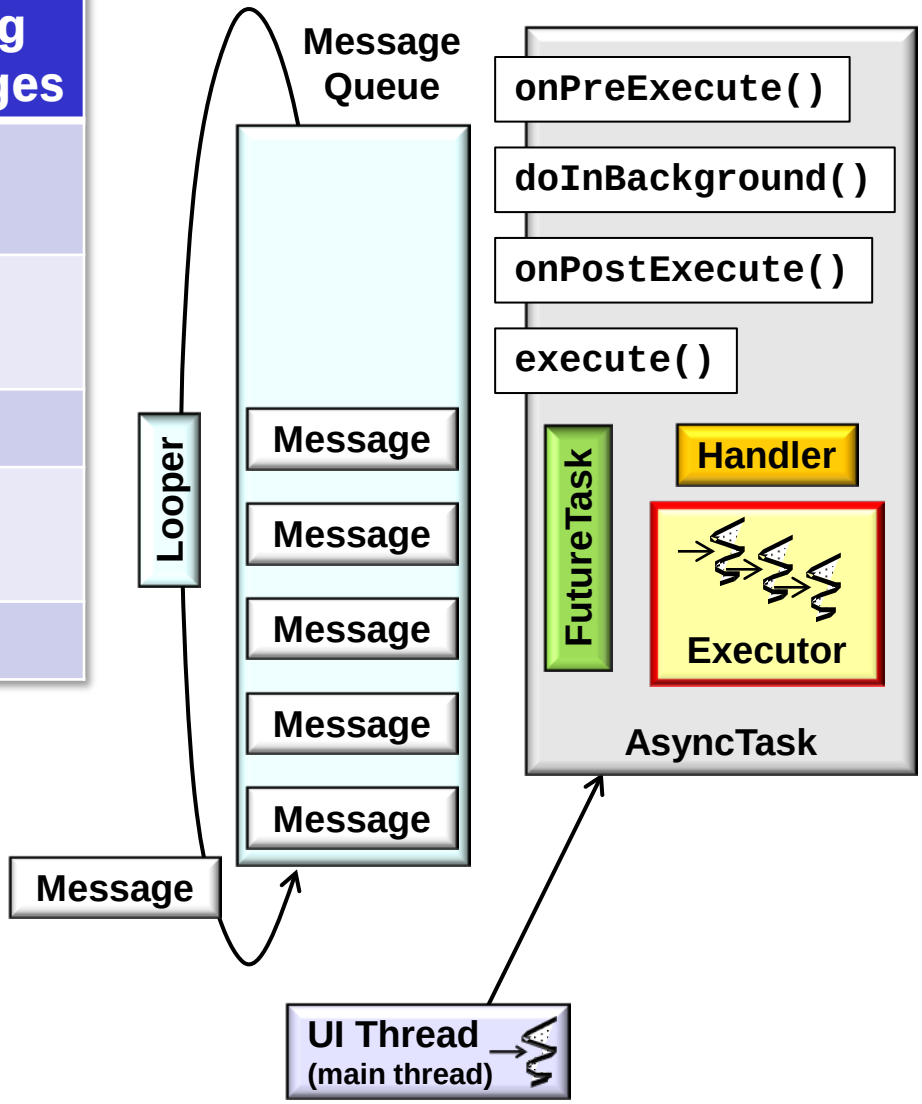
- Incurs higher overhead due to



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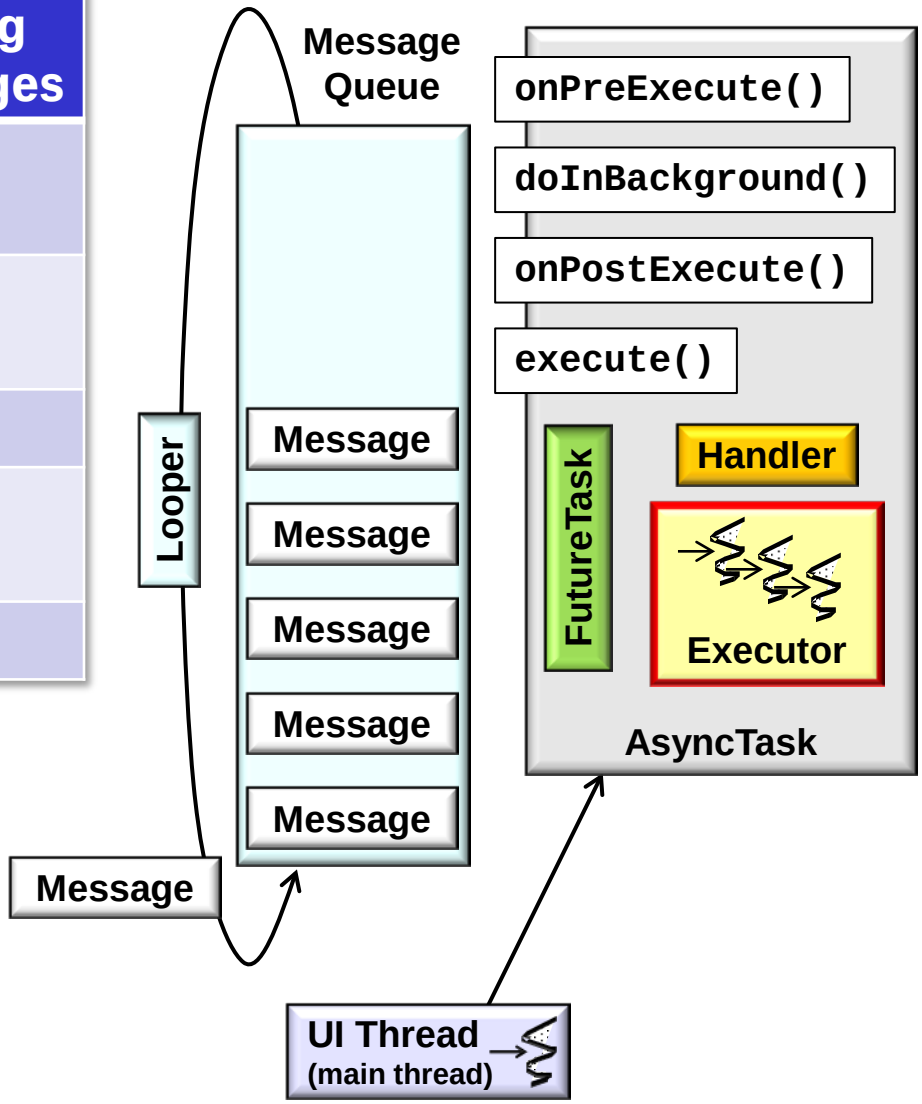
- Incurs higher overhead due to
  - Extra levels of indirection



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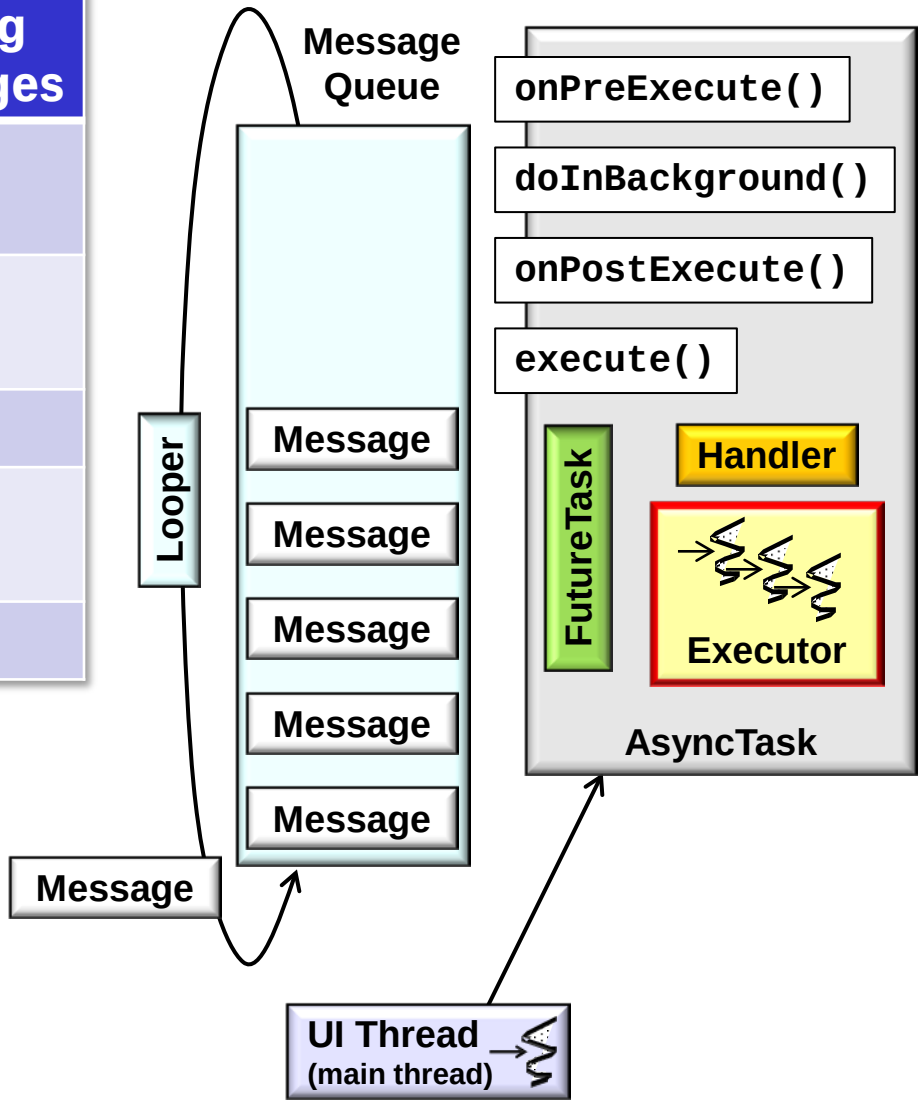
- Incurs higher overhead due to
  - Extra levels of indirection
  - Inter-Thread communication costs
    - e.g., synchronization, context switching, & data movement



See www.dre.vanderbilt.edu/~schmidt/PDF/INFOCOM-94.pdf

Evaluating ThreadedDownloads Solutions (Part 2)

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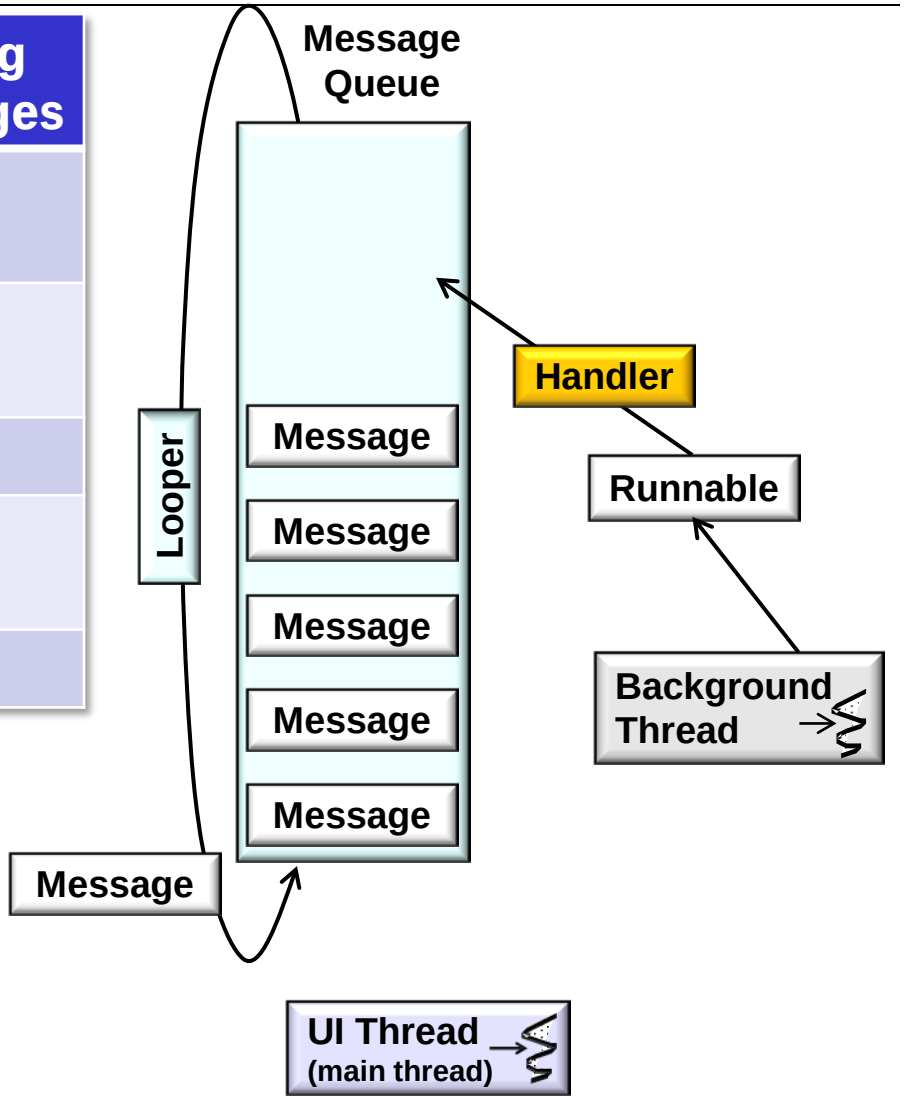
- Efficient & easy to use for simple use cases



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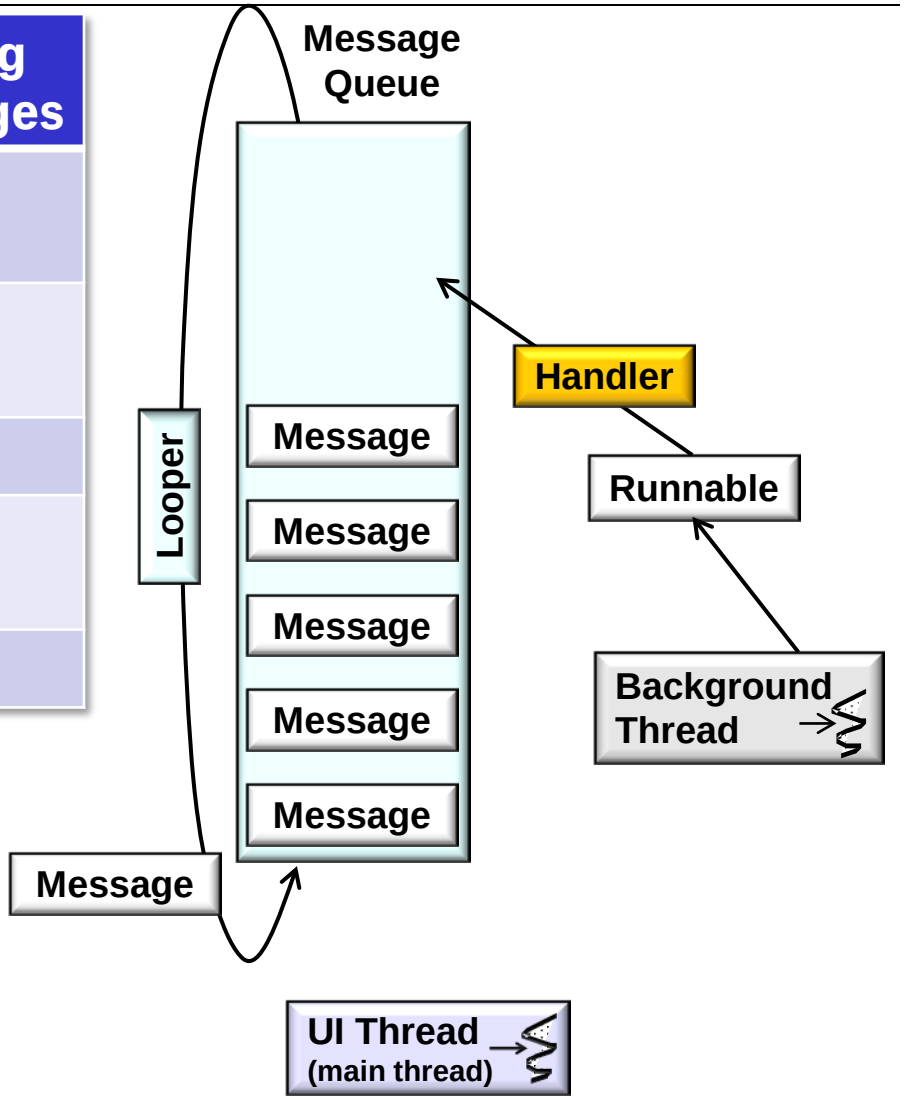
- Less flexible & easy to use for more complex use cases



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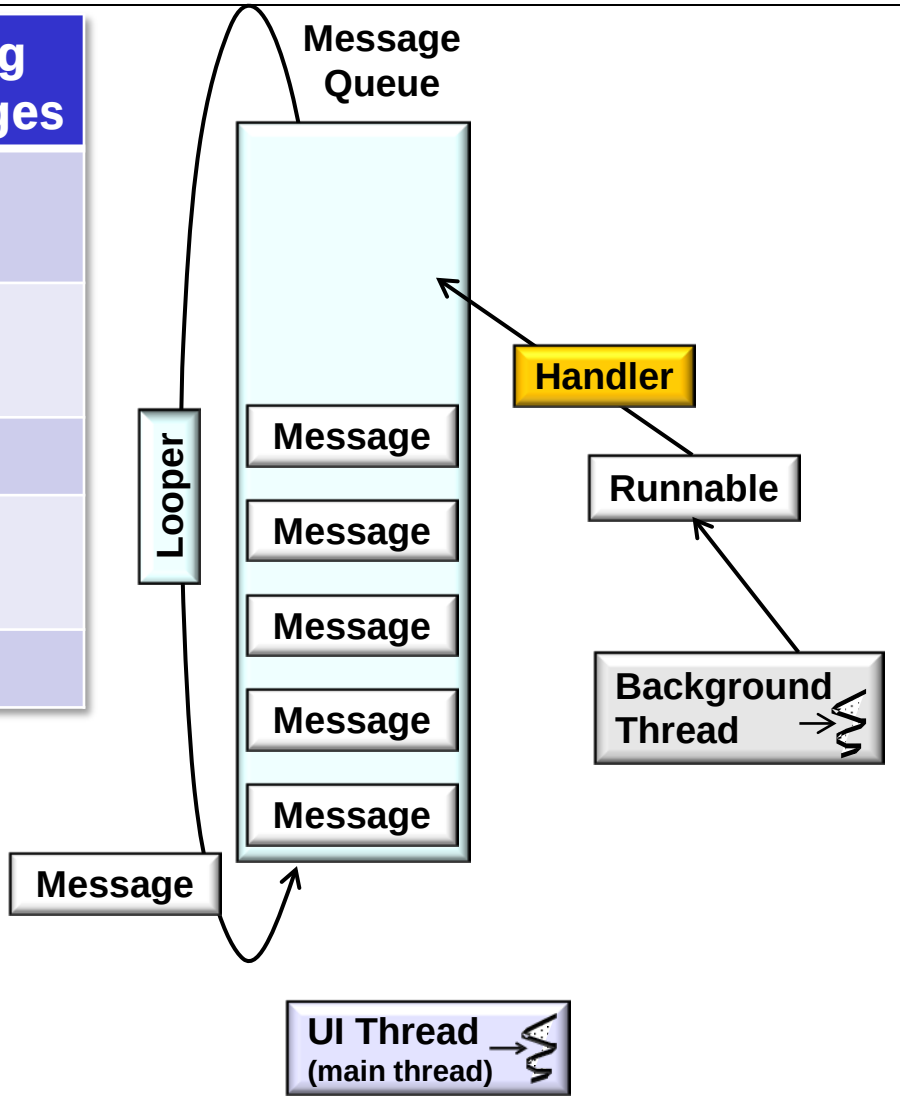
- Thread pools must be managed manually, which is hard to scale



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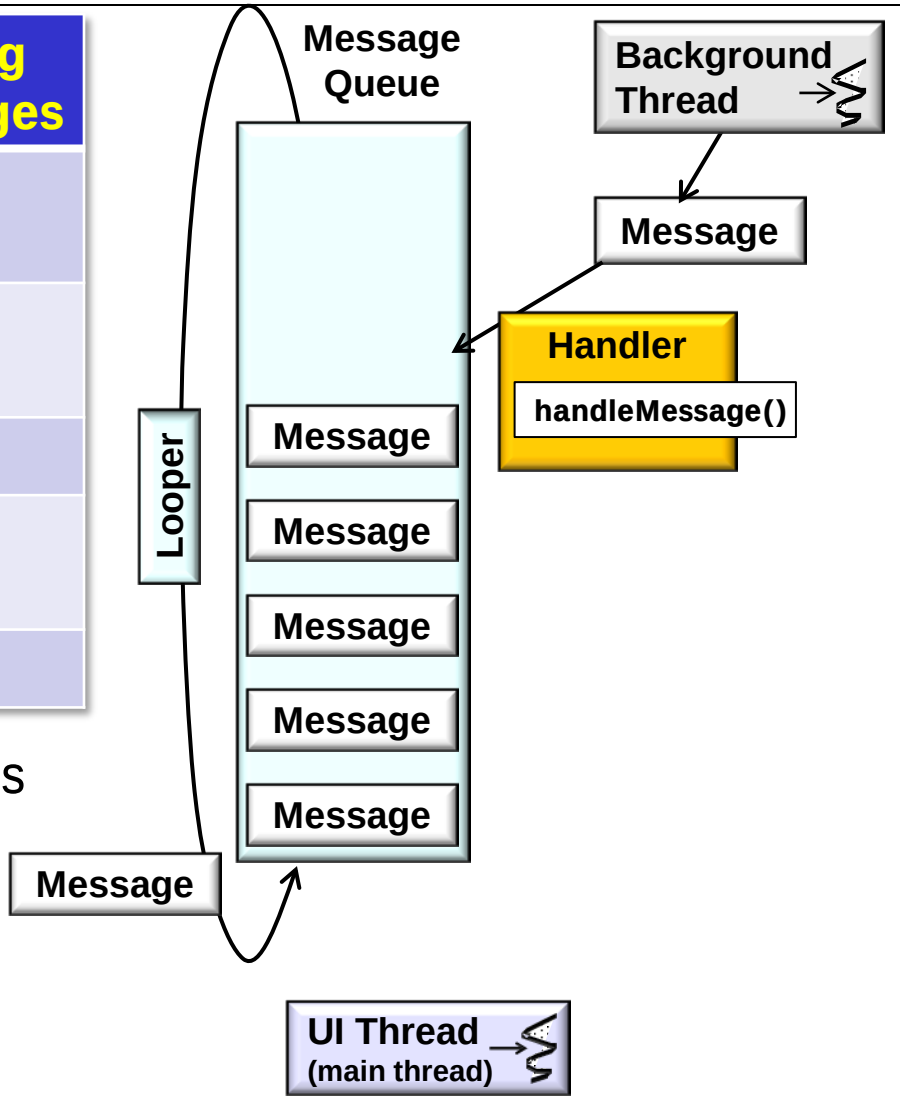
- Flexible & efficient for passing Messages between various types of Threads



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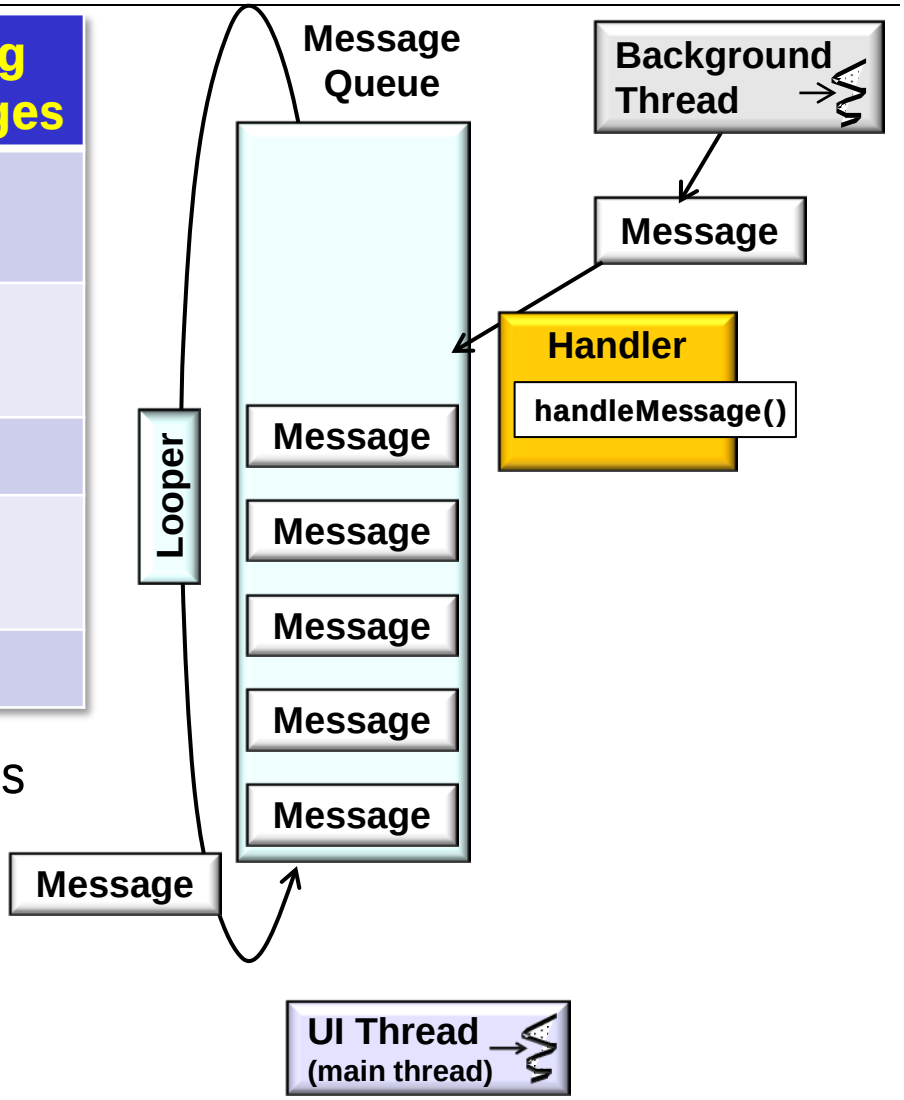
- Flexible & efficient for passing Messages between various types of Threads
  - Messages contain arbitrary data



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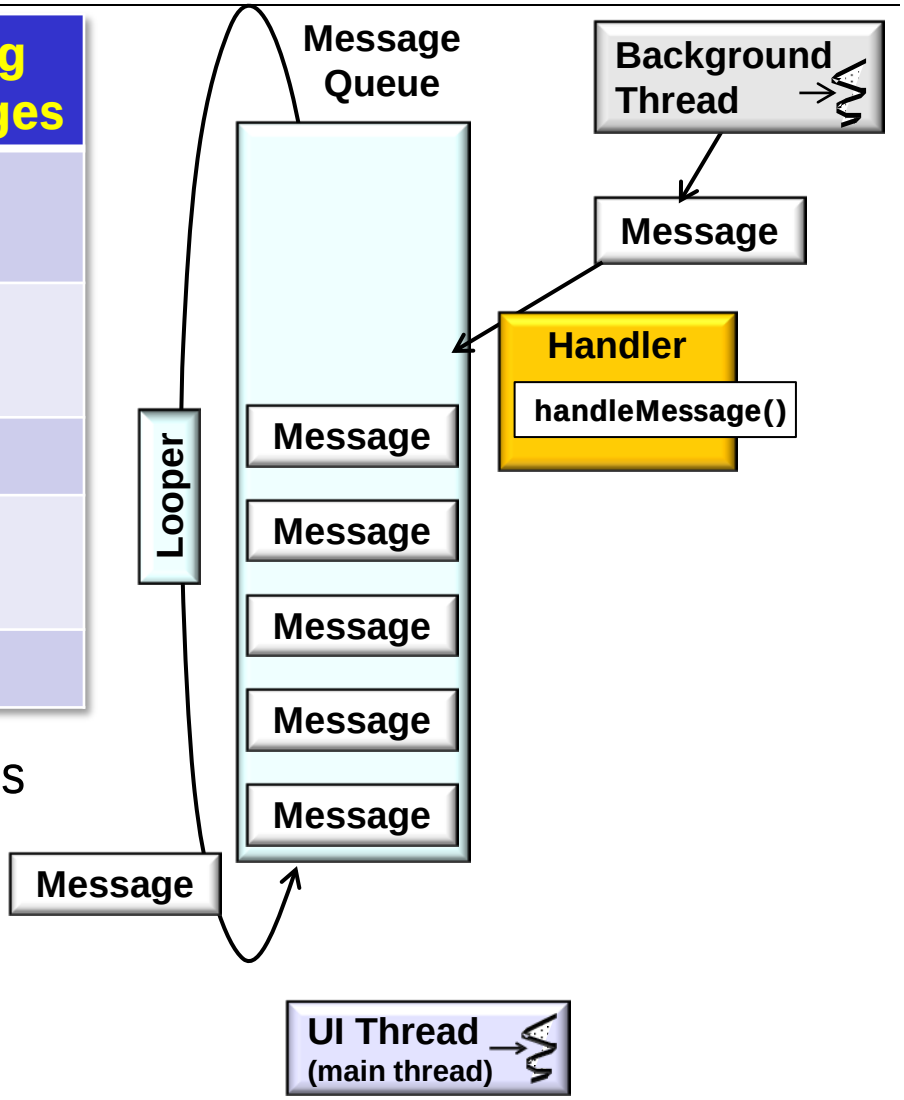

- Flexible & efficient for passing Messages between various types of Threads
  - Messages contain arbitrary data
  - Peer-to-peer conversations between various types of Threads

Evaluating ThreadedDownloads Solutions

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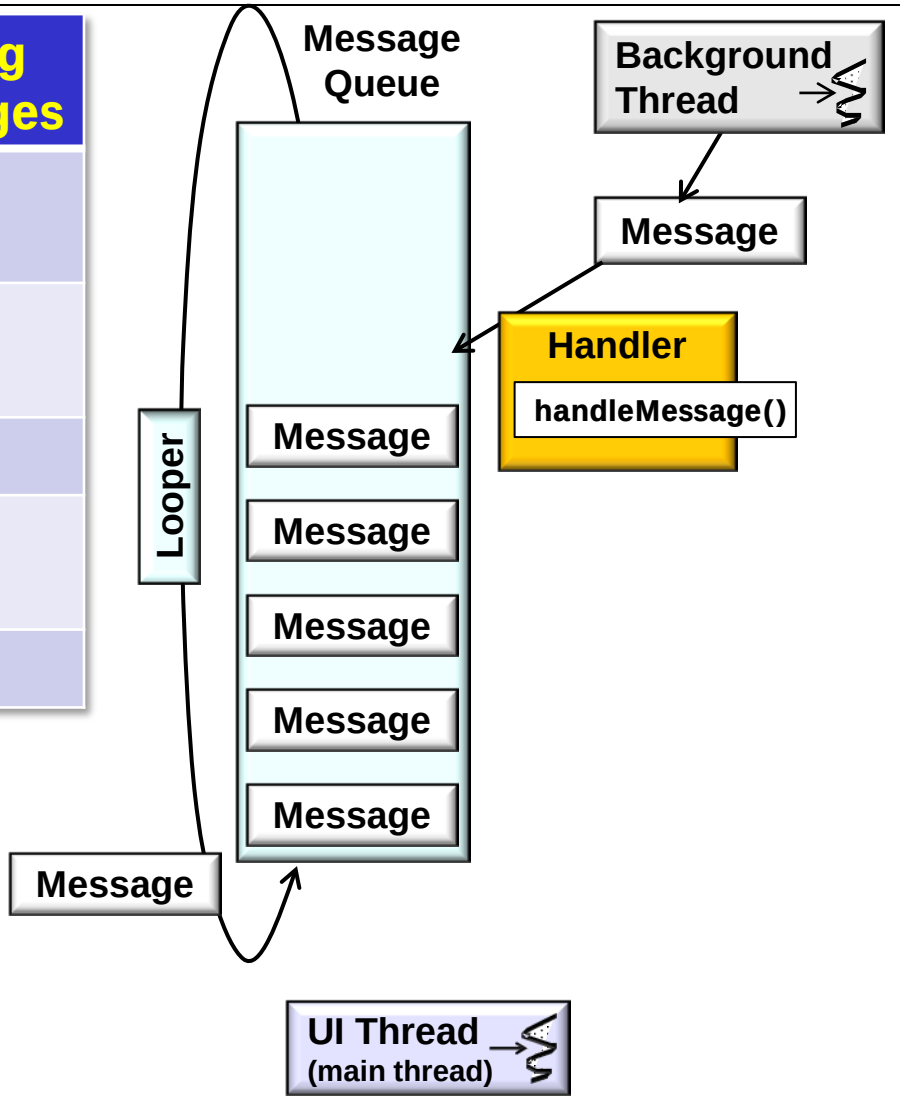
- Sending Messages is more complicated than posting Runnable commands



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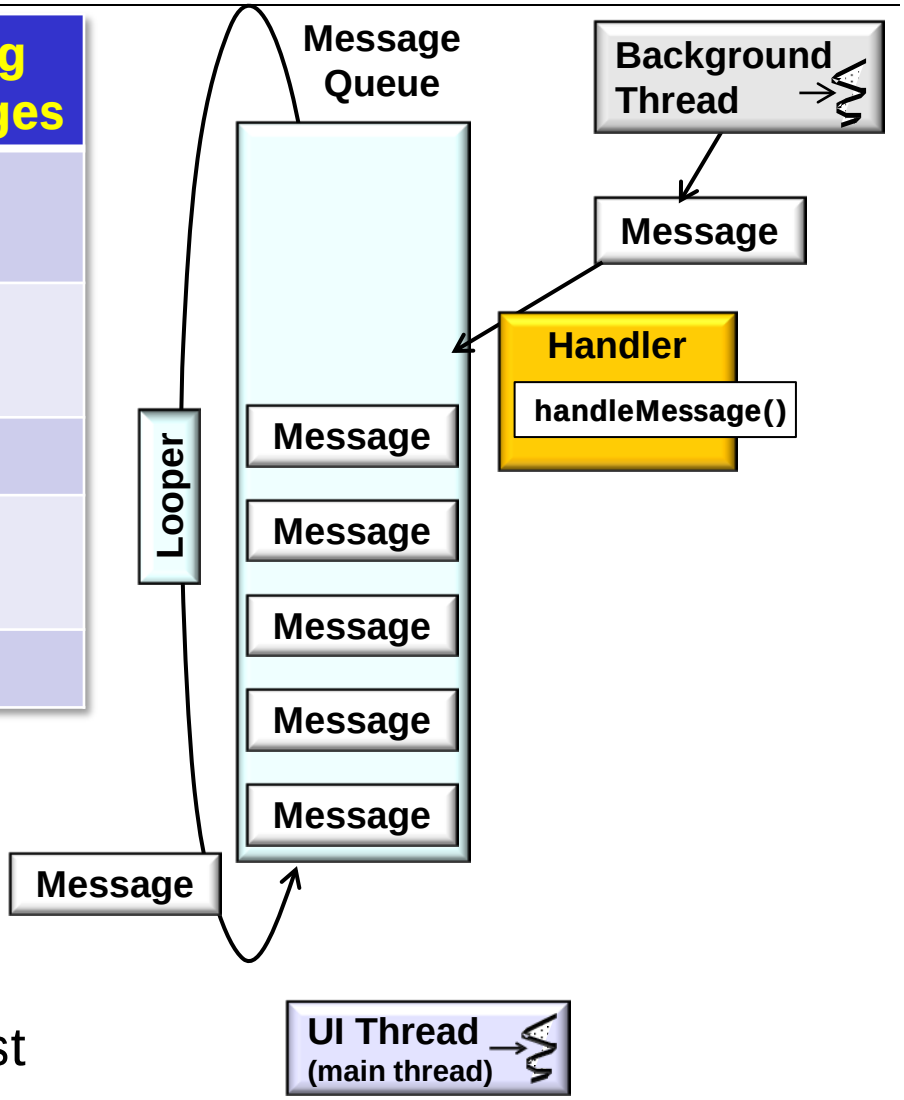
- Sending Messages is more complicated than posting Runnable commands
  - e.g., Handler must be extended & its handleMessage() hook method overridden or a Handler.Callback must be used



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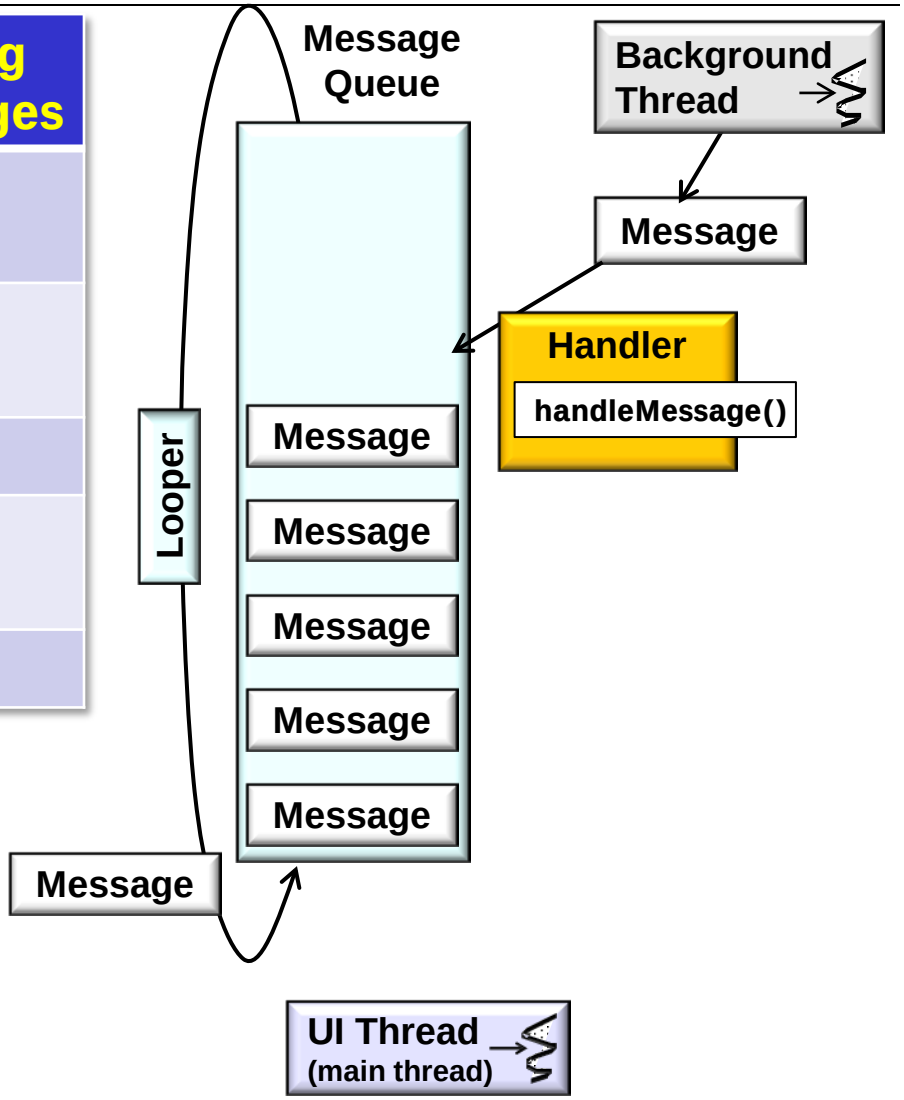

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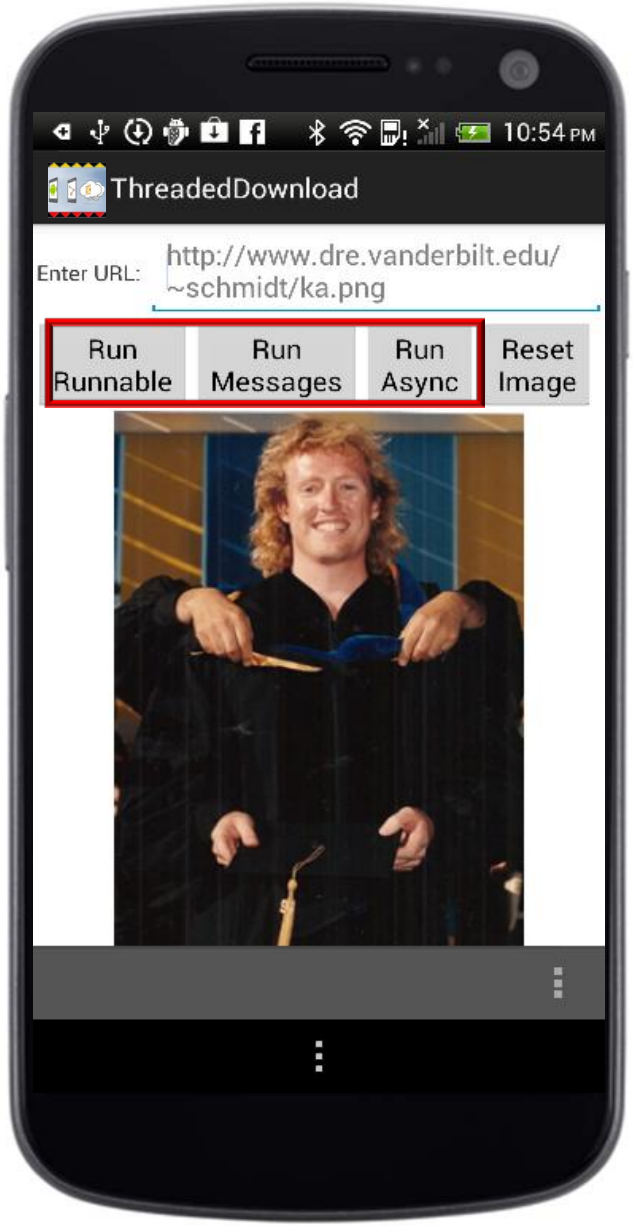
Flexibility	☐☐	☐	☐☐☐
Efficiency	☐☐	☐☐☐	☐☐☐

Choosing the right concurrency model depends on requirements & expertise

Summary

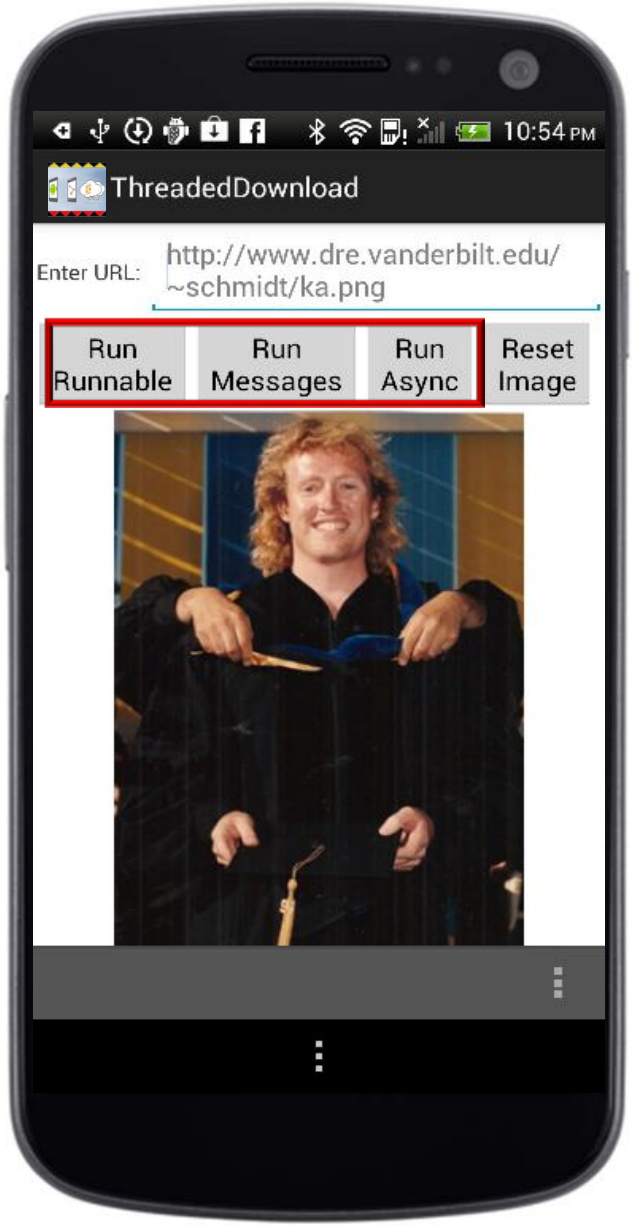
Summary

- Threaded Downloads implements three different concurrency models



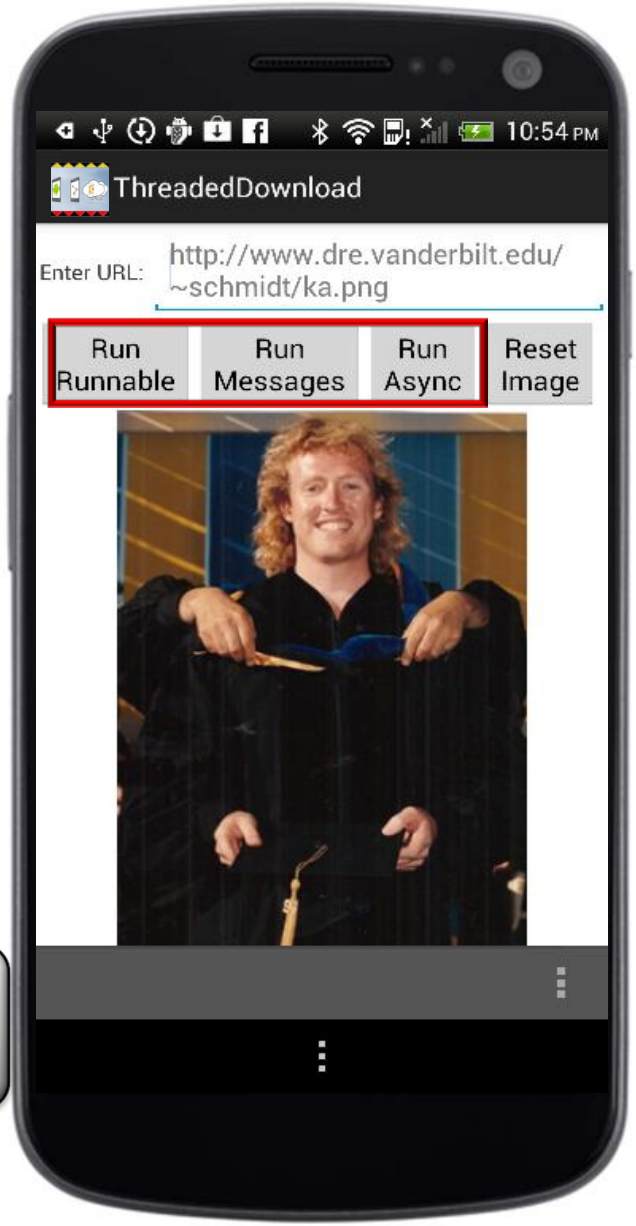
Summary

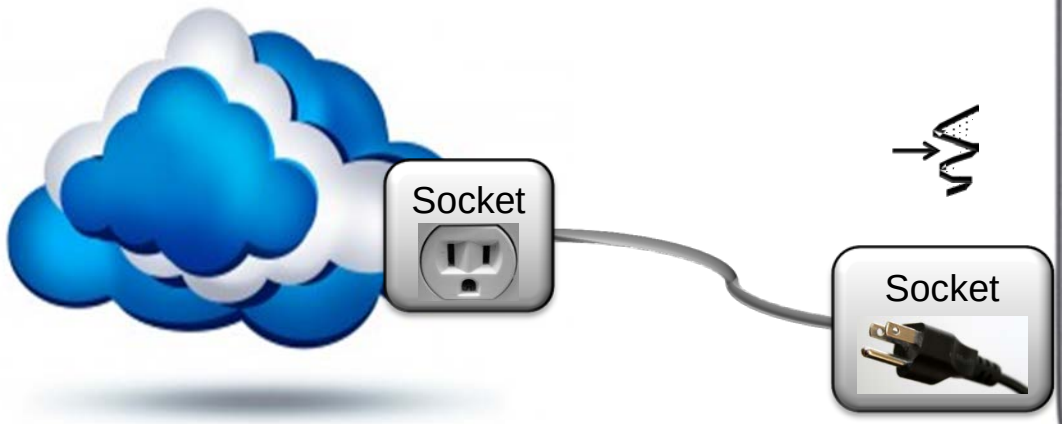
- Threaded Downloads implements three different concurrency models
  - Uses the Android HaMeR & AsyncTask frameworks



Summary

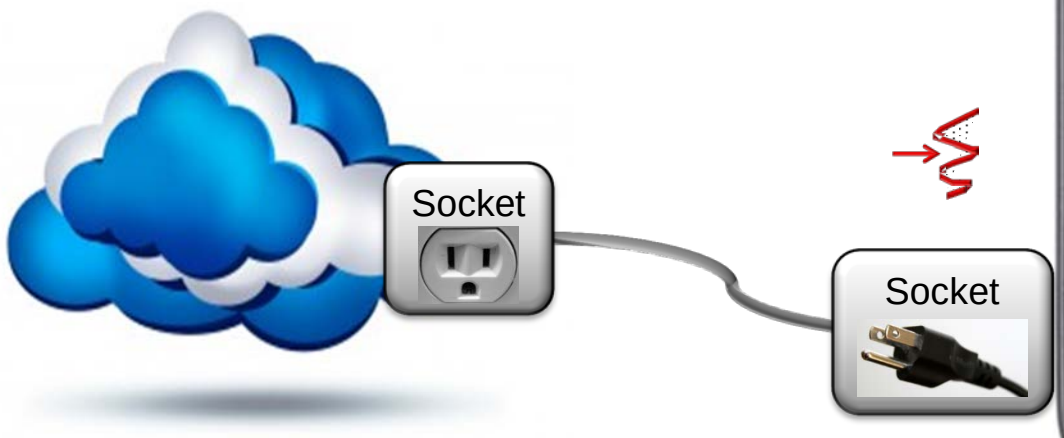
- Threaded Downloads implements three different concurrency models
- Solutions share some thing in common

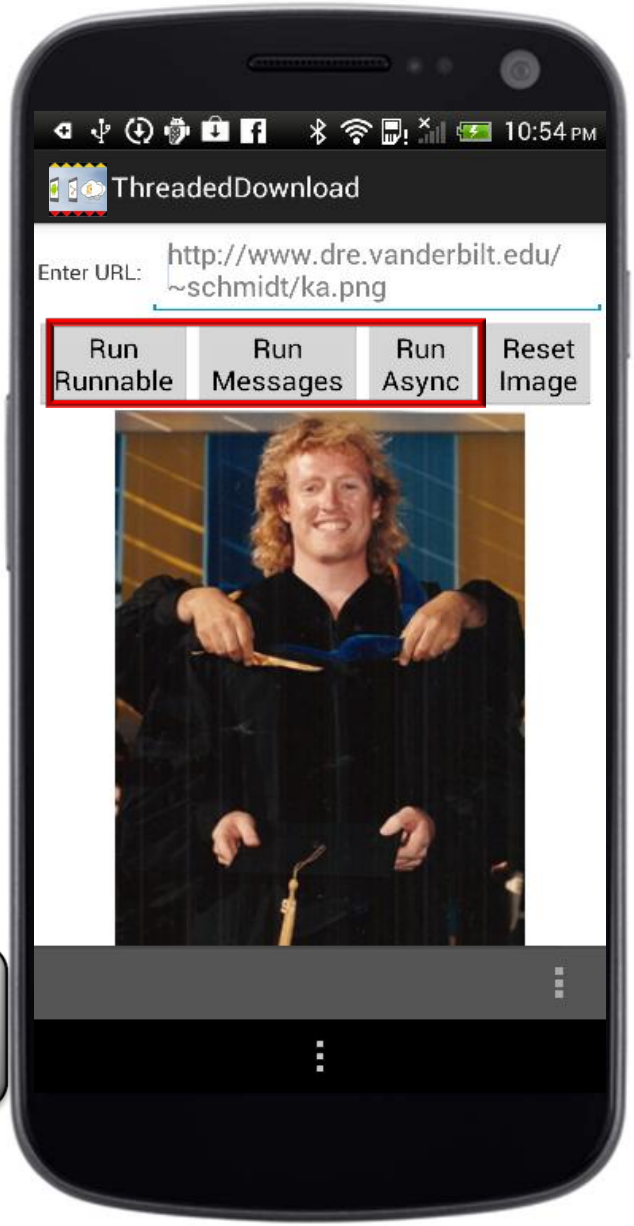




Summary

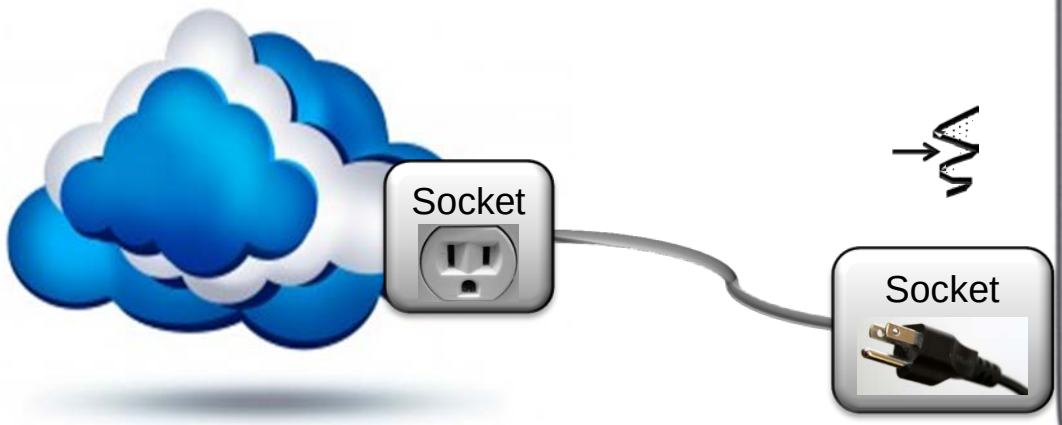
- Threaded Downloads implements three different concurrency models
- Solutions share some thing in common
  - Long duration operations run in a background Thread

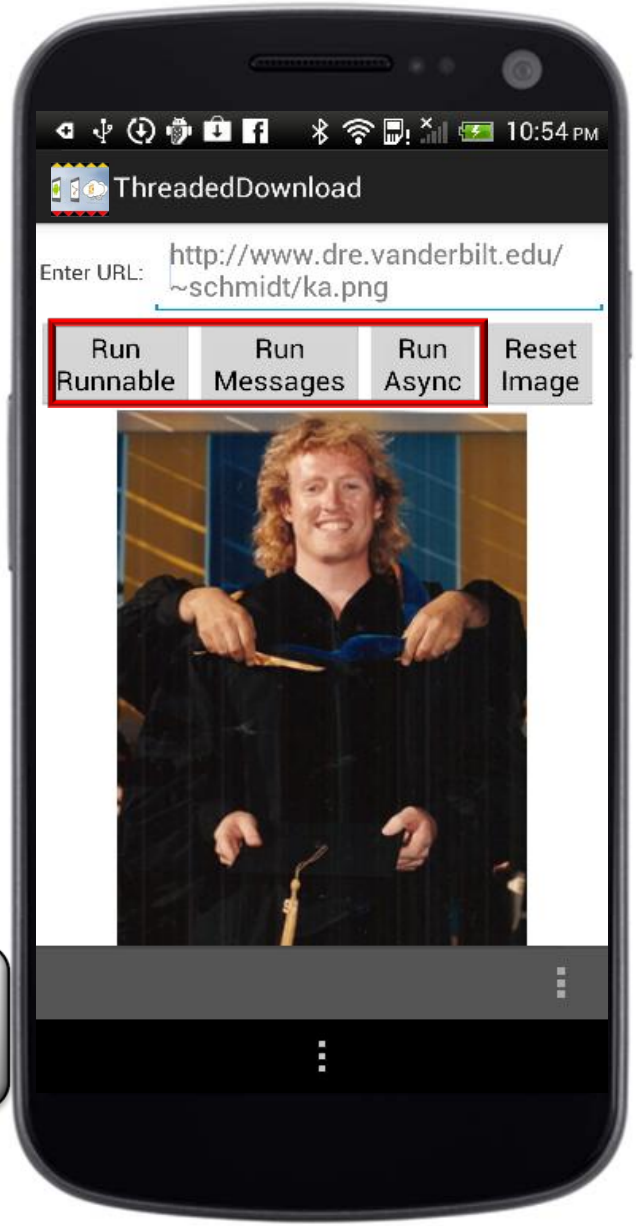




Summary

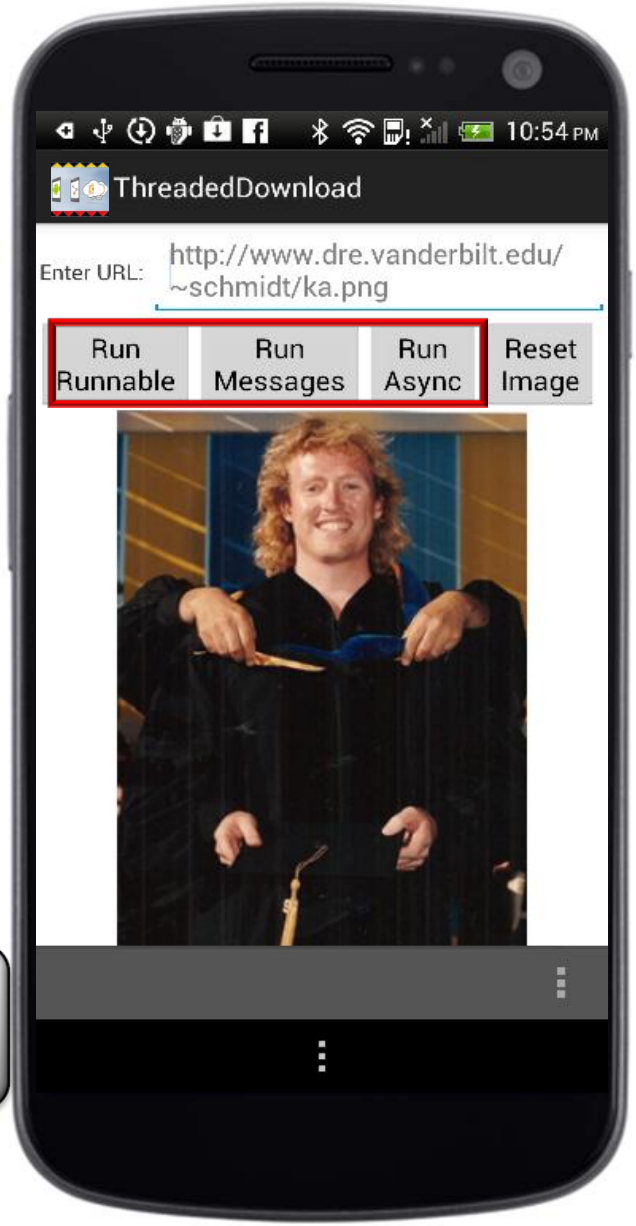
- Threaded Downloads implements three different concurrency models
- Solutions share some thing in common
  - Long duration operations run in a background Thread
  - Short duration operations run in the UI Thread

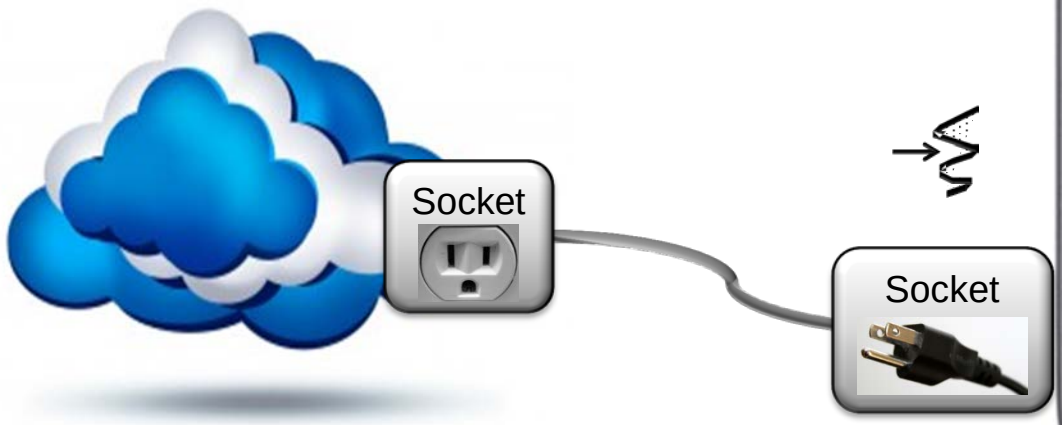




Summary

- Threaded Downloads implements three different concurrency models
- Solutions share some thing in common
- Solutions also have some differences





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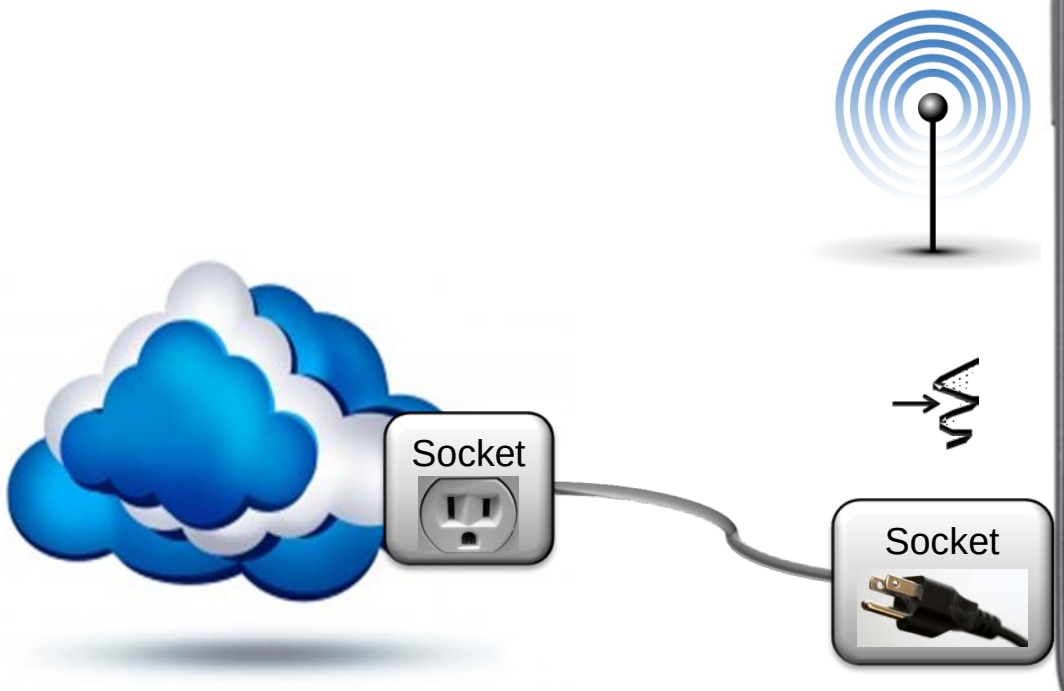
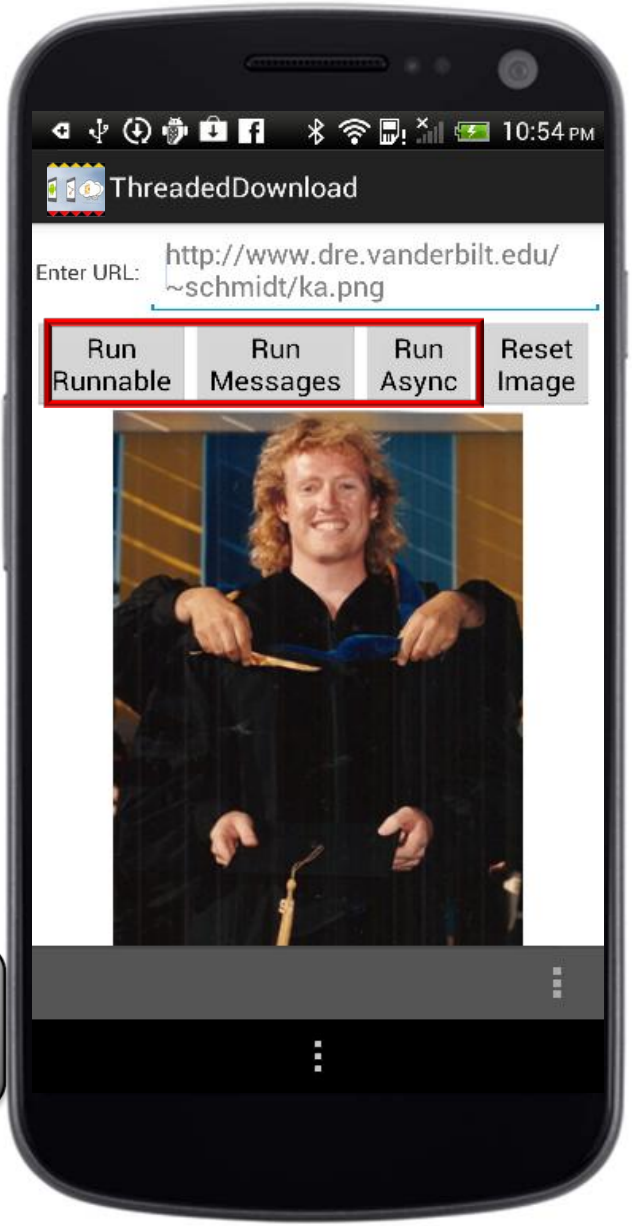
- Threaded Downloads implements three different concurrency models
- Solutions share some thing in common
- Solutions also have some differences
  - Background Threads & UI Thread communicate in different ways





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- Threaded Downloads implements three different concurrency models
- Solutions share some thing in common
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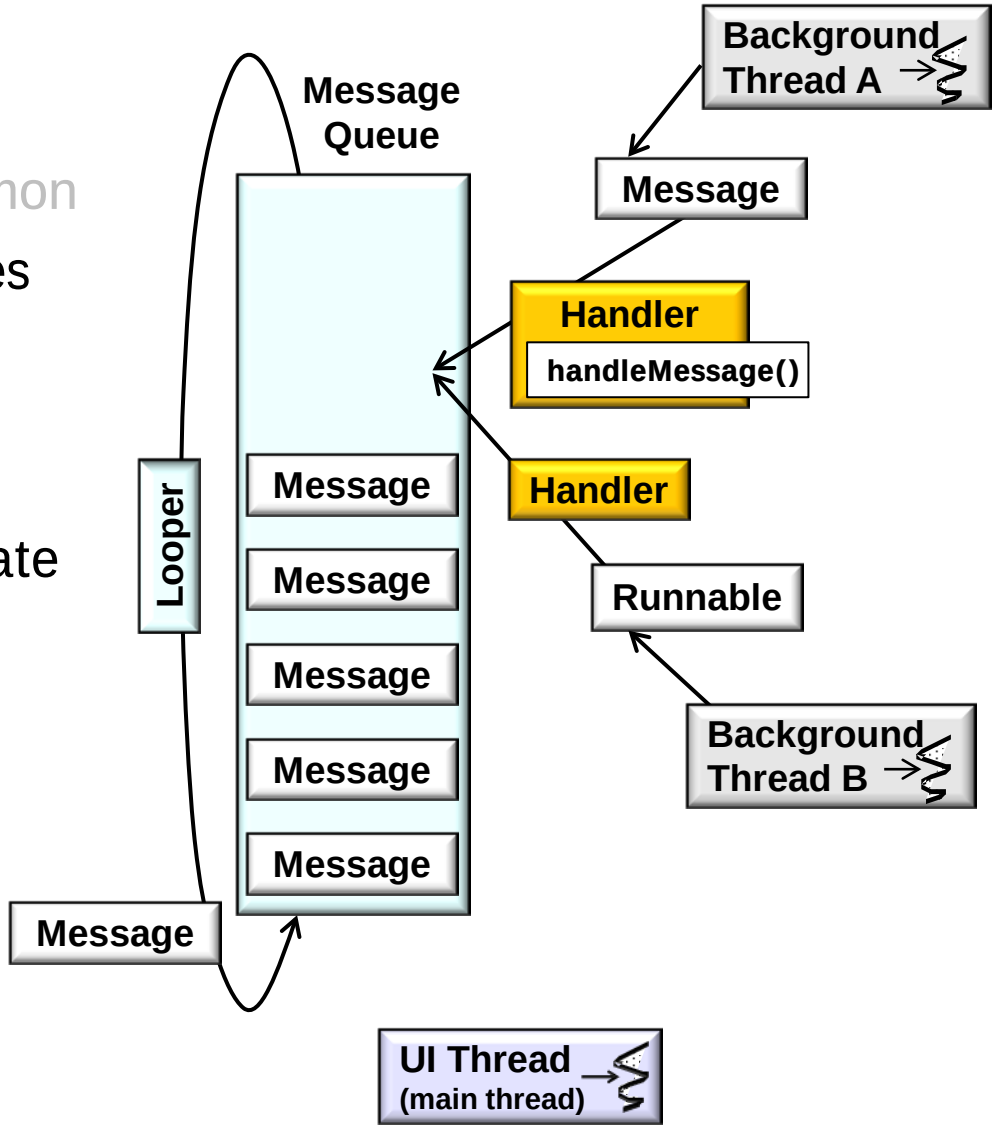
  - Background Threads & UI Thread communicate in different ways
    - Background Threads in HaMeR framework explicitly communicate with UI Thread



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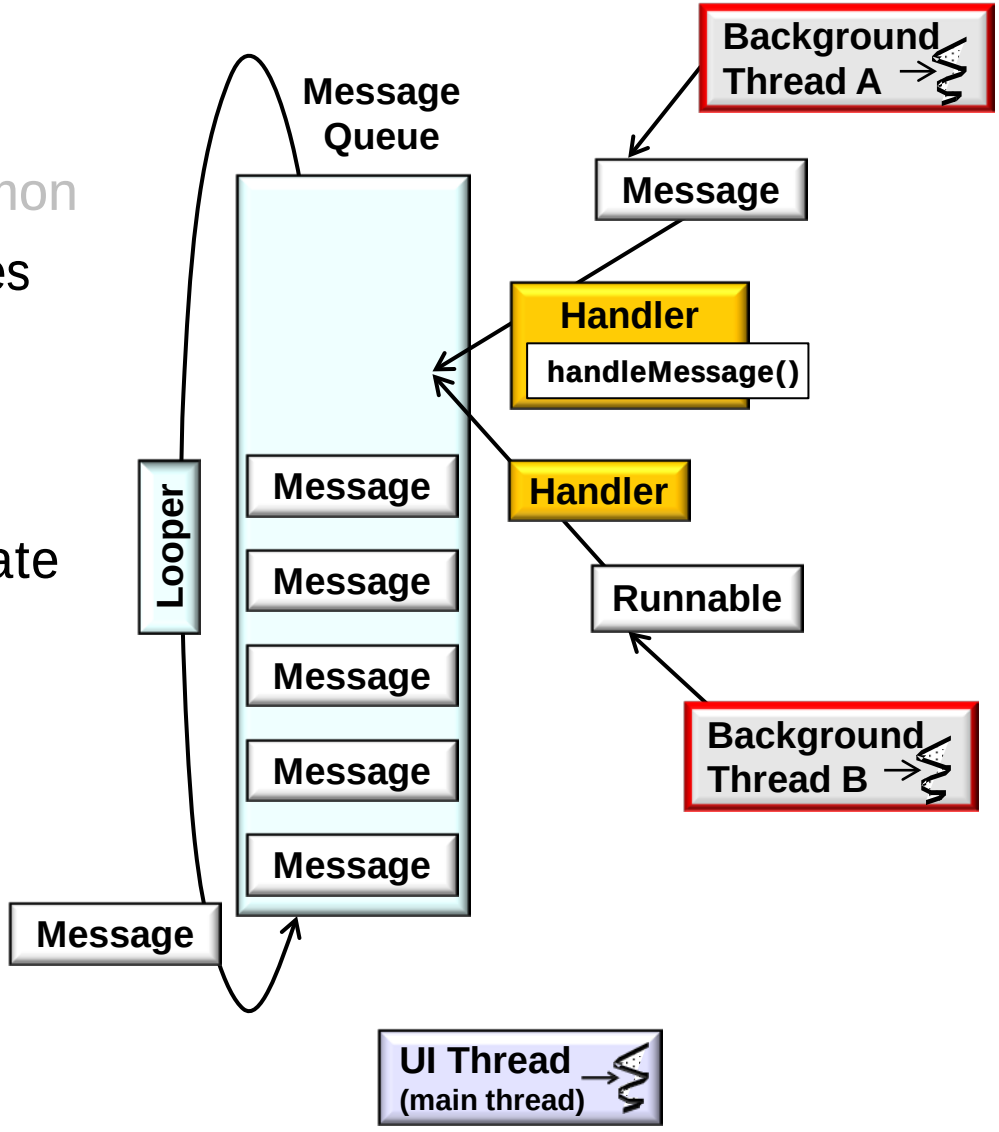

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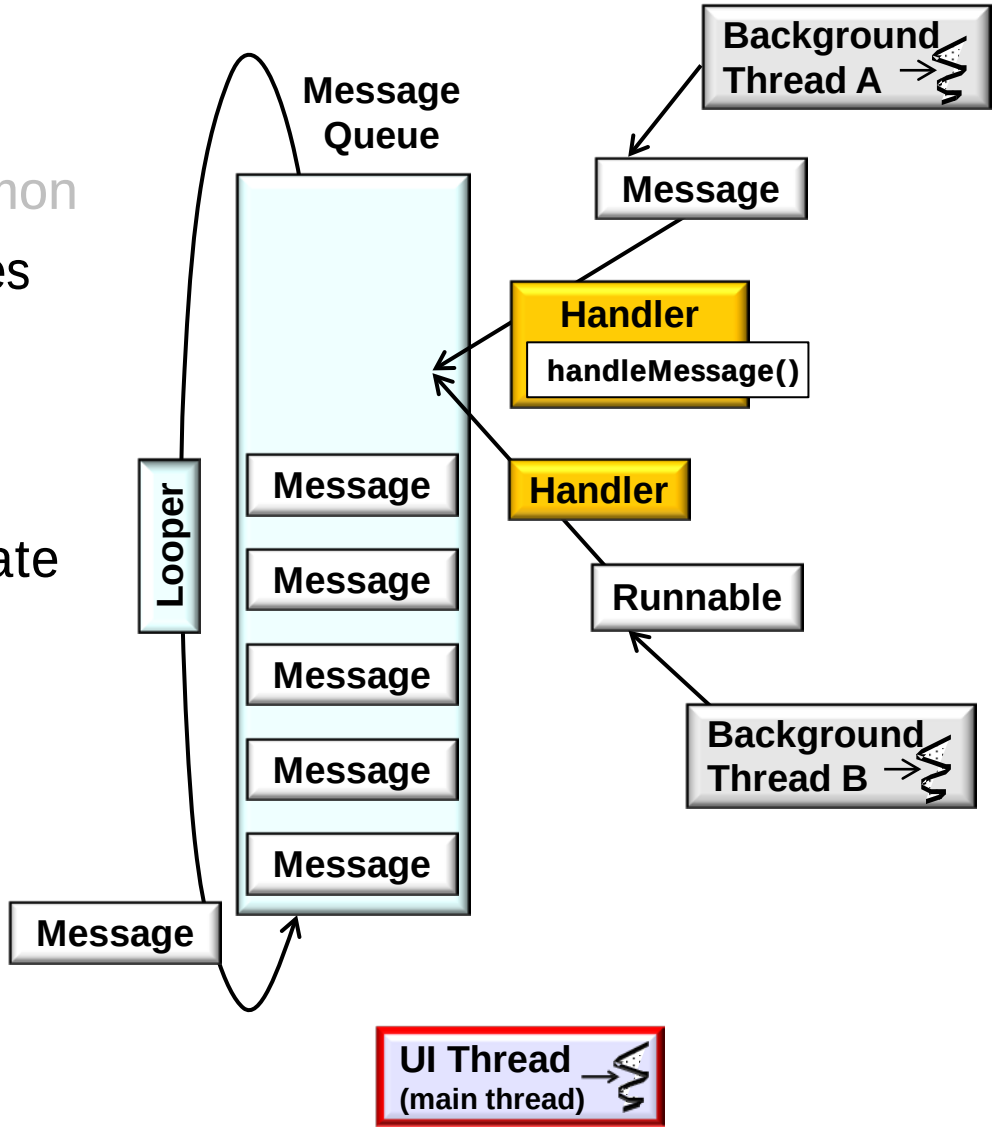

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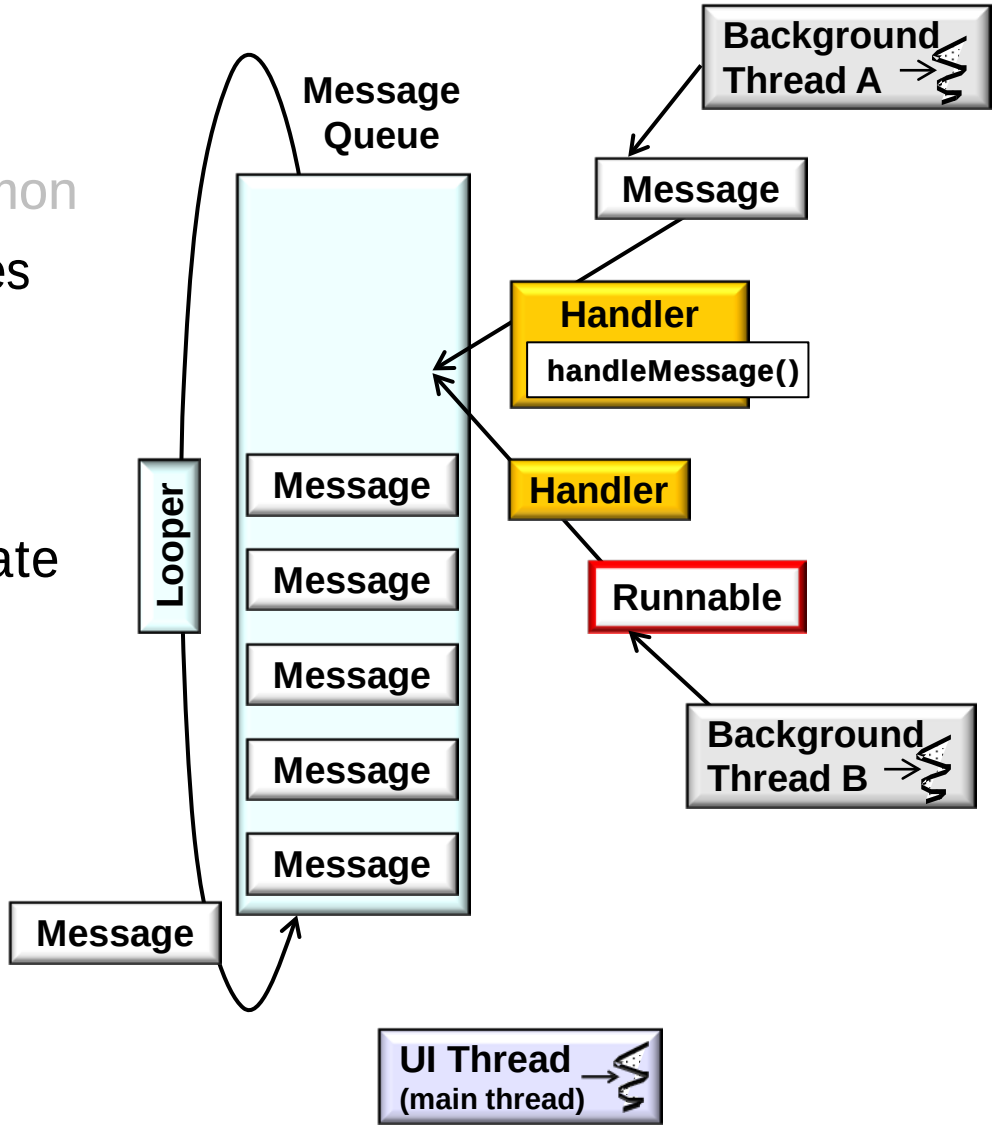

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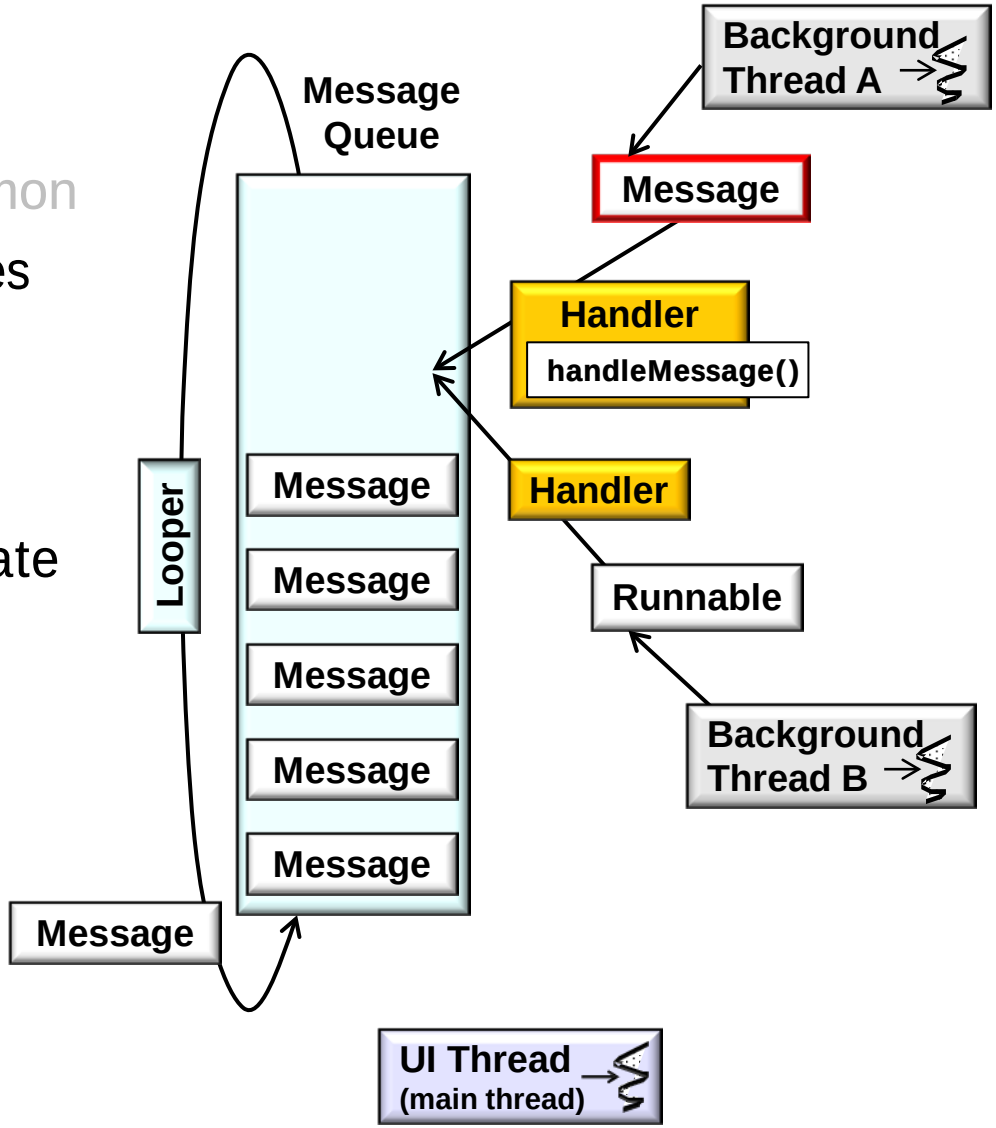

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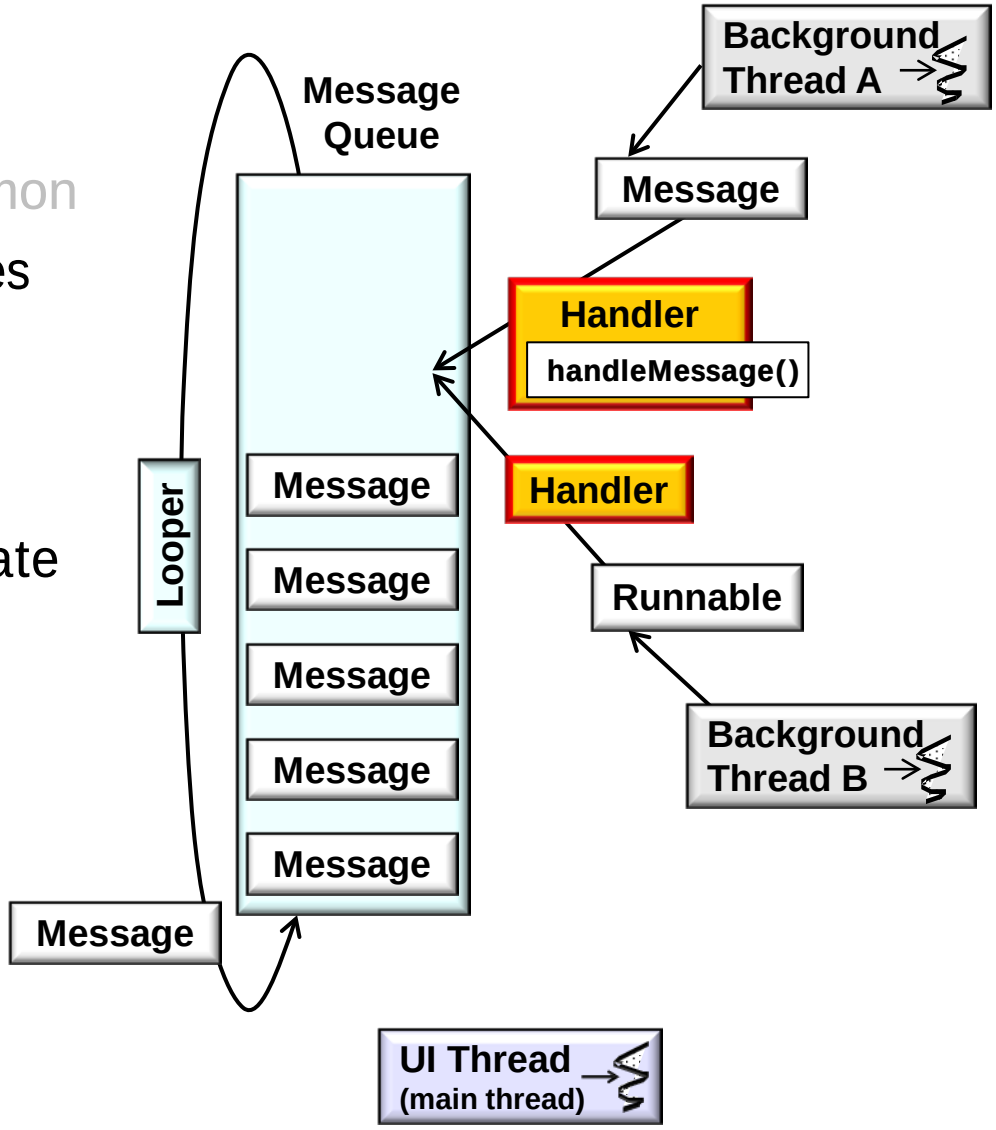

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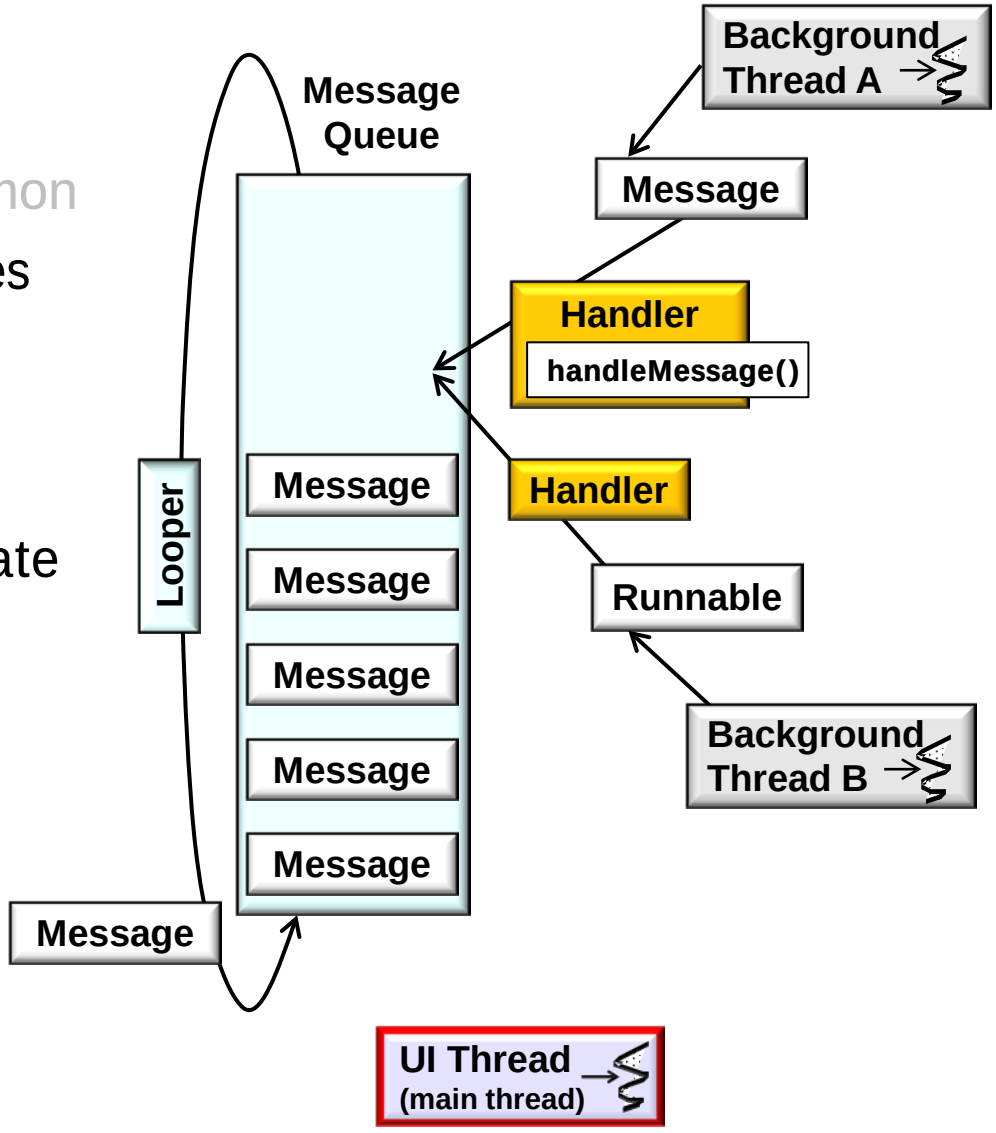

See earlier parts on using the Android Handler class

Summary

- Threaded Downloads implements three different concurrency models
- Solutions share some thing in common
- Solutions also have some differences
  - Background Threads & UI Thread communicate in different ways
    - Background Threads in HaMeR framework explicitly communicate with UI Thread
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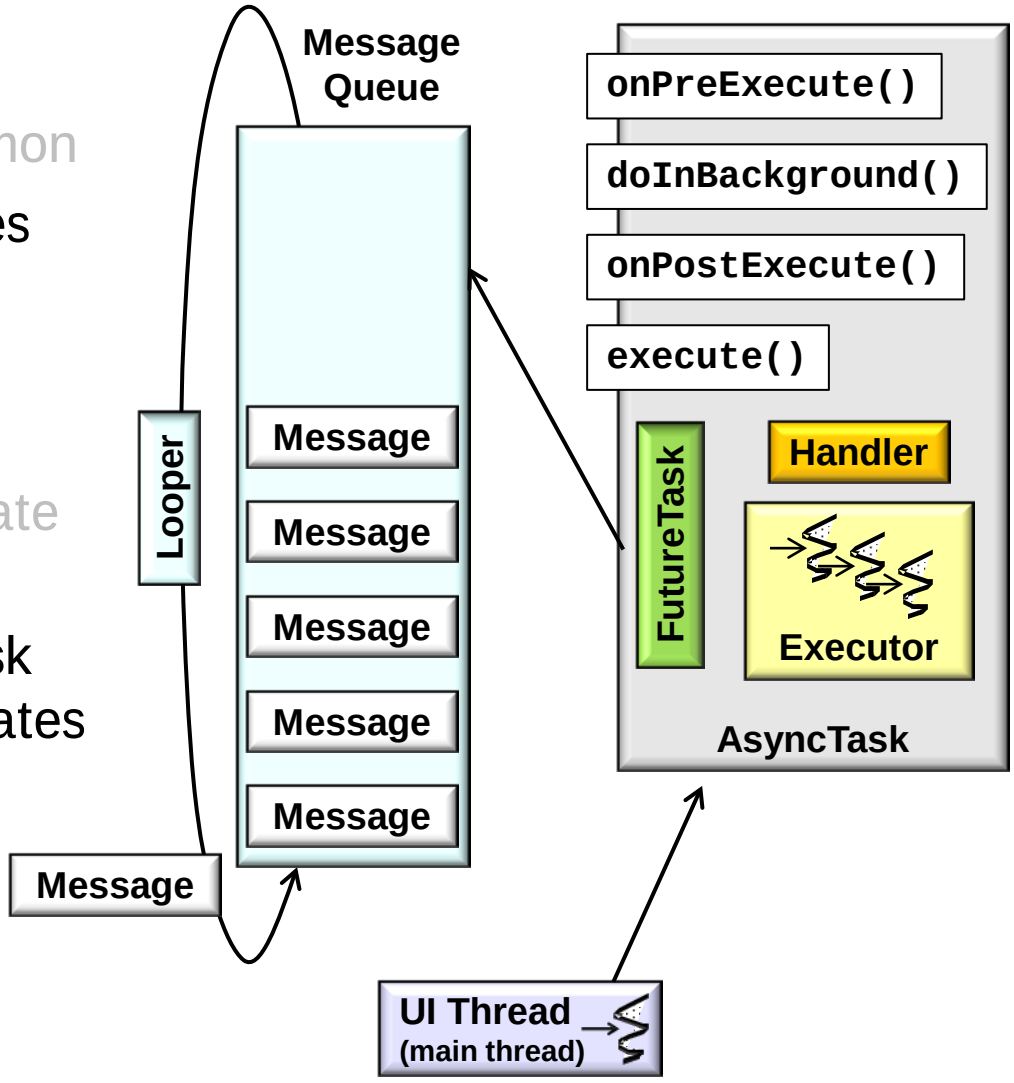

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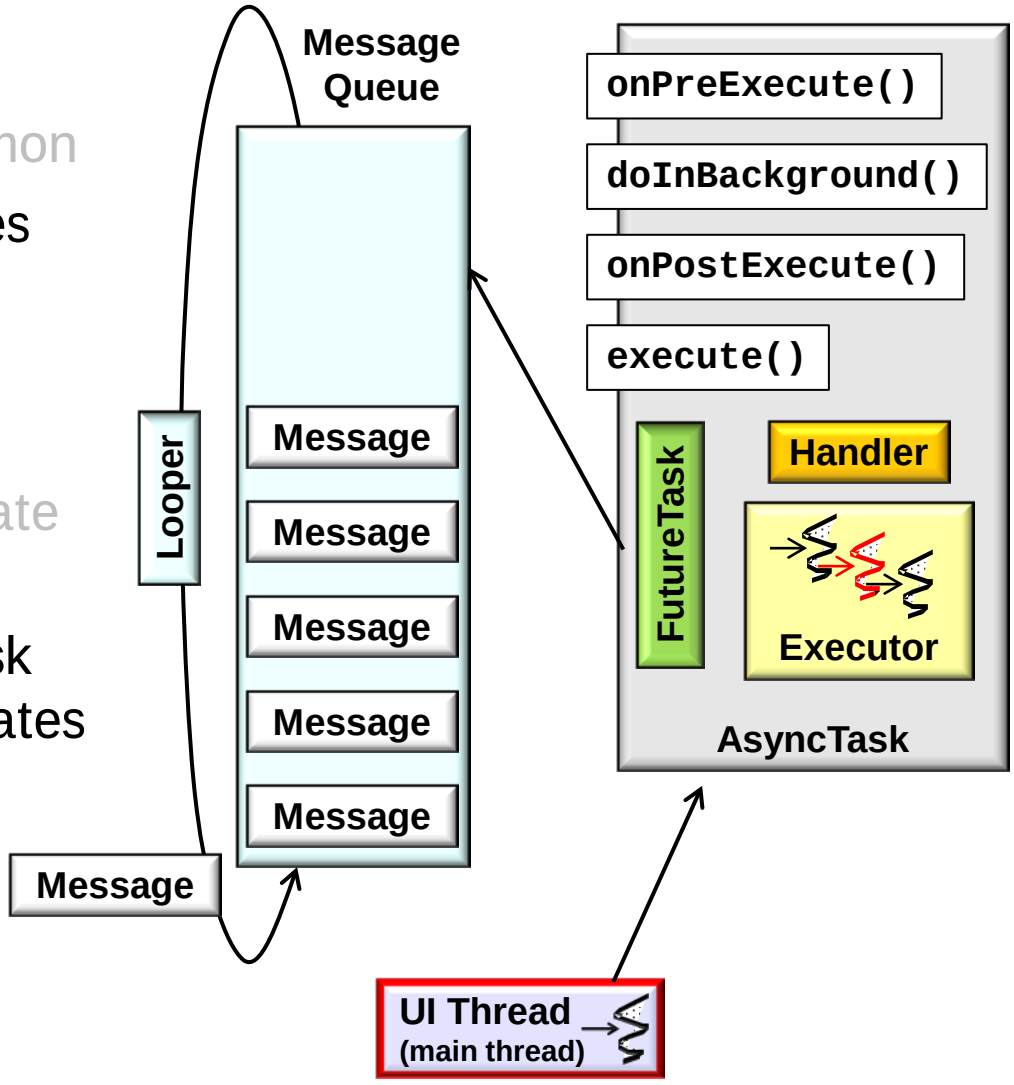

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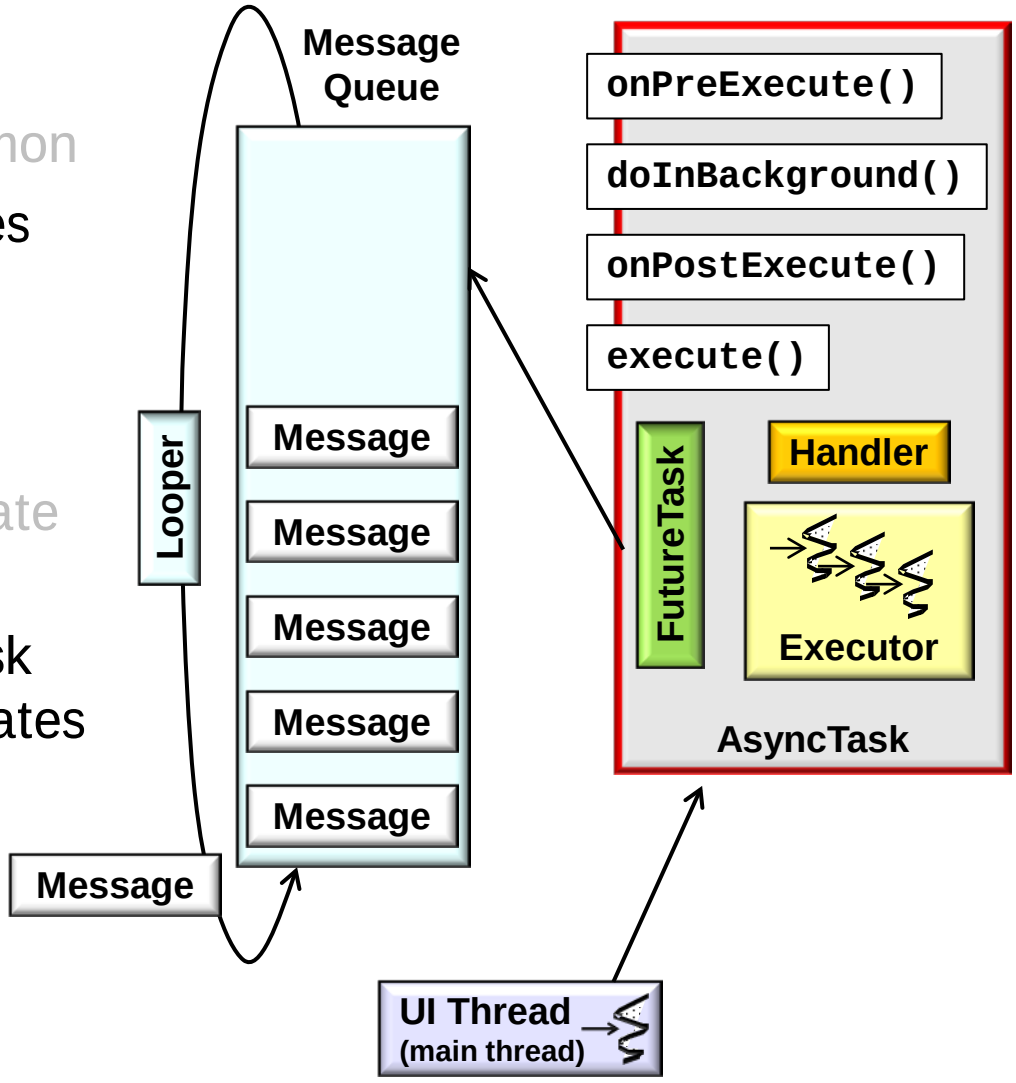

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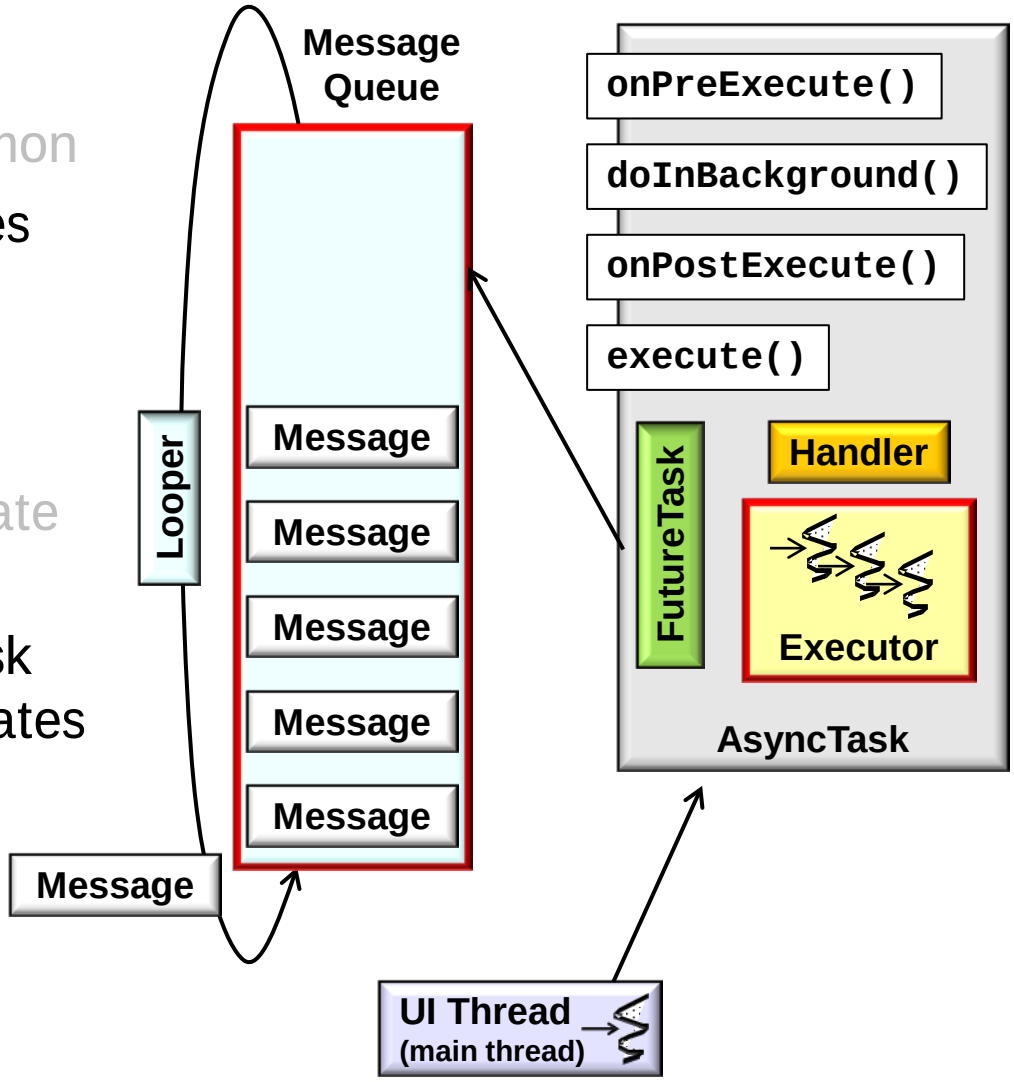

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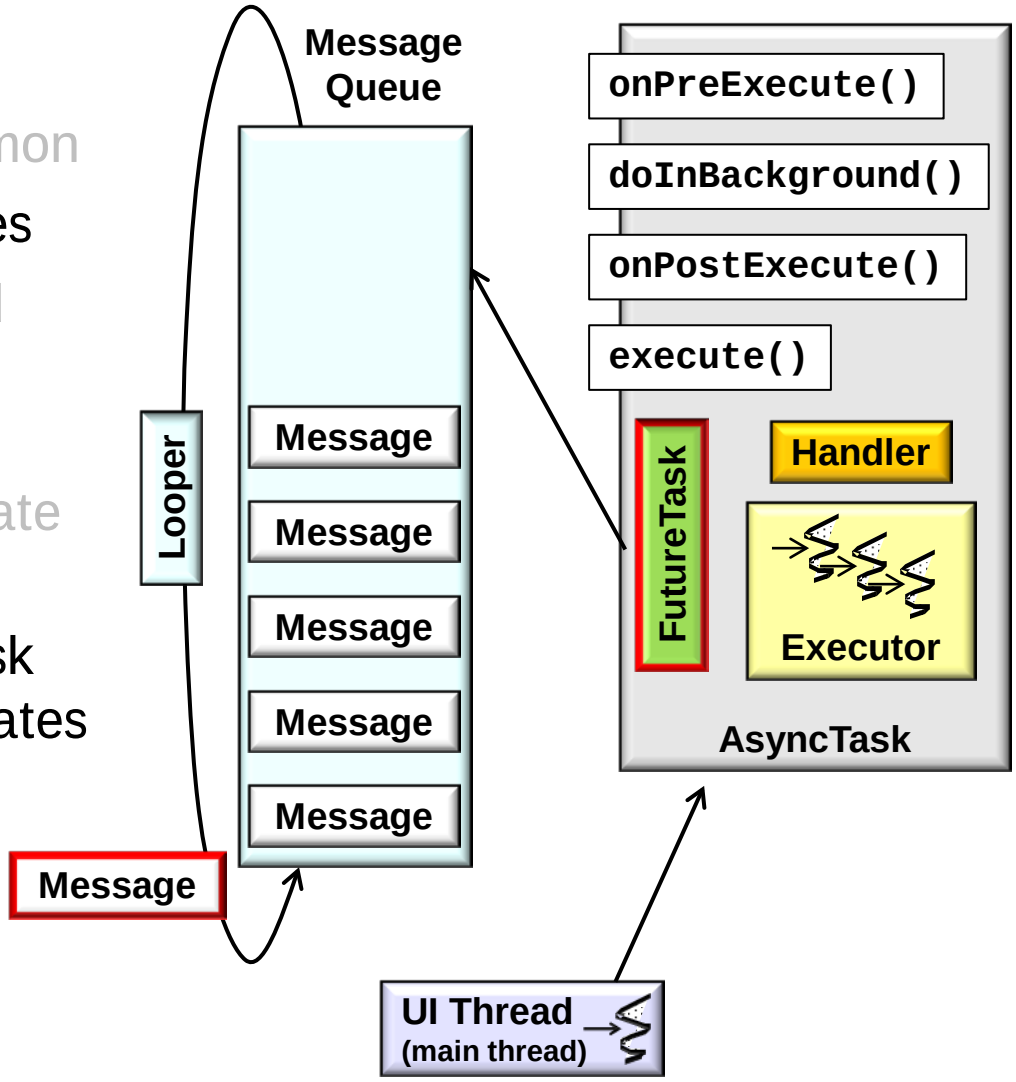

See earlier parts on "The AsyncTask Framework"

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- Each solution has pros & cons

	Async Task	Posting Runnables	Sending Messages
Usability (Simple)	□□□	□□□	□□
Usability (Complex)	□□□	□	□□
Scalability	□□□	□	□
Flexibility	□□	□	□□□
Efficiency	□□	□□□	□□□

It's important to understand application requirements to make the right choice

Summary

- Threaded Downloads implements three different concurrency models
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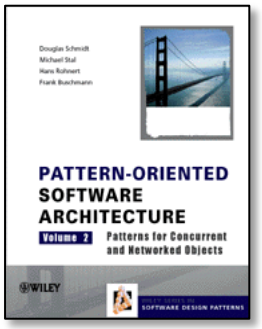
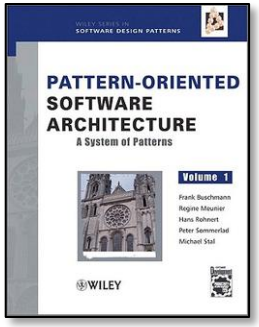
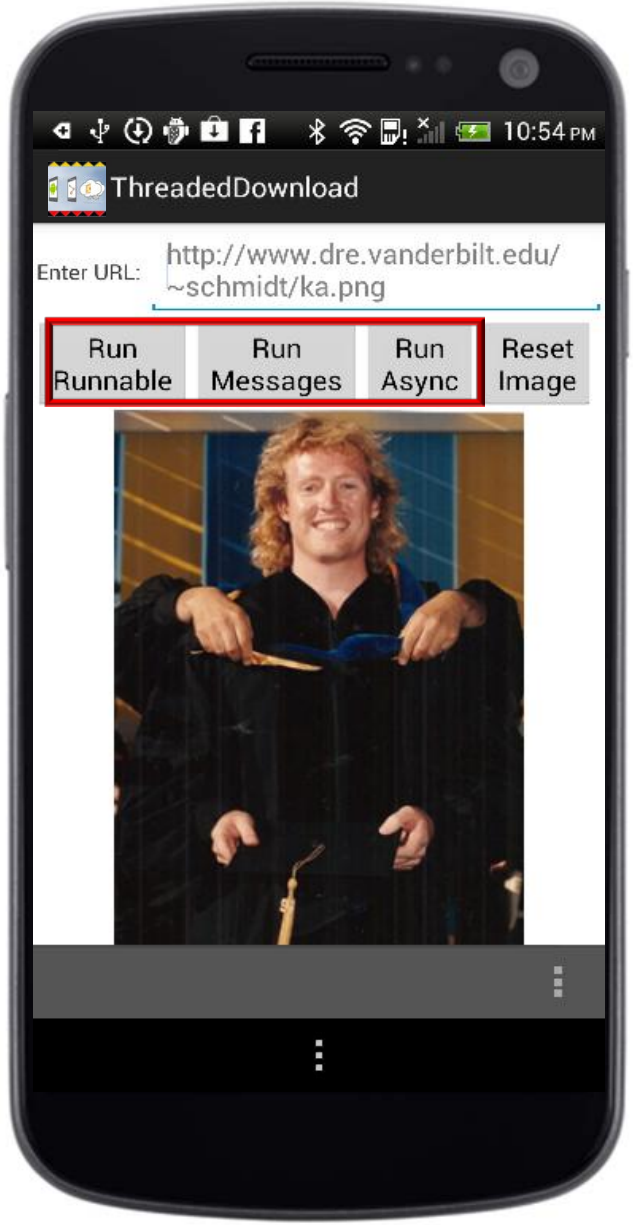
- These solutions are based on GoF & POSA patterns







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