Overview of Android Layers & Concurrency

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Learning Objectives in this Lesson

• Recognize Android’s architectural layers
Learning Objectives in this Lesson

- Recognize Android’s architectural layers
- Understand Android’s architectural layers wrt concurrency
Android’s Architectural Layers
Android’s architecture is structured into multiple layers for several reasons:

- Operating System Kernel
- System Libraries
- Execution Environment (Dalvik & ART)
- Android Concurrency Frameworks
  - Java Threads & Synchronizers
- Additional Application Frameworks
- Applications
Android’s Architectural Layers

- Android’s architecture is structured into multiple layers for several reasons, e.g.
  - Enhance systematic reuse

See [en.wikipedia.org/wiki/Code_reuse#Systematic_software_reuse](en.wikipedia.org/wiki/Code_reuse#Systematic_software_reuse)
Android’s Architectural Layers

- Android’s architecture is structured into multiple layers for several reasons, e.g.
  - Enhance systematic reuse
  - Enable “plug & play” replacement of certain layer implementations
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Effects of updates can be confined to the layer whose implementation changes
Android's Architectural Layers

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  - Enhance systematic reuse
  - Enable “plug & play” replacement of certain layer implementations
  - Reduce the complexity of APIs that app developers must know

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### Additional Application Frameworks

- Operating System Kernel
- Applications
  - Additional Application Frameworks
  - Android Concurrency Frameworks
    - Java Threads & Synchronizers
  - Execution Environment (Dalvik & ART)
  - System Libraries
  - Operating System Kernel

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See [en.wikipedia.org/wiki/Facade_pattern](en.wikipedia.org/wiki/Facade_pattern)
Android’s Architectural Layers

• Android’s architecture is structured into multiple layers for several reasons, e.g.
  • Enhance systematic reuse
  • Enable “plug & play” replacement of certain layer implementations
  • Reduce the complexity of APIs that app developers must know
  • Enable the use of popular APIs, protocols, & programming languages

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Applications

Additional Application Frameworks

Android Concurrency Frameworks
  Java Threads & Synchronizers

Execution Environment (Dalvik & ART)

System Libraries

Operating System Kernel

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THE C PROGRAMMING LANGUAGE

TCP/IP Illustrated Volume 2: The Transmission Control Protocol/Internet Protocol
Android’s Architectural Layers

Android’s architecture is structured into multiple layers for several reasons, e.g.:

- Enhance systematic reuse
- Enable “plug & play” replacement of certain layer implementations
- Reduce the complexity of APIs that app developers must know
- Enable the use of popular APIs, protocols, & programming languages
- These popular protocols & APIs are available in open-source form

See source.android.com & source.android.com/source/building-kernels.html
Android’s Architectural Layers wrt Concurrency
The architectural layers of the Android platform define various mechanisms for running concurrent programs on a range of computing devices.
Android’s Architectural Layers wrt Concurrency

- The architectural layers of the Android platform define various mechanisms for running concurrent programs on a range of computing devices.

![Diagram showing the layers of the Android platform]

Android strives to strike an effective balance between programmer productivity & computing performance.
The architectural layers of the Android platform define various mechanisms for running concurrent programs on a range of computing devices. The Android Linux kernel controls hardware and manages system resources.
Android’s Architectural Layers wrt Concurrency

- The architectural layers of the Android platform define various mechanisms for running concurrent programs on a range of computing devices.

The Bionic LibC library supports the Pthreads C programming APIs.
Dalvik & ART provide a managed execution environment for Java apps.

The architectural layers of the Android platform define various mechanisms for running concurrent programs on a range of computing devices.

- Additional Application Frameworks
- Android Concurrency Frameworks
  - Java Threads & Synchronizers
- Execution Environment (Dalvik & ART)
- System Libraries
- Operating System Kernel

Dalvik & ART provide a managed execution environment for Java apps.
The Android runtime layer contains a copy of classes in the java.util.concurrent packages.
The architectural layers of the Android platform define various mechanisms for running concurrent programs on a range of computing devices.

The Android runtime layer also provides concurrency frameworks.
Android’s Architectural Layers wrt Concurrency

- The architectural layers of the Android platform define various mechanisms for running concurrent programs on a range of computing devices.

- Android’s application frameworks & packaged applications use its concurrency mechanisms & frameworks extensively.
End of Overview of Android Layers & Concurrency
Discussion Questions

1. Which of the following are reasons why Android’s architecture is designed with multiple layers?
   a. Enable the use of popular APIs, protocols, & programming languages
   b. Enhance performance on multi-core processors
   c. Enable “plug & play” replacement of certain layer implementations
   d. Enhance the complexity of APIs that app developers must know