The Universe of Android Programming

Development Tools

Android Architecture

Software Engineering

Platform Architecture

- **Linux kernel**
  - Use key security features of linux
  - Hardware drivers for well-known kernel

- **Android Runtime**
  - Similar to Java virtual machine
Android Runtime

- ART and DEX files optimized for low-memory devices
- Ahead-of-time (AOT) and just-in-time (JIT) compilation
- Optimized garbage collection
Android Framework

Hardware API          App Components          Resources

Sensor Manager       Activities            Strings
Location Manager     Services             Media
Bluetooth Manager    Intents             Layout
...                 ...                ...
Android Key Terms

- **Activity**
  - Logical unit of a user activity (like window in a computer program)
  - Usually full-screen

- **View**
  - Hierarchical UI element
  - Combined in layouts and extended to Widgets with more functionality

- **Service**
  - Background activity without UI, e.g., music player or FTP server
Android Key Terms

- **«Intent»**
  - Asynchronous message to bind components
  - Starts or switches between «Activities»
  - Intent Filters are used to only act on specific Intents

- **«BroadcastReceiver»**
  - Listens for global events (Intents)
    - e.g., «headphones were plugged» sent by the system
  - Can be used to pass system events for further processing
  - Can inform the user about system events
Activity Lifecycle

- **Multi-Tasking**
  - OS keeps apps alive as long as possible
  - On memory shortage, processes are killed according to their priority

- **Essential states of an activity**
  - Running (resumed)
  - Paused
  - Stopped
  - Finished/killed
Development Tools

- SDK Tools
  - Development and debug tools, emulator, etc.
- SDK Platforms
  - APIs for target platforms
- Build Tools
- Support libraries
  - Libraries to support backward compatibility
Now: Android Live Hacking