Digital Image and Signal Processing Lab

Introduction to Smart Phone

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Outline

- **Why do I need to learn about designing the applications of smart phone?**
- **Hardware Architecture**
- **Software Architecture(references on Google Android)**
- **How do we design an application on android phone?**
- **Reference**

Why do I need to learn about designing the applications of smart phone?

- **My research style must focus not only on theory but also implementation**

- **Destination : Make something people really want**

- **A suitable platform**

- **Easy way to design**

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Hardware Architecture

- **IPhone/Android Hardware**
  - Capacitive multi-touch screen
  - CPU/RAM/storage
    - CPU: 500MHz~1GHz ARM 11 or Cortex A8
    - GPU
    - 128-512MB RAM
    - 8-32GB flash
    - US$400-$700
  - vs IBM Thinkpad X40 from 2004
    - Pentium M 1GHz, 256MB RAM, 20GB
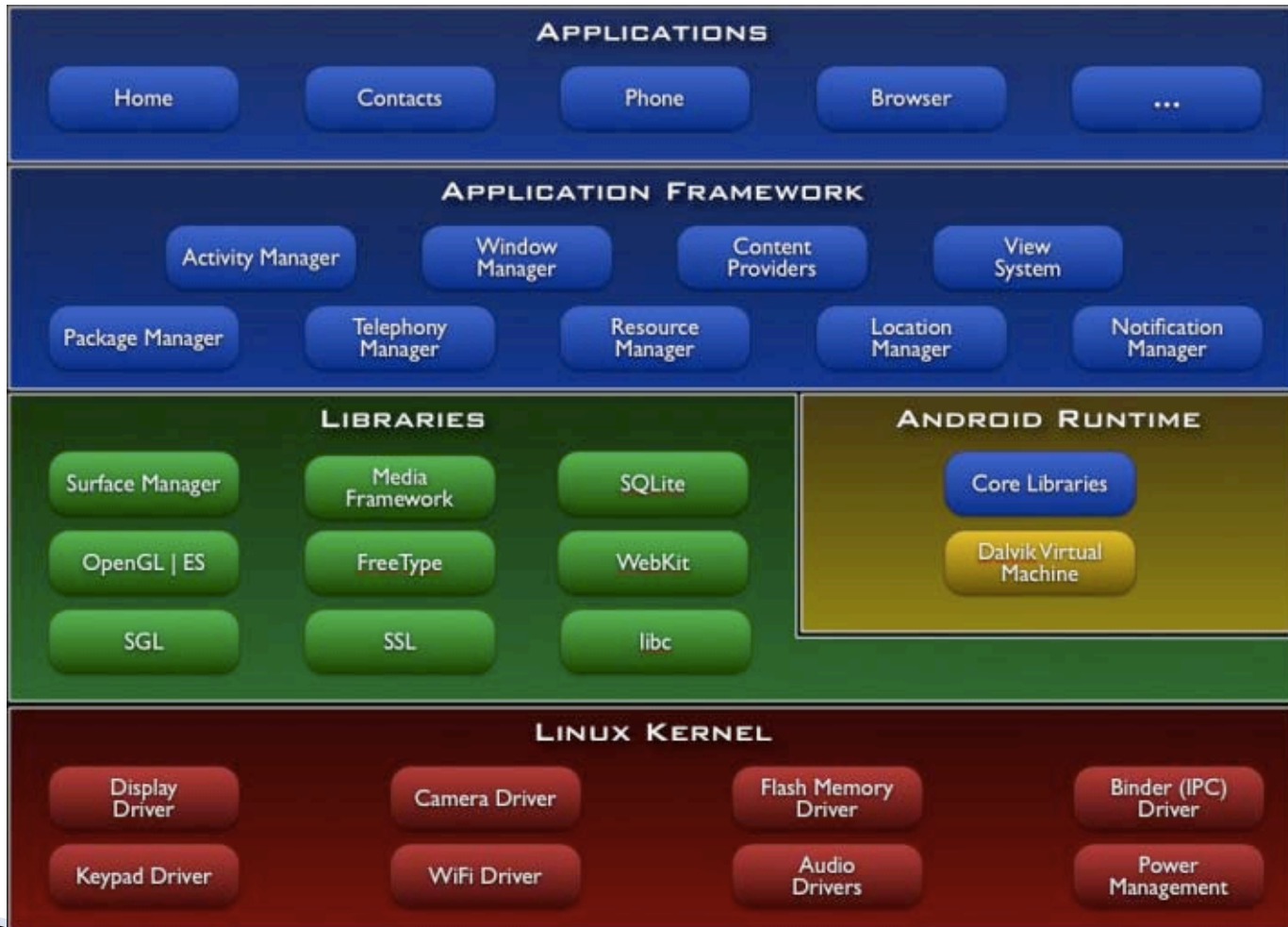   - $1500!

Hardware Architecture

- **IPhone/Android Hardware**
  - Sensors
    - GPS
    - 3D accelerometer (think Wii controller)
      - iPhone 4 with gyroscope
    - Compass
    - Camera
    - Proximity & light sensor
    - Microphone
    - WiFi/Bluetooth
    - GSM/UMTS (GPRS/Edge/HSDPA)

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Software Architecture(references on Google Android)

Software Architecture(references on Google Android)

- **Linux Kernel**
  - Android is built on the Linux kernel, but Android is not Linux
  - Hardware driver :
    - Display driver
    - camera driver
    - …

Software Architecture(references on Google Android)

- **Linux Kernel**
  - Binder (IPC) Driver：
    - Applications and Services may run in separate processes but must communicate and share data.
    - IPC can introduce significant processing overhead and security holes.

Software Architecture(references on Google Android)

- **Linux Kernel**
  - Power management：
    - Mobile devices run on battery power.
    - Batteries have limited capacity.

Software Architecture (references on Google Android)

- **Native** Libraries
  - Libc
  - Function Libraries :
    - WebKit
    - Media Framework,
    - SQLite

Software Architecture(references on Google Android)

- **Native** Libraries
  - Native servers
    - Surface Manager
    - OpenGL | ES
  - Hardware Abstraction Libraries

Software Architecture(references on Google Android)

- **Java Runtime Environment, JRE**
  - Java virtual machine, JVM
  - Java runtime library

- **Android Runtime**
  - Dalvik Virtual Machine : Java .class / .jar files converted to .dex at build time
  - Core Libraries

Software Architecture(references on Google Android)

- **Application Framework**

- **Applications**

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How do we design an application on android phone?

- **How to start**
  - The Java approach
  - Download Android SDK (Software development kit)
    - http://developer.android.com/sdk/index.html
  - Eclipse – ADT (Android Development Tools)

How do we design an application on android phone?

- **Design an application**
  - Create a simulator
  - Create a new project
  - Project
    - src
    - assets
    - res
      - drawable
      - layout
      - Value
    - AndroidManifest.xml

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Reference

- http://www.google.com/events/io/2010/
- http://developer.android.com/index.html
- http://www.oracle.com/technetwork/java/index.html
- http://www.eclipse.org/