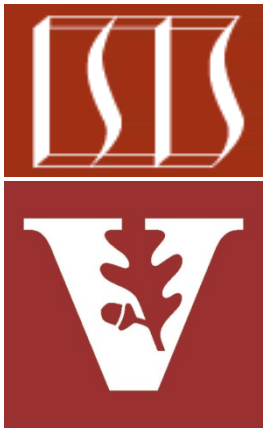
Overview of Frameworks: Part 3



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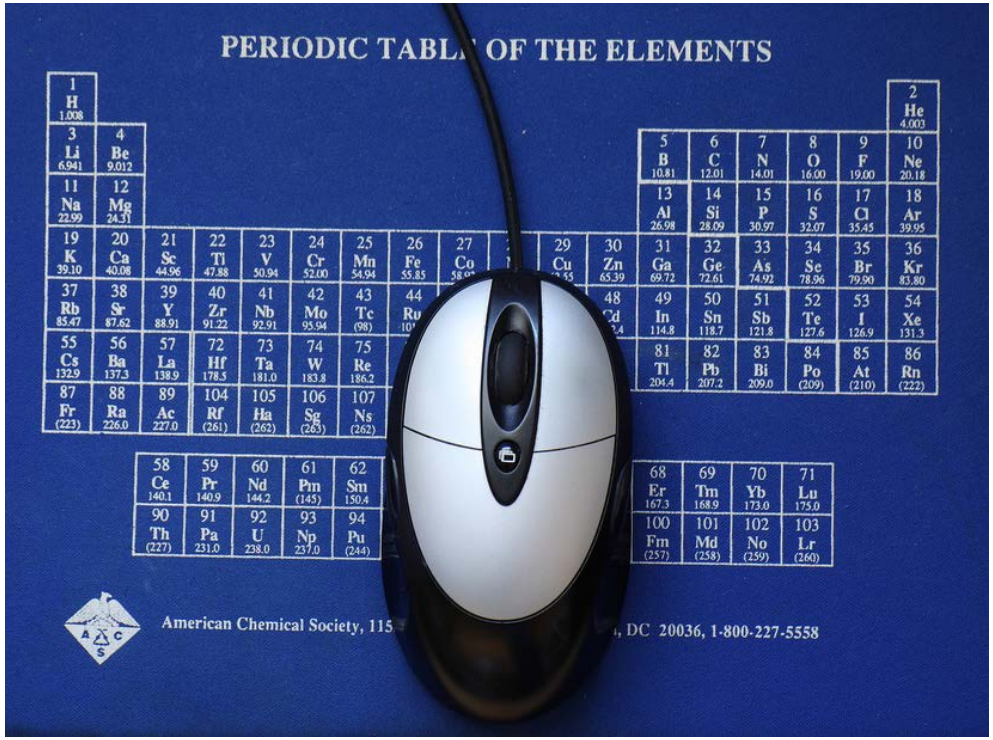
CS 282 Principles of Operating Systems II

Systems Programming for Android

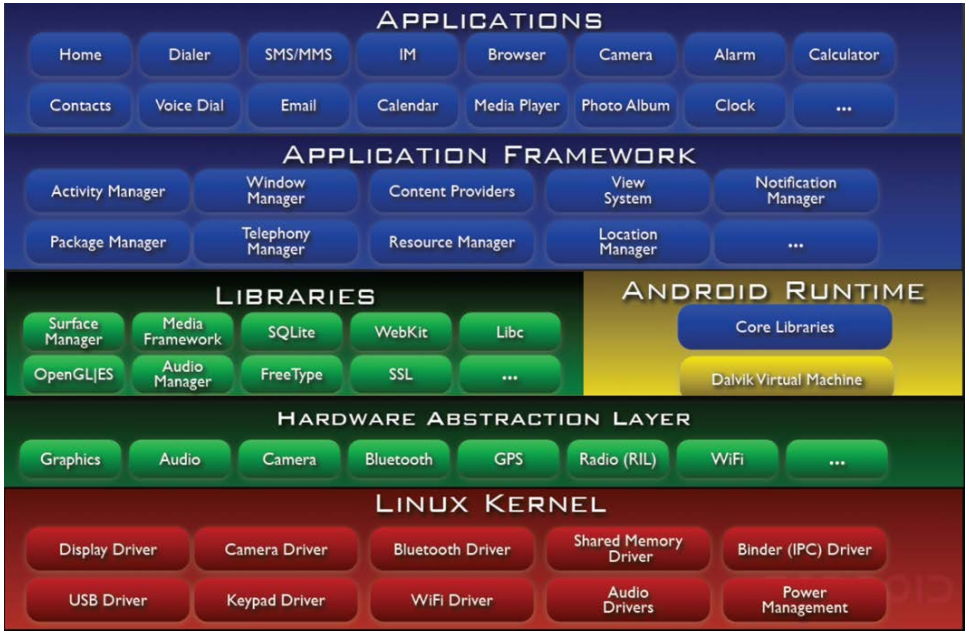
Learning Objectives of this Module

- Present *Scope, Commonality, & Variability* (SCV) analysis as a method for developing & applying software product-lines & frameworks



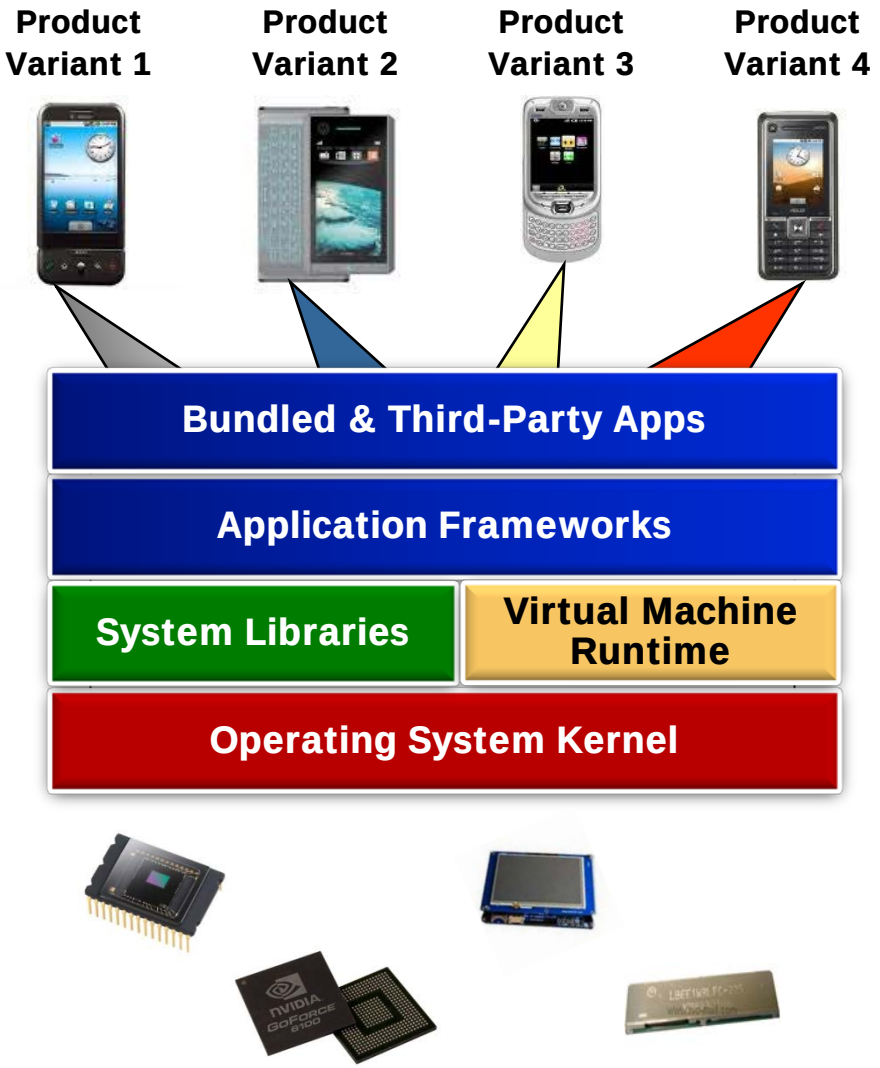
Learning Objectives of this Module

- Present *Scope, Commonality, & Variability* (SCV) analysis as a method for developing & applying software product-lines & frameworks
- Illustrate the application of SCV to Android



Overview of Software Product-Lines

- A *software product line* (SPL) is a form of systematic software reuse
  - An SPL a set of software-intensive systems
  - These systems share a common, managed set of features satisfying the specific needs of a particular market segment or mission
  - They are developed from a common set of core assets in a prescribed way



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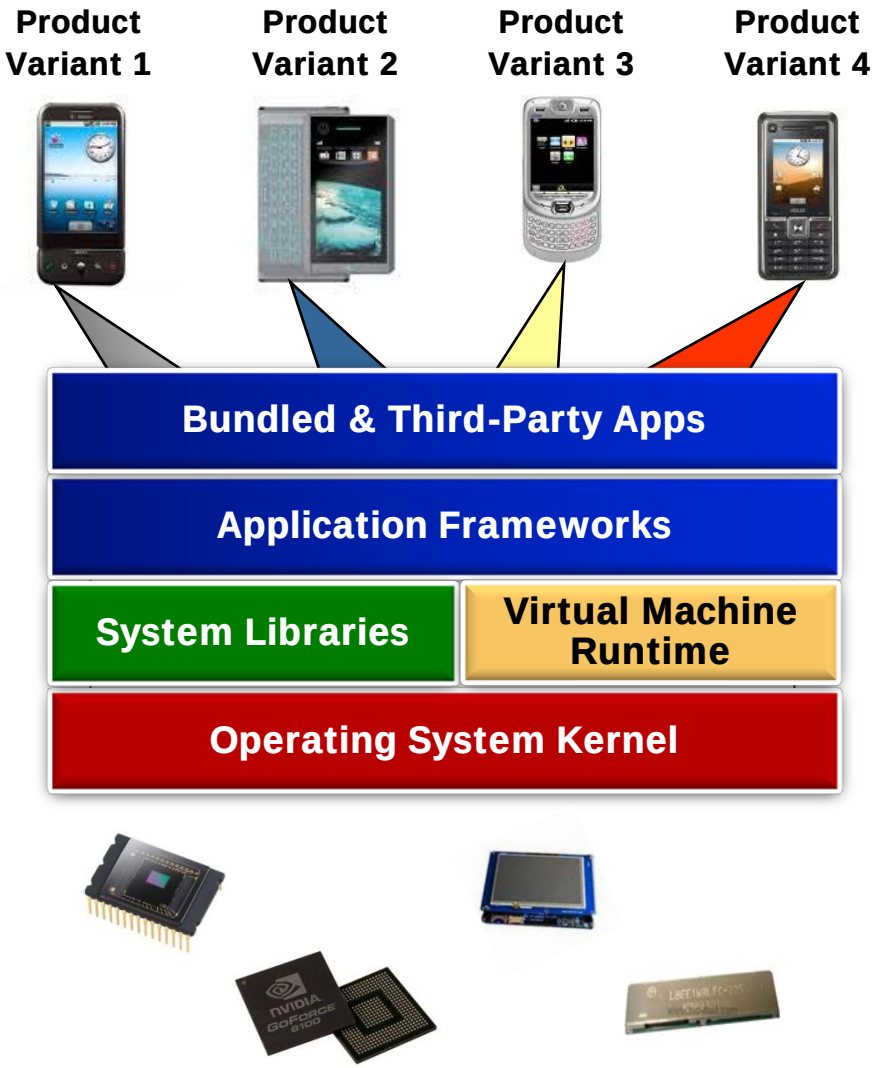
- Frameworks can help define & improve core SPL assets by factoring out many reusable general-purpose & domain-specific services from application responsibility



See www.sei.cmu.edu/productlines for more info on software product-lines

Scope, Commonality, & Variability Analysis

- Key software product-line & framework structure & behavior can be captured systematically via *Scope*, *Commonality*, & *Variability* (SCV) analysis

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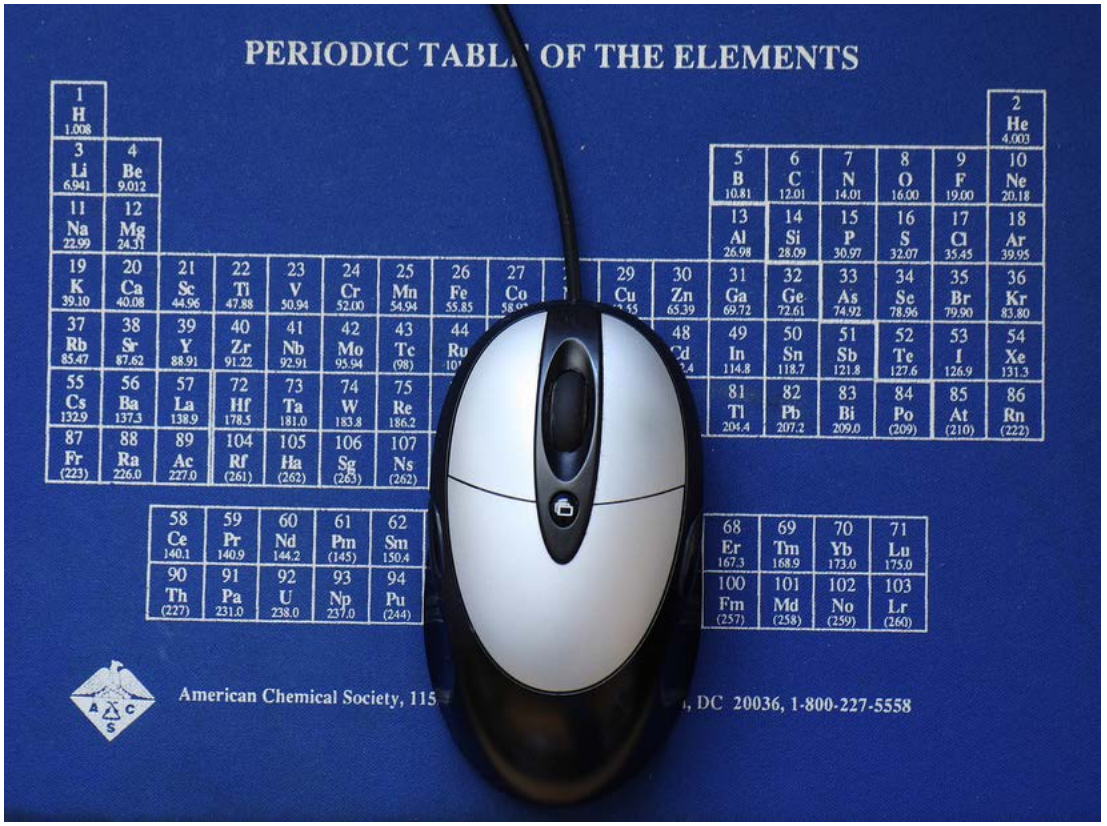

www.cs.iastate.edu/~cs309/references/CoplienHoffmanWeiss_CommonalityVariability.pdf

Scope, Commonality, & Variability Analysis

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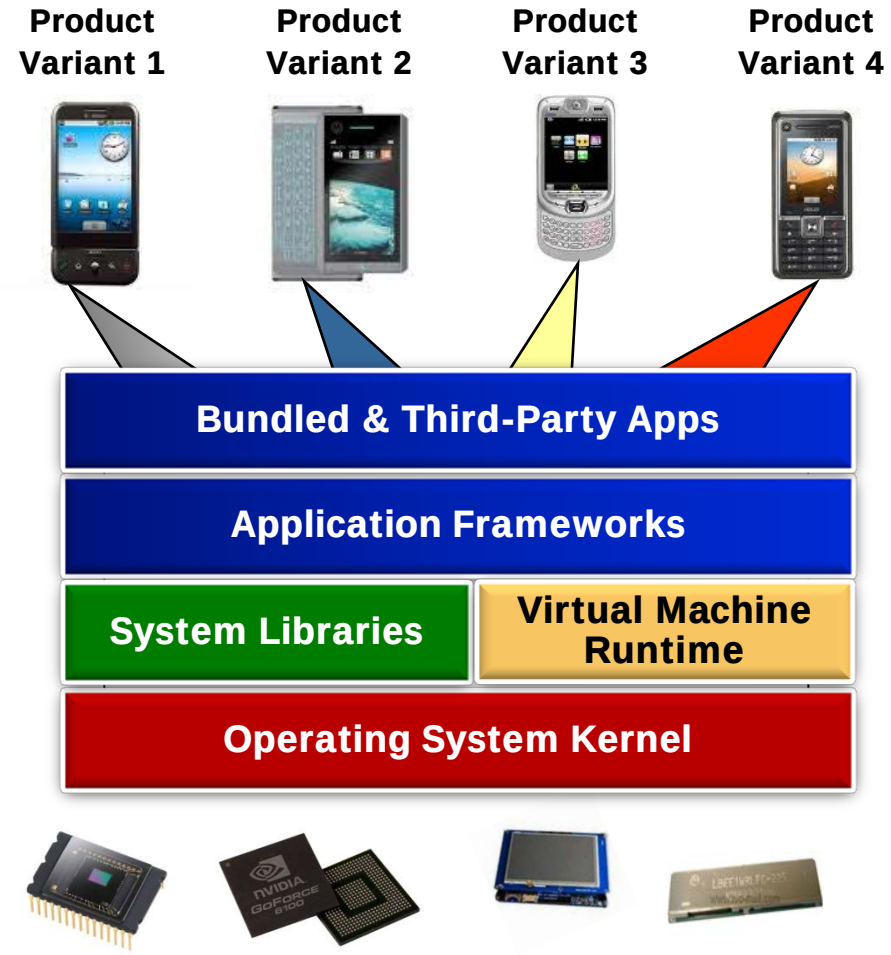
  - Often used to guide the development & application of software product-lines & frameworks



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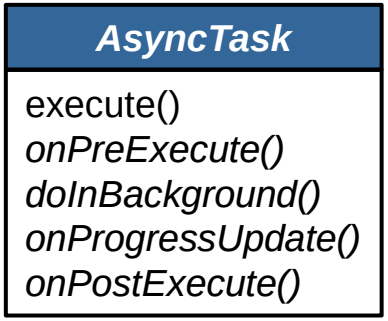
  - Identify common portions of a domain & define stable interfaces (fairly easy)



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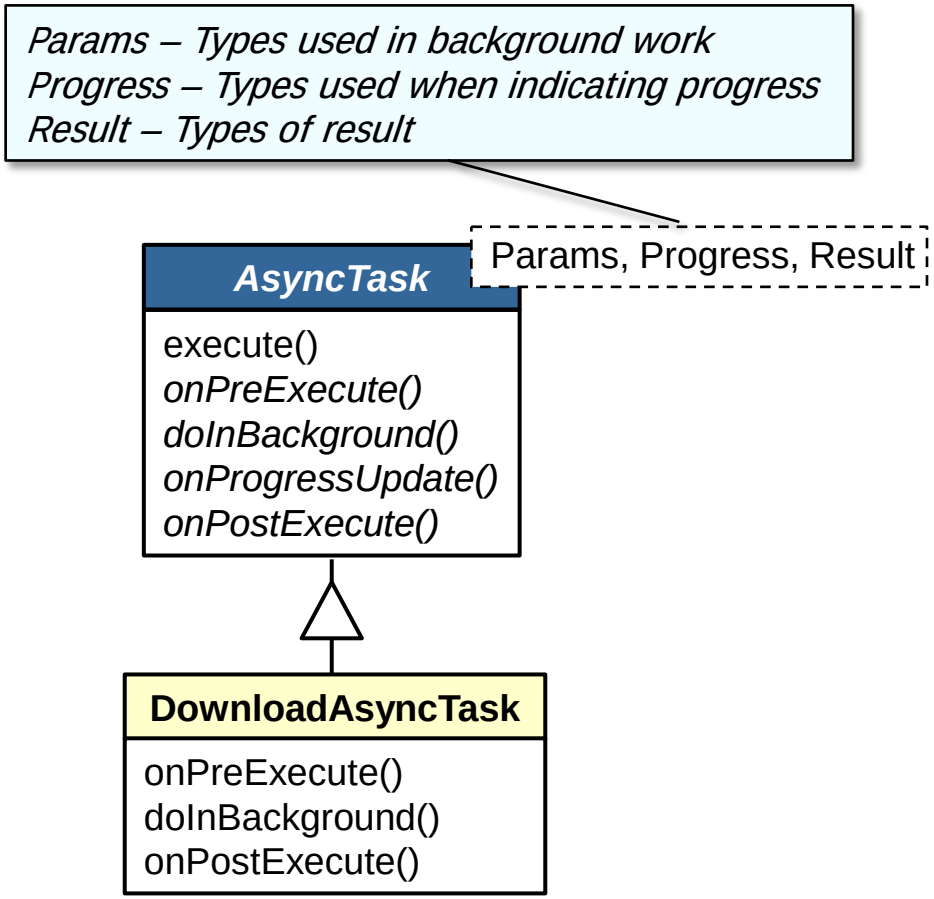

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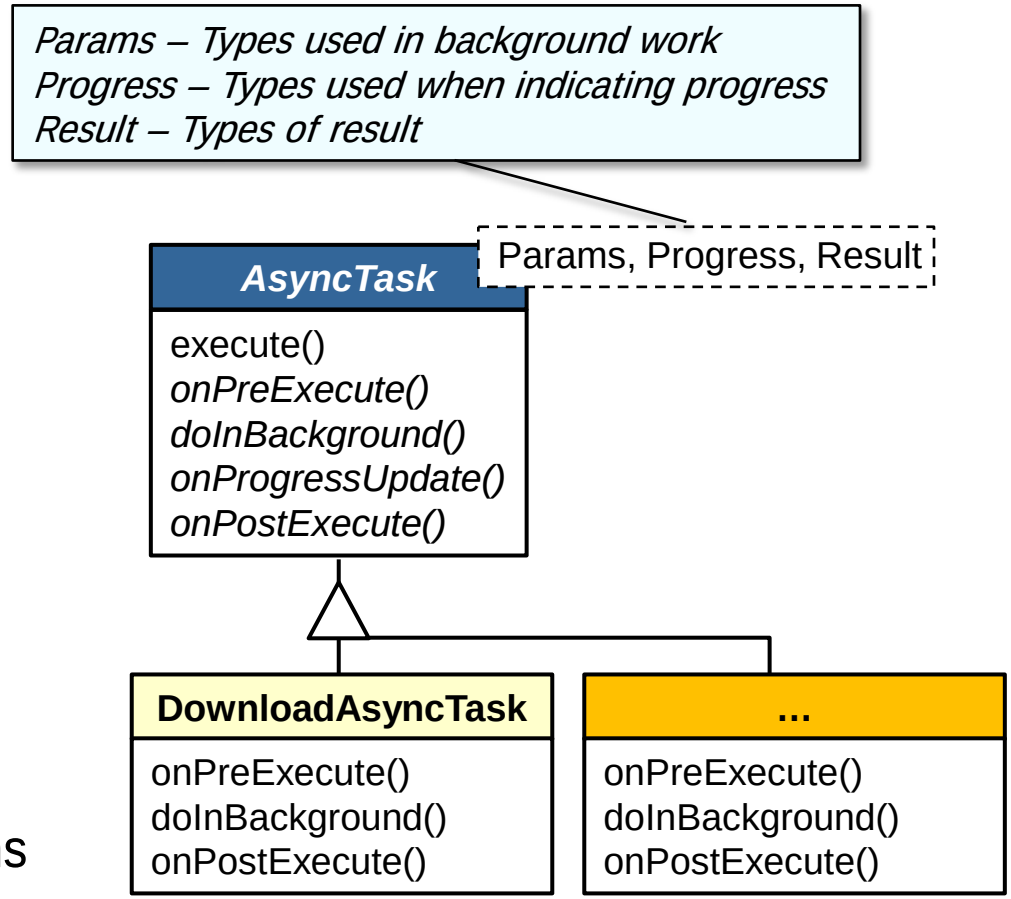

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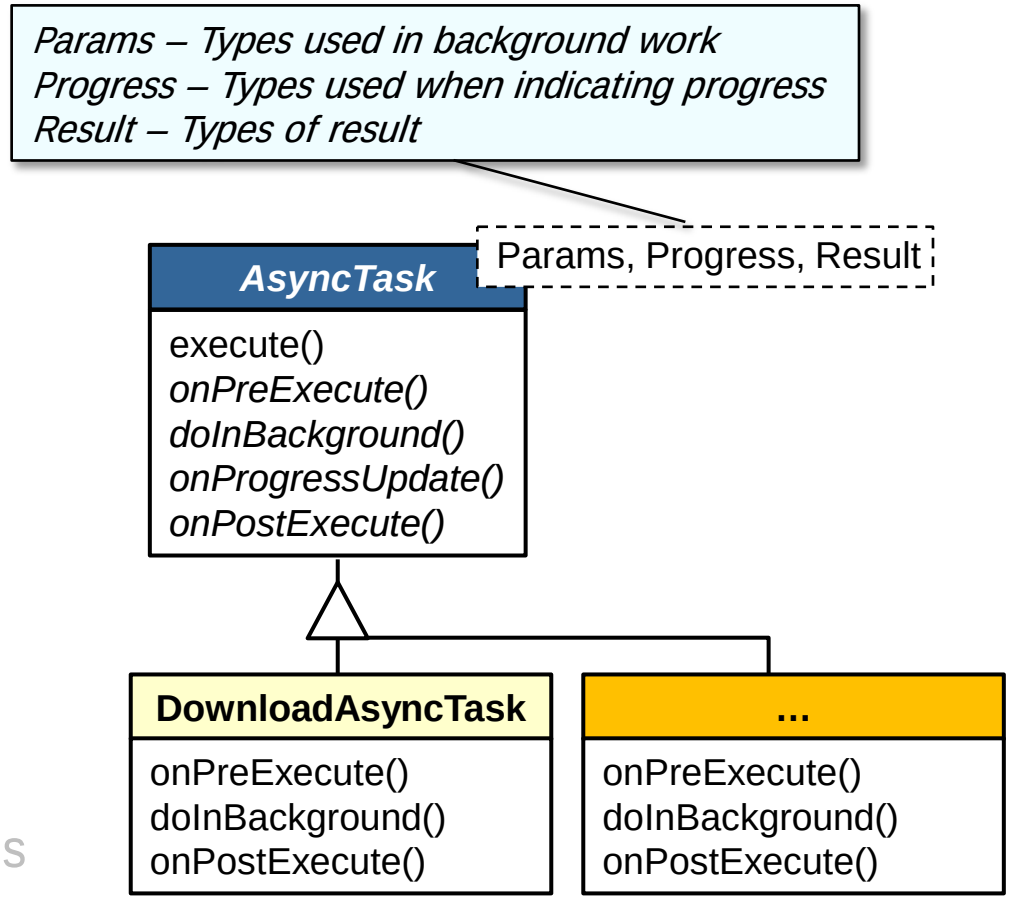
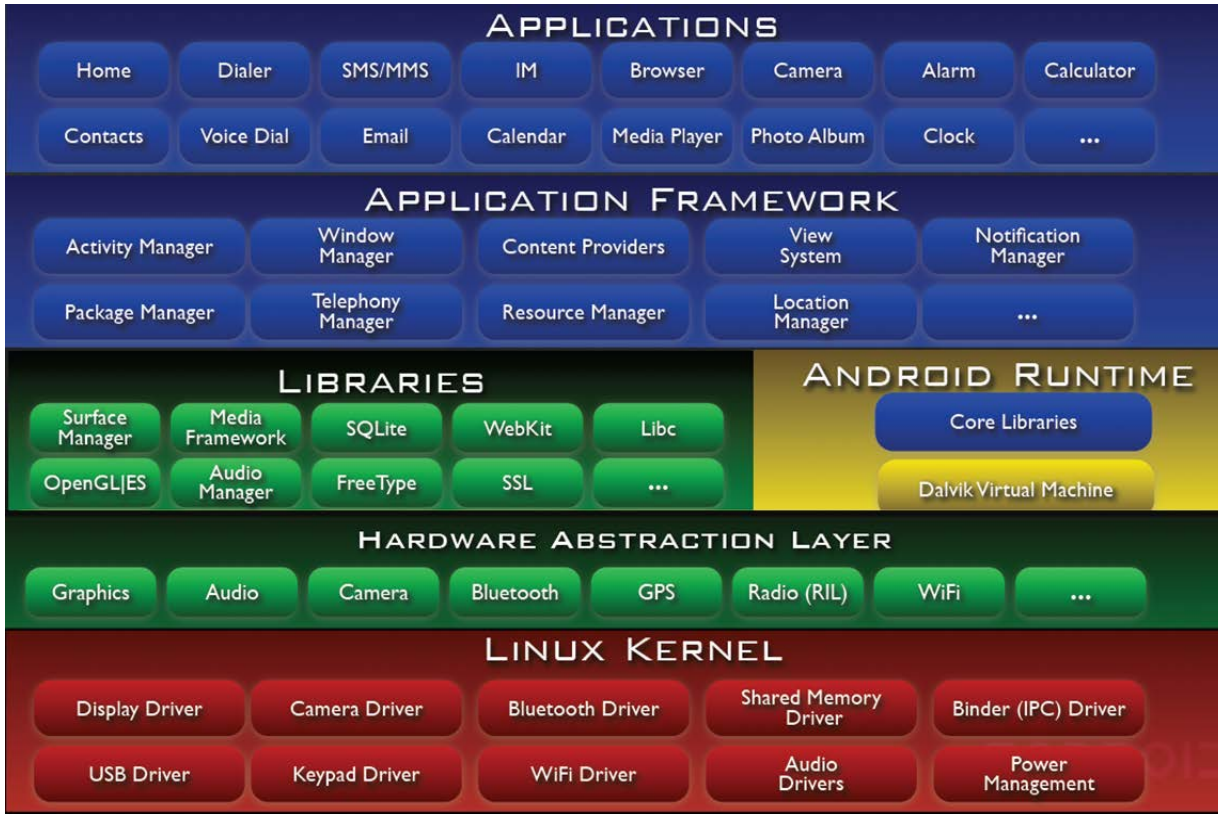


en.wikipedia.org/wiki/SOLID_(object-oriented_design) has more info

Applying SCV to Android

- **Scope** defines the domain & context of Android & its various frameworks & components
- e.g.,
  - Resource-constrained mobile devices
    - e.g., limited power, memory, processors, network, & price points



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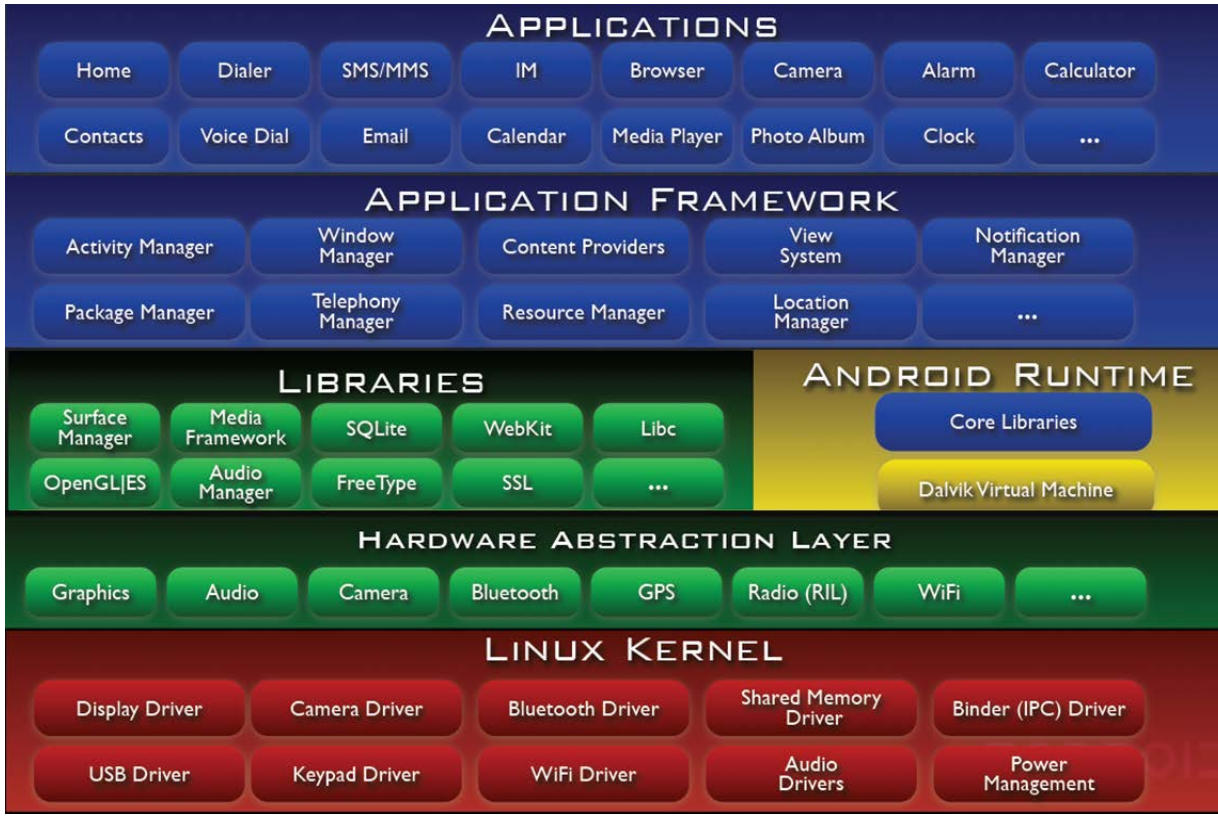

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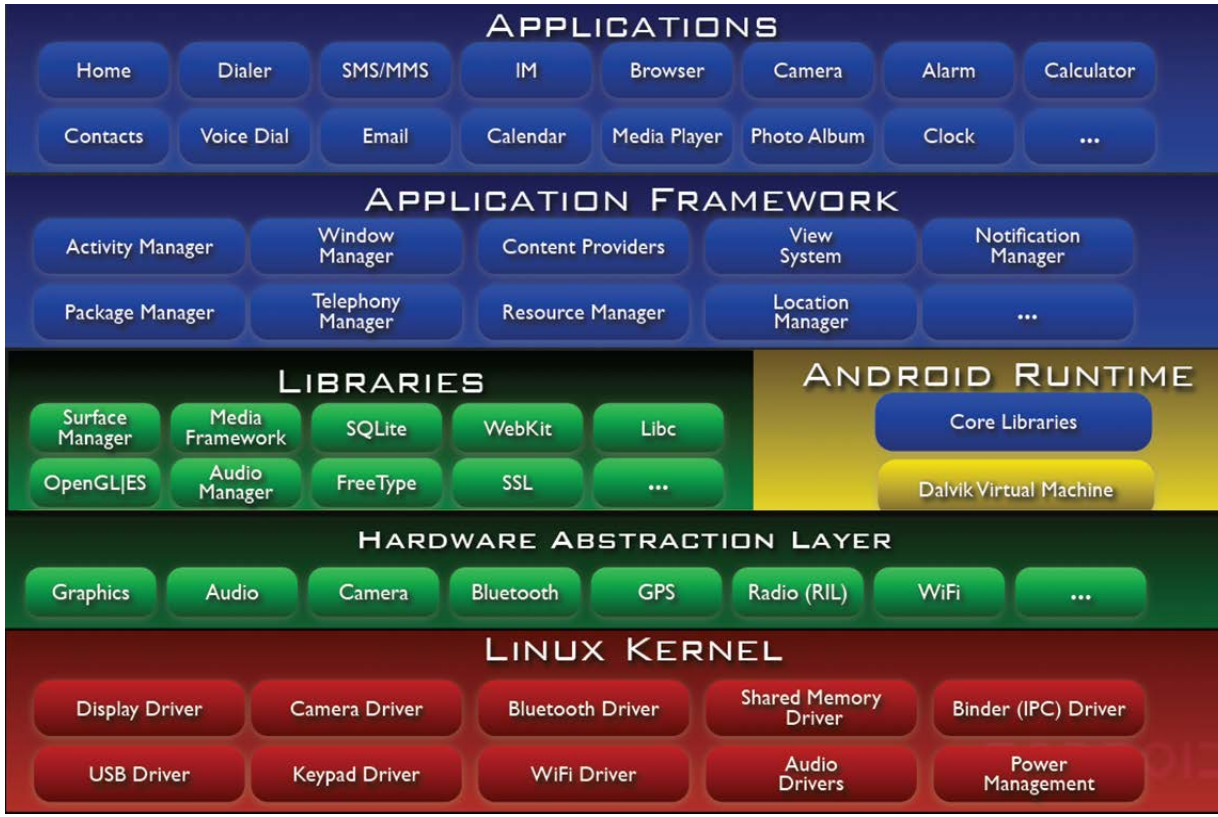

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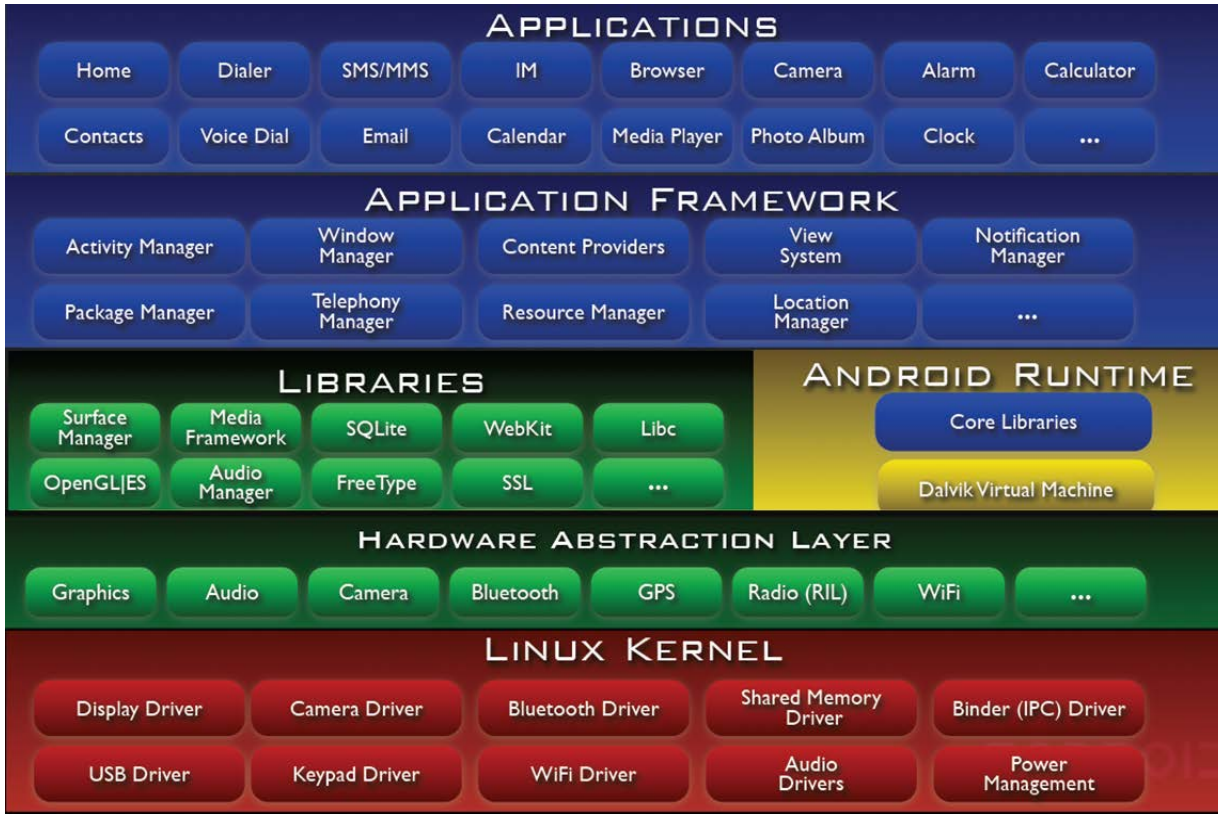
  - (Largely) open-source, vendor- & hardware-agnostic ecosystem
  - Focus on installed-base of Java app developers



See developer.android.com for more info on Android

Applying SCV to Android

- **Commonalities** describe the attributes common across all instances of Android
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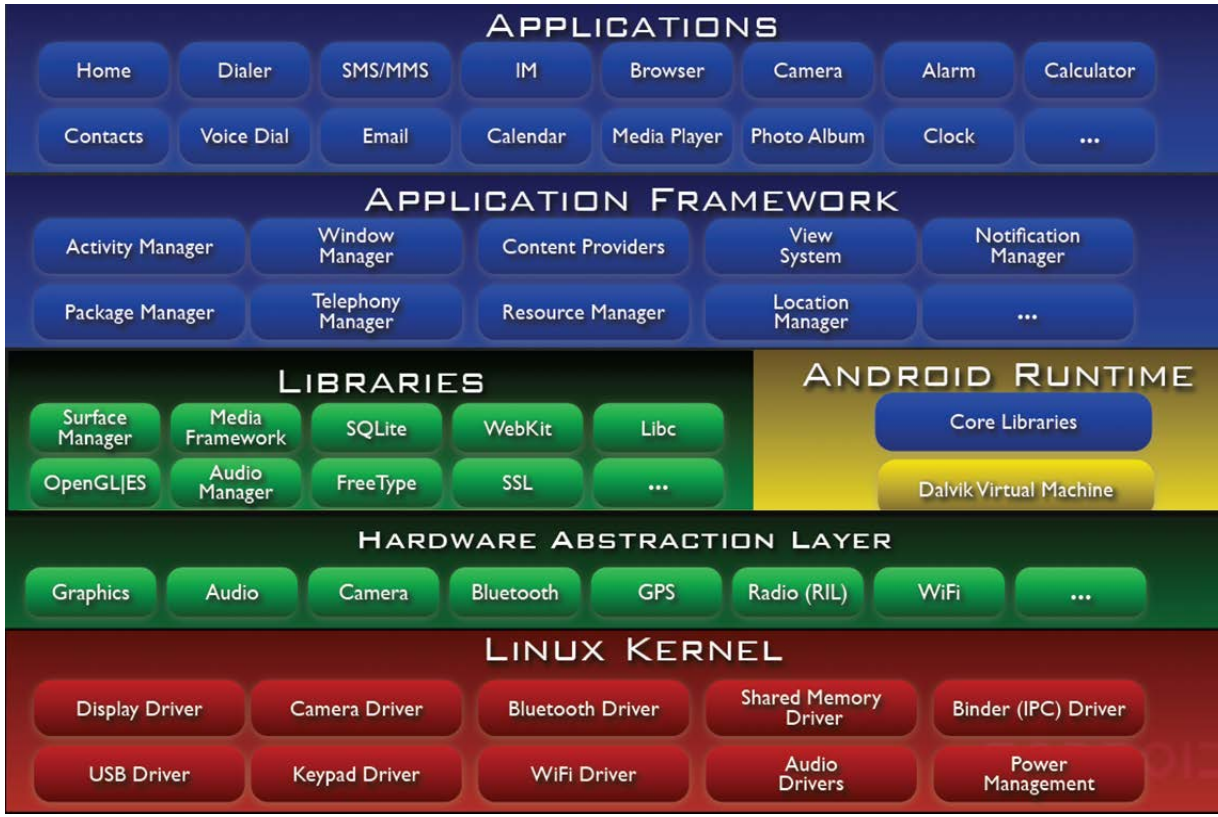
    - e.g., Activities, Services, Content Providers, & Broadcast Receivers



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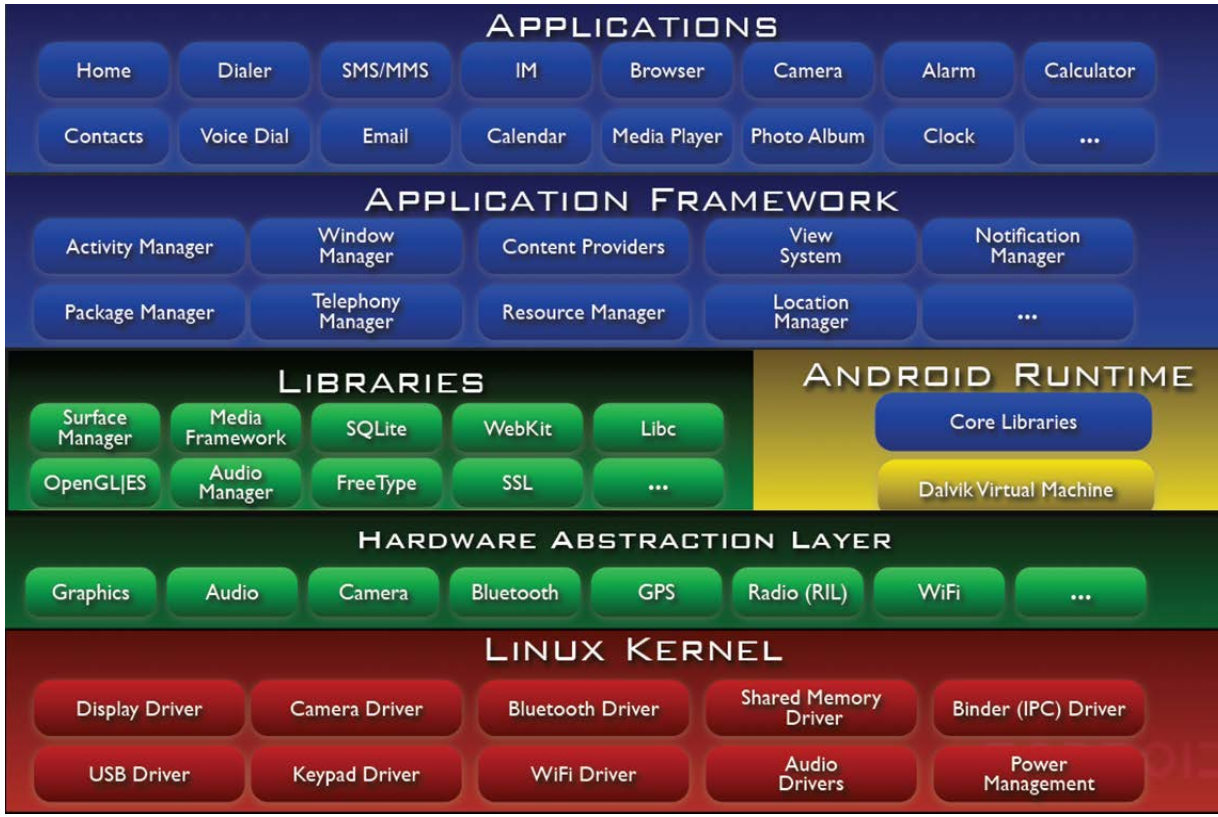

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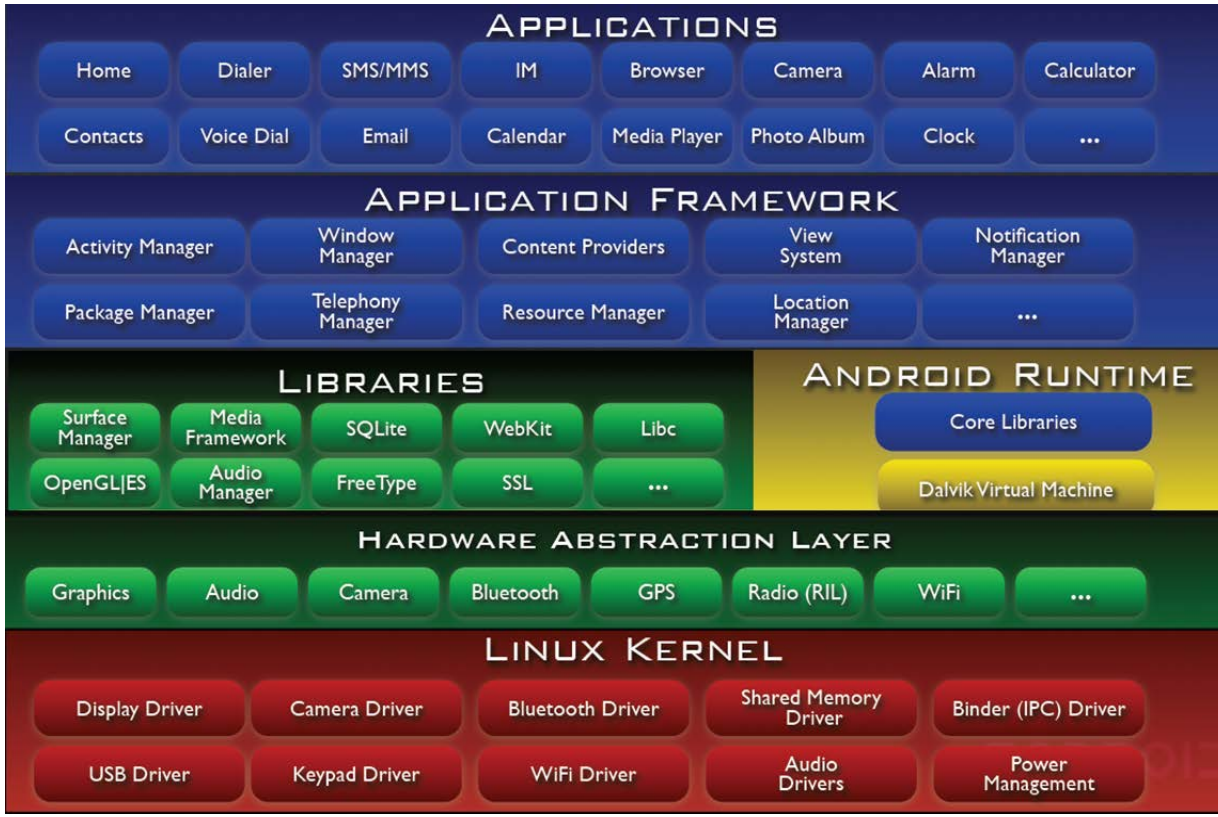
  - *Common infrastructure*
    - e.g., Intent framework, Binder, Webkit, Hardware Abstraction Layer, OS device driver frameworks etc.



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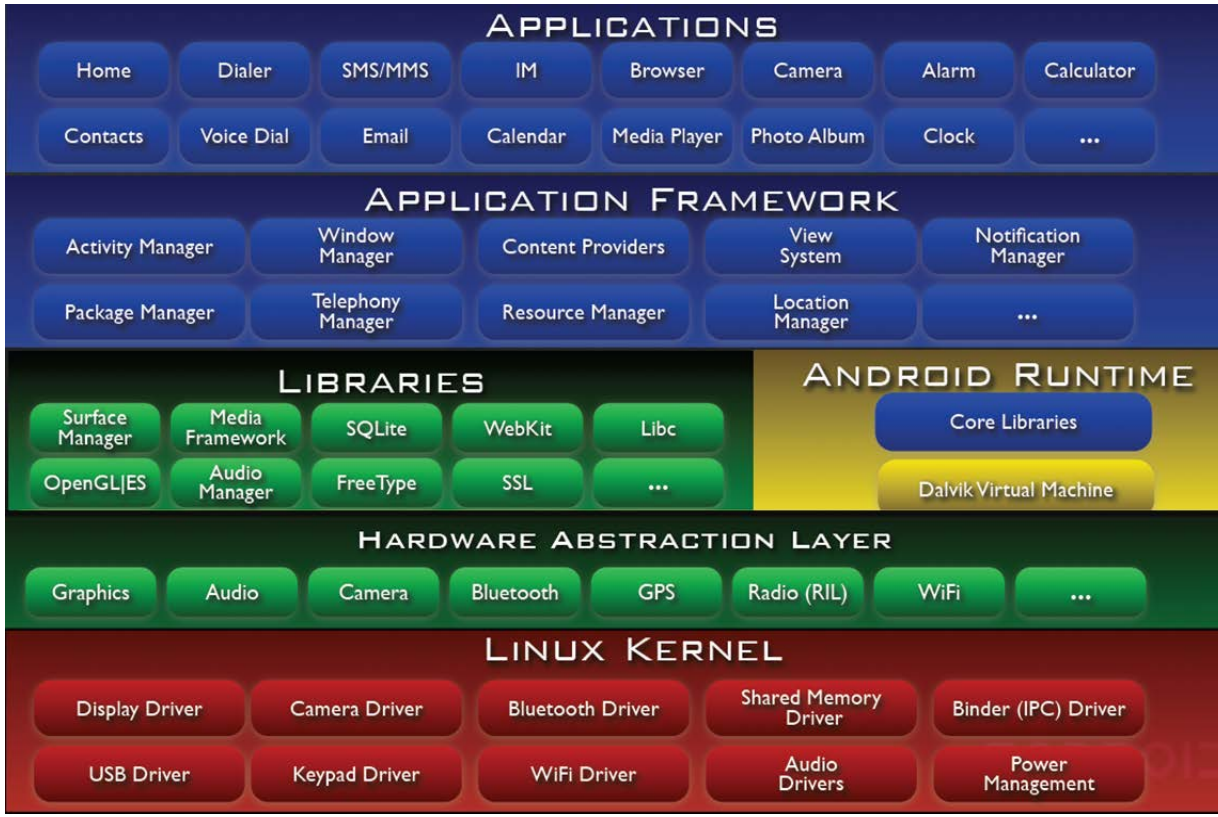
    - e.g., different "look & feel" variants of vendor-specific user interfaces, sensor & device properties, etc.



Applying SCV to Android

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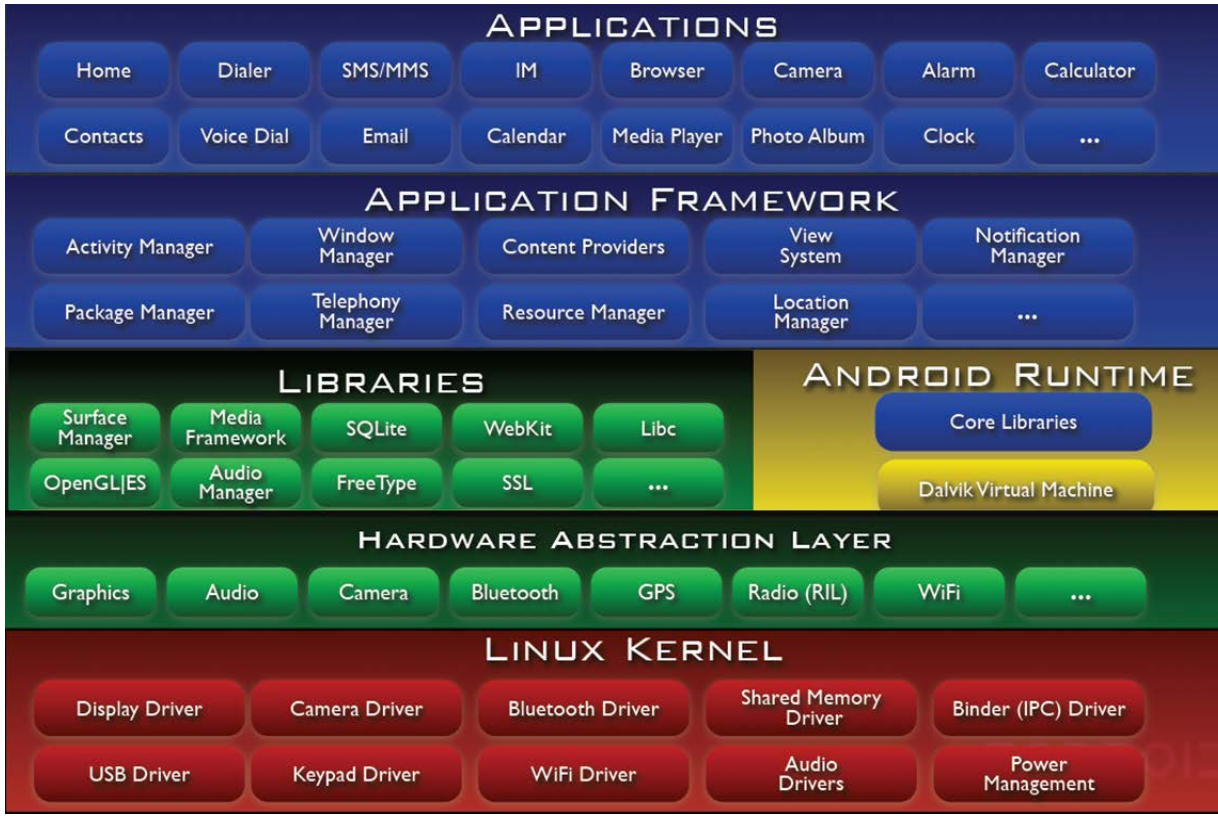
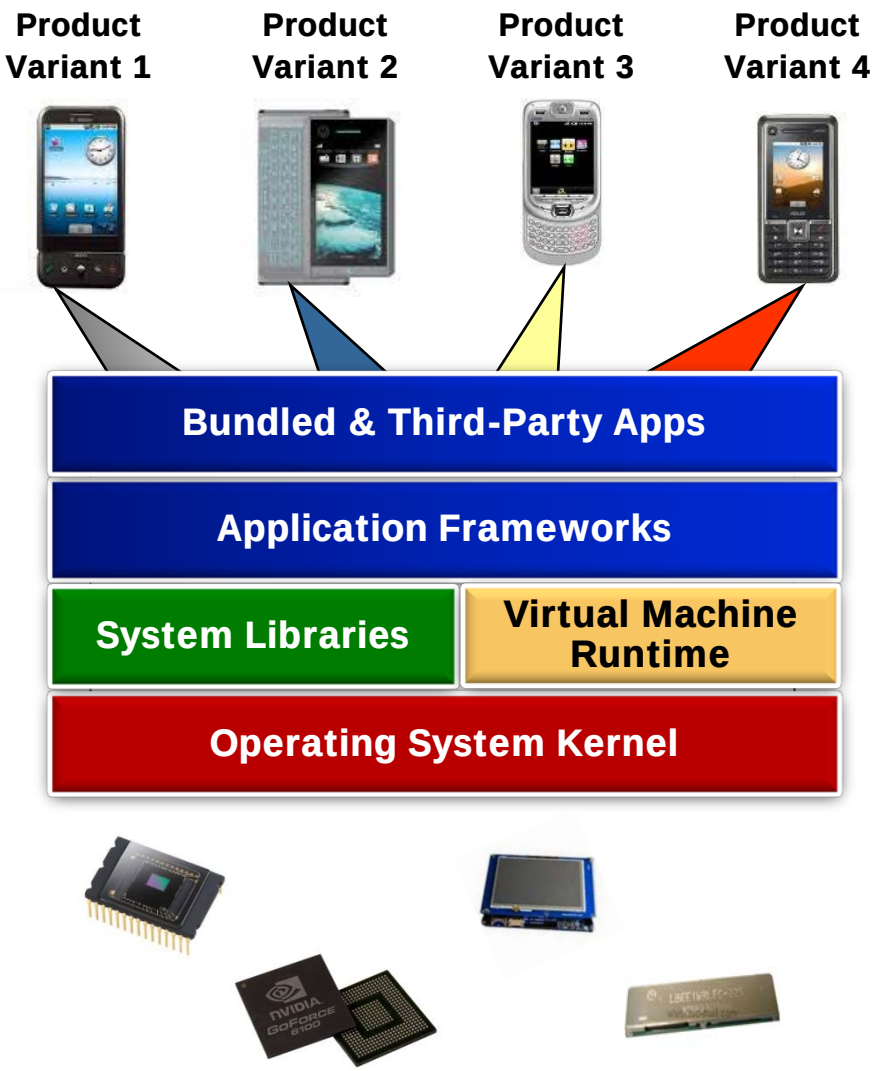
  - *Product-dependent components*
    - e.g., different "look & feel" variants of vendor-specific user interfaces, sensor & device properties, etc.
  - *Product-dependent component assemblies*
    - e.g., different bundled apps, CDMA vs. GSM & different hardware, OS, & network/bus configurations, etc.



SCV can also be applied recursively for all the Android frameworks & layers

Summary

- *Scope, Commonality, & Variability* (SCV) analysis is an advanced systematic reuse technique
  - It helps developers alleviate problems associated with maintaining many versions of the same product that have large amounts of similar software created to satisfy new & diverse requirements



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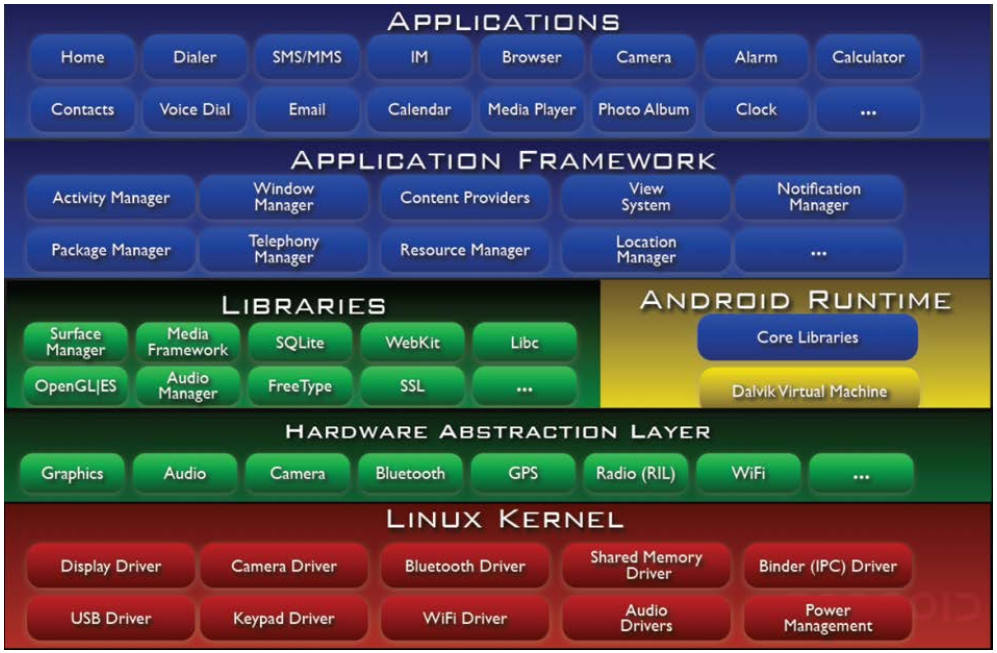

- The frameworks in Android form software product-lines that enable systematic software reuse across a wide range of apps & infrastructure platforms