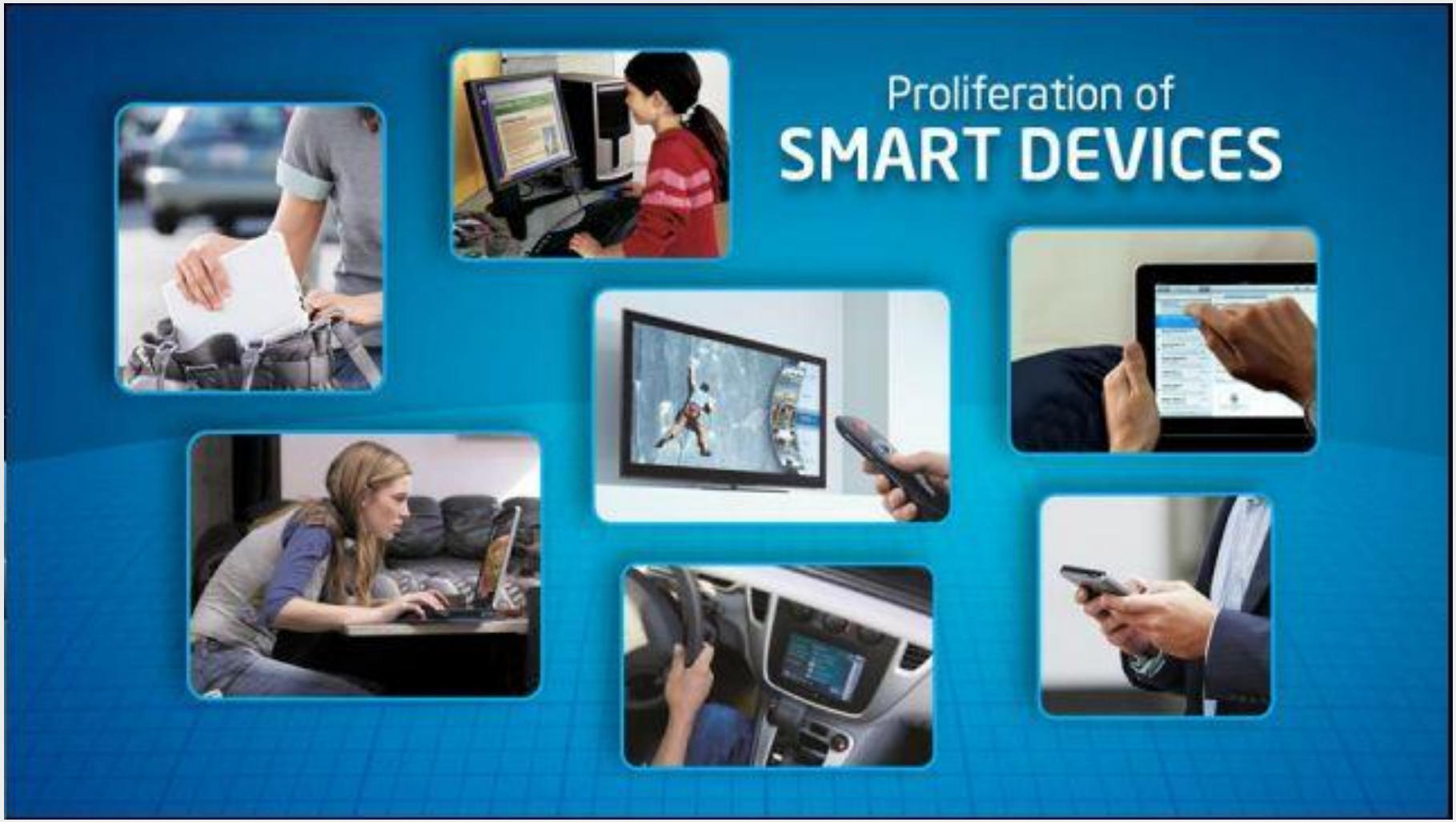
Smart Device Computing



Introduction

- A smart device is a device that is digital, active, computer networked, is user reconfigurable and that can operate to some extent autonomously.
- The term can also refer to a ubiquitous (pervasive) computing device: a device that exhibits some properties of ubiquitous computing including artificial intelligence.

Introduction

- Ubiquitous means **“existing or being everywhere at the same time”**
- When applying this concept to technology, the term ubiquitous implies that technology is everywhere and we use it all the time.
- Ubiquitous computing is changing our daily activities in a variety of ways.
  - communicate in different ways
  - be more active
  - have more control

Smart devices can be designed to

- Ubiquitous Computing = Mobile Computing +

  Intelligent Environment
- Ubiquitous technology is often wireless, mobile, and networked, making its users more **connected** to the world around them
- support a range of properties pertaining to ubiquitous computing
- be used in any combination of three main system environments: physical world, human-centred environments and distributed computing environments.

Life without Smart Devices

- An Odessey of Several Instruments.
- Jumbled Work and So the Jumbled Mind
- Core Work Suffers as One tends to get Expertise in Several Instruments

Life with Smart Devices

- One Device to do All Jobs
- High Portability
- High Ubiquity
- Peace of Mind
- Little Expertise Required

Mobile Application Languages

- Languages to be used in development
  - Java Micro Edition
  - Android Java
  - Objective C for iPhone
  - Swift for iPhone
  - QT for Nokia
  - Nokia Web Toolkit
  - Python
- Evaluation and Testing of Mobile Applications

Evolution of Mobile Phones

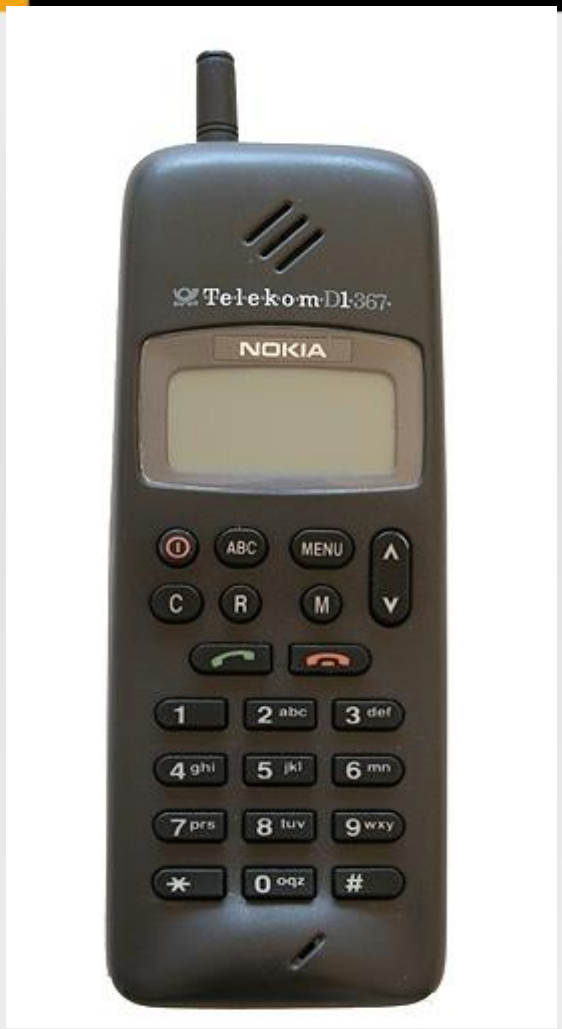
It will be instresting to learn the evolution and growth of handheld Mobile Devices and plan our application suiting the device configurations

Motorola MicroTAC 9800X and Motorola DynaTAC 8000X (1983)

Motorola International 3200

First Digital Phone

Nokia 1011(1994)Motorola StarTAC(1996) Nokia 9000 Communicator



FIRST GSM PHONE

FIRST CLAMSHELL PHONE

PHONE, DIARY AND others

Nokia 5110,7110,5210,

POPULAR CONSUMER MODEL

FIRST WAP BROWSER

FIRST CHANGEBLE BODY

FIRST T9 TEXTING

Benefone Asc,Samsung SPH-M100 Uproar, Erricson R380

FIRST GPS PHONE

FIRST MP3 PHONE

FIRST BLACK AND WHITE TOUCH SCREEN

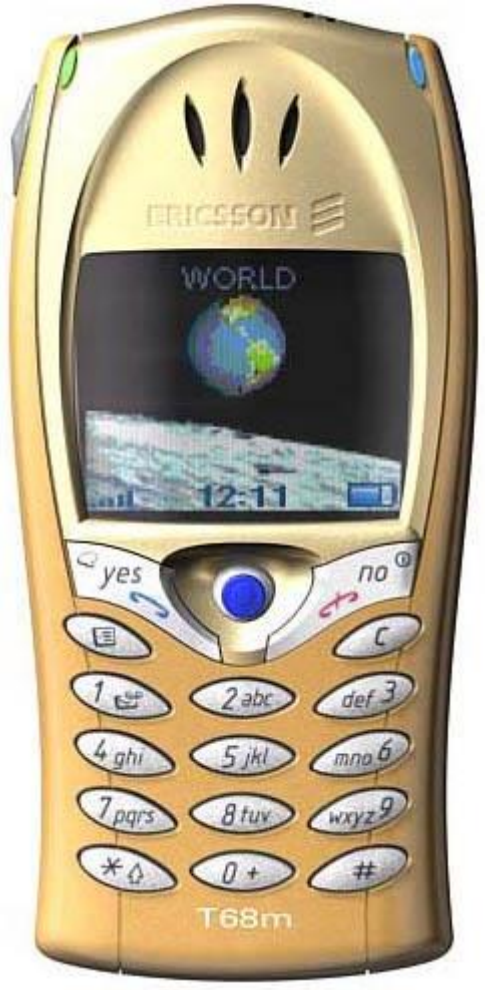
Nokia 5510, Nokia R 8830, ERICSSON t39

FIRST QUERTY KEYBOARD

FIRST BLUE TOOTH DEVICE

CALENDAR AND FM

ERICSSON T68,SIEMENS S545, NOKIA 7650



FIRST HANDSET WITH COLOR SCREEN

first ever GPRS mobile phone with 360kb of internal memory

FIRST BUILTIN CAMERA

NOKIA 6600, 7600

SYMBIAN BASE, S60, VERY POPULAR

FIRST 3G SMARTPHONE

NOKIA 6630, HTC UNIVERSAL

GLOBAL ROAMING,
INTERNET ACCESS,
3G

MICROSOFT ENTERS WITH
WINDOWS MOBILE

Iphone (2007) – a revolution, iphone-3G

Blackberry Storm , HTC Magic

FIRST ANDROID PHONE

The Key less smart phones

Samsung galaxy S3

NOKIA Lumia

The tabs – mobile made bigger

The tabs – mobile made bigger

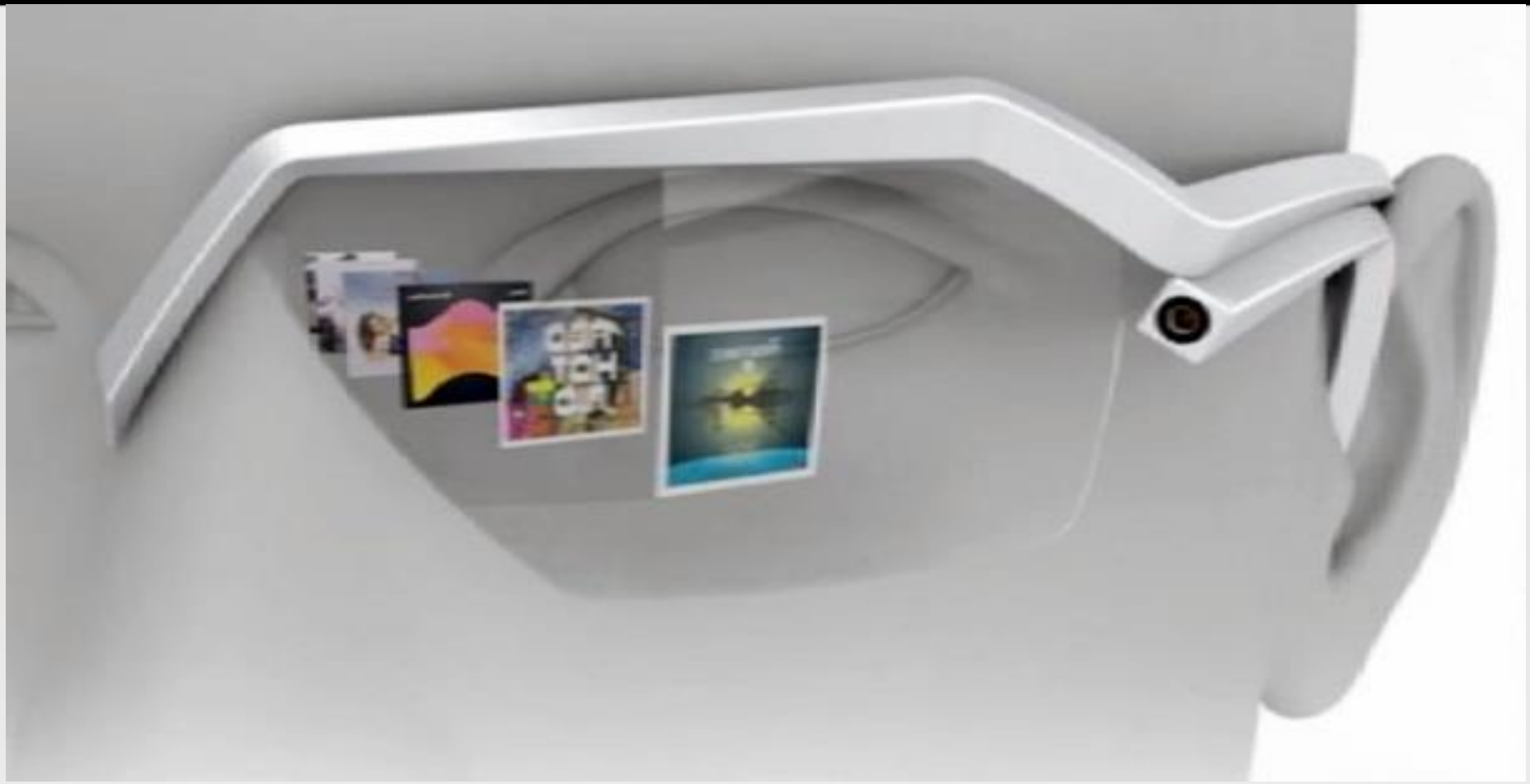
The tabs – mobile made bigger

Microsoft Surface Tablet

The tabs – mobile made bigger

Google Nexus

The Glasses – The Google smart specs (Prototype)



OS Features for a Mobile Phone

Operating Systems for mobile phone is somewhat different from usual OS in terms of

- Size
- FileSystem and Memory Management
- Real Time Execution and Control
- Service Layers
- Size and Memory Contstraints
- The Kernel
- The Service Layers
- The Language and Platform Support

Introduction to Android

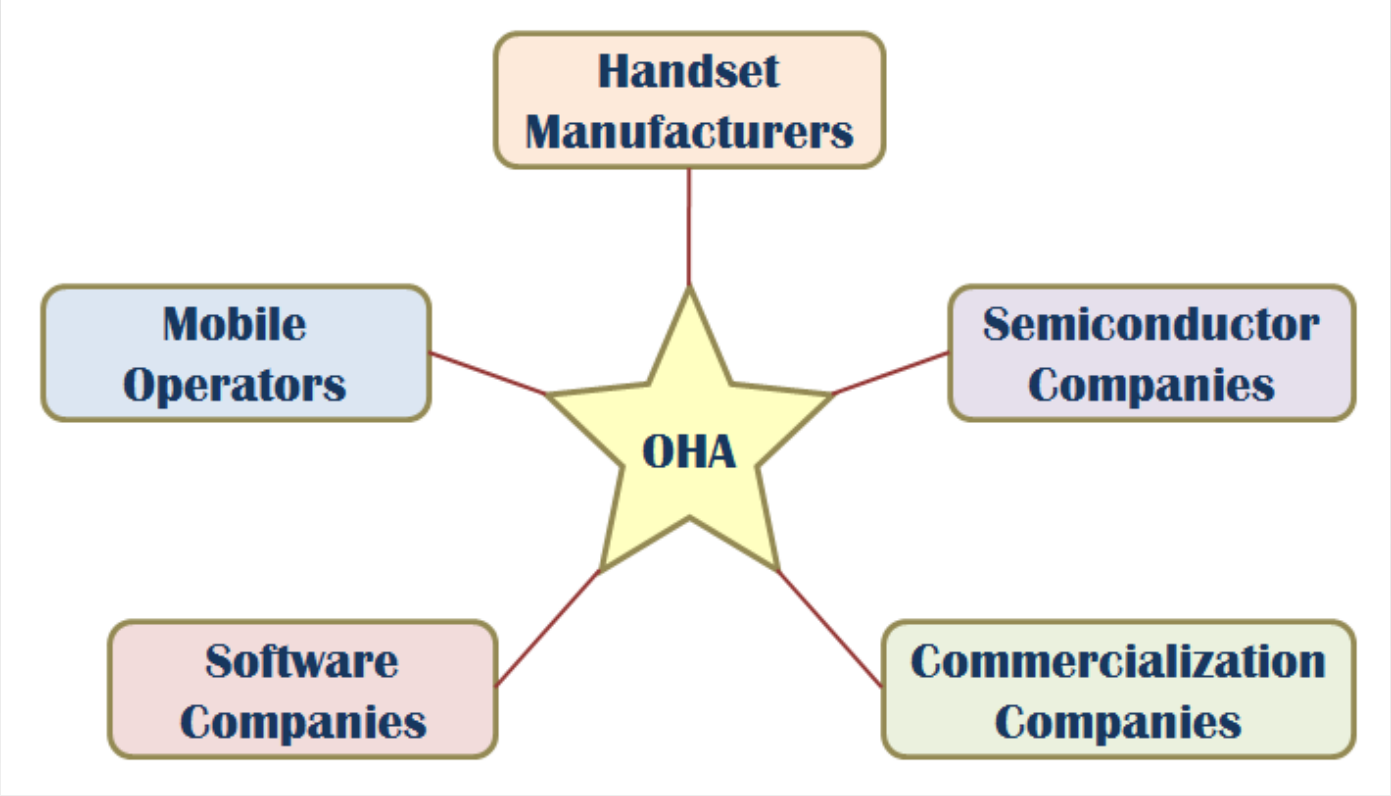
- Open software platform for mobile development
- A complete stack – OS, Middleware, Applications
- An Open Handset Alliance (OHA) project
- Powered by Linux operating system
- Fast application development in Java
- Open source under the Apache 2 license

What is Android?

Android is a software stack for mobile devices that includes an operating system, middleware and key applications.

OHA (Open Handset Alliance)

A business alliance consisting of 47 companies to develop open standards for mobile devices



Phones

HTC G1,
Droid,
Tattoo

Motorola Droid (X)

Suno S880

Samsung Galaxy

Sony Ericsson

Tablets

Velocity Micro Cruz

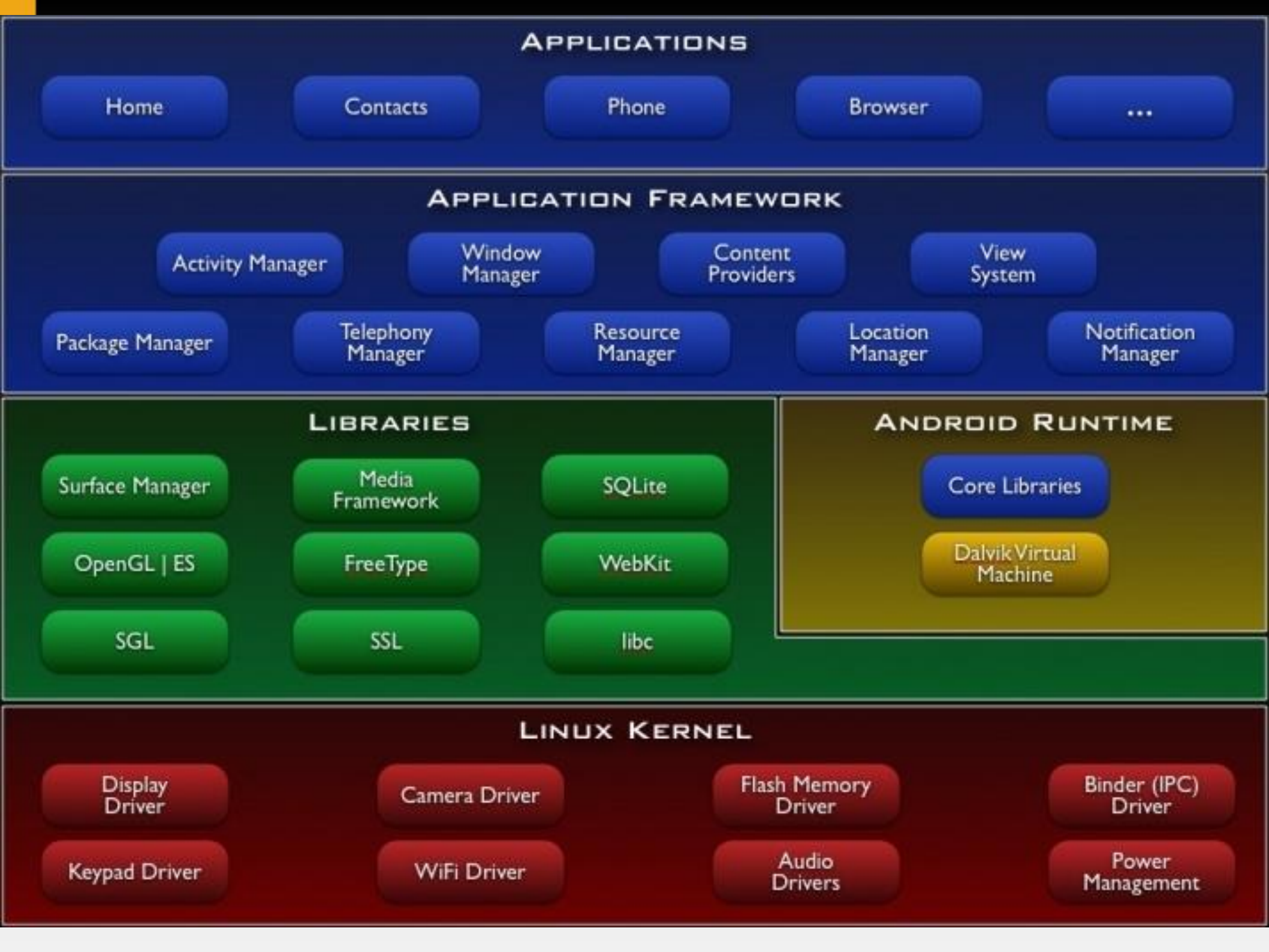
Gome FlyTouch

Acer beTouch

Dawa D7

Toshiba Android SmartBook

Cisco Android Tablet


Applications
Home
Contacts
Phone
Browser
...
Application Framework
Activity Manager
Window Manager
Content Providers
View System
Package Manager
Telephony Manager
Resource Manager
Location Manager
Notification Manager
Libraries
Surface Manager
Media Framework
SQLite
OpenGL | ES
FreeType
WebKit
SGL
SSL
libc
Android Runtime
Core Libraries
Dalvik Virtual Machine
Linux Kernel
Display Driver
Camera Driver
Flash Memory Driver
Binder (IPC) Driver
Keypad Driver
WiFi Driver
Audio Drivers
Power Management

Linux Kernel

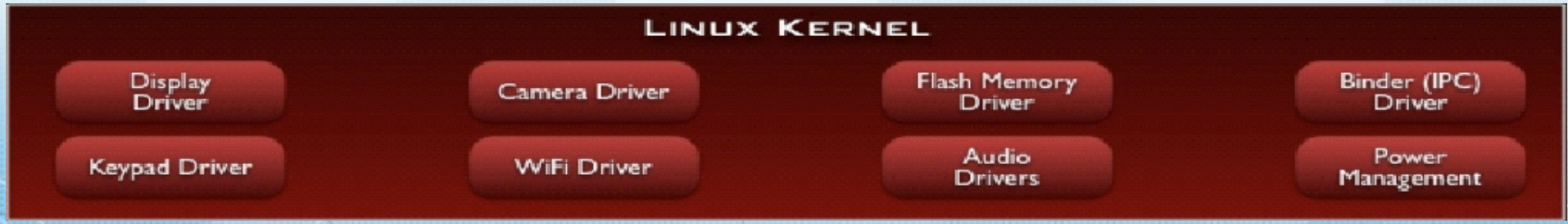
The whole Android OS is built on top of the Linux 2.6 Kernel with some further architectural changes made by Google.

contains all the essential hardware drivers. Drivers are programs that control and communicate with the hardware.

The Linux kernel also acts as an abstraction layer between the hardware and other software layers.

Android uses the Linux for all its core functionality such as Memory management, process management, networking, security settings etc.

As the Android is built on a most popular and proven foundation, it made the porting of Android to variety of hardware, a relatively painless task.



Libraries

The next layer is the Android's native libraries. It is the layer that enables the device to handle different types of data. These libraries are written in c or c++ language and are specific for a particular hardware.

Some of the important native libraries include the following:

Surface Manager: It is used for compositing window manager with off-screen buffering. Off-screen buffering means you cant directly draw into the screen, but your drawings go to the off-screen buffer. There it is combined with other drawings and form the final screen the user will see. This off screen buffer is the reason behind the transparency of windows.

Media framework: Media framework provides different media codecs allowing the recording and playback of different media formats

SQLite: SQLite is the database engine used in android for data storage purposes

WebKit: It is the browser engine used to display HTML content

OpenGL: Used to render 2D or 3D graphics content to the screen

Android Runtime

Android Runtime consists of Dalvik Virtual machine and Core Java libraries.

Dalvik Virtual Machine

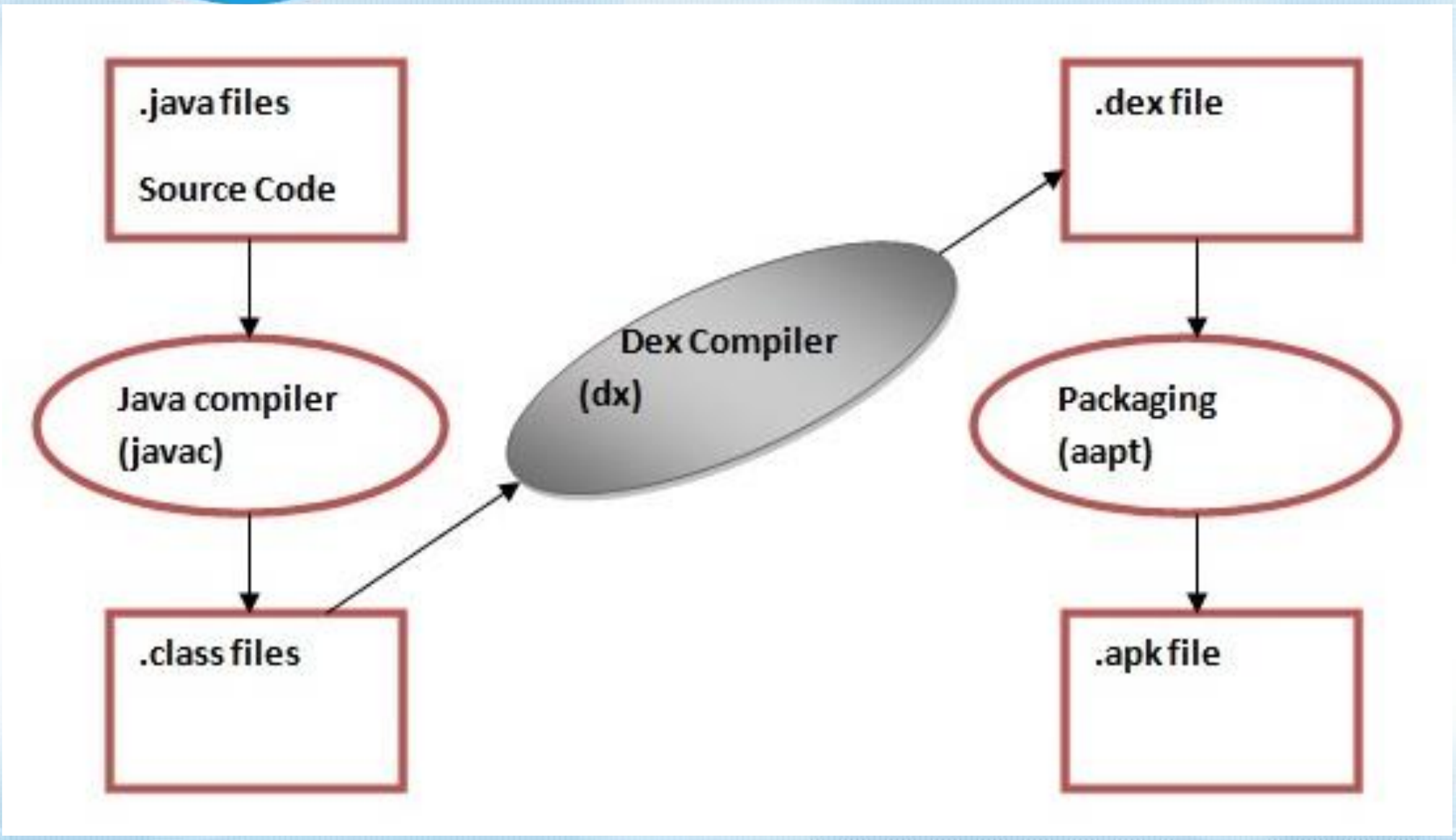
It is a type of JVM used in android devices to run apps and is optimized for low processing power and low memory environments.

Unlike the JVM, the Dalvik Virtual Machine doesn't run .class files, instead it runs .dex files. .dex files are built from .class file at the time of compilation and provides higher efficiency in low resource environments.

The Dalvik VM allows multiple instance of Virtual machine to be created simultaneously providing security, isolation, memory management and threading support. It is developed by Dan Bornstein of Google.

Core Java Libraries

These are different from Java SE and Java ME libraries. However these libraries provides most of the functionalities defined in the Java SE libraries.


.java files
Source Code
Java compiler
(javac)
.class files
Dex Compiler
(dx)
.dex file
Packaging
(aapt)
.apk file

Application Framework

These are the blocks that our applications directly interacts with. These programs manage the basic functions of phone like resource management, voice call management etc.

As a developer, you just consider these are some basic tools with which we are building our applications.

Important blocks of Application framework are:

Activity Manager: Manages the activity life cycle of applications

Content Providers: Manage the data sharing between applications

Telephony Manager: Manages all voice calls. We use telephony manager if we want to access voice calls in our application.

Location Manager: Location management, using GPS or cell tower

Resource Manager: Manage the various types of resources we use in our Application

Applications

Applications are the top layer in the Android architecture and this is where our applications are gonna fit.

Several standard applications comes pre-installed with every device, such as:

SMS client app

Dialer

Web browser

Contact manager

As a developer we are able to write an app which replace any existing system app. That is, you are not limited in accessing any particular feature.

You are practically limitless and can whatever you want to do with the android (as long as the users of your app permits it). Thus Android is opening endless opportunities to the developer.