A Study on Architectures of Mobile Operating System

Mr. Harendra Kumar#,
M.Tech Scholar, CSE Department,
RAMA University, KANPUR
harendra1692@gmail.com
Mr. Anugrah Srivastava#,
Assistant professor, CSE Department
RAMA University, KANPUR
amative.anugrah@gmail.com

Abstract: *In the early years of mobile evolution, mobile devices are enabled only with voice services that allow the users to communicate with each other. But now a day, the mobile technology undergone various changes to a great extent, so that the devices allow the users not only to communicate, but also to attain a variety of services such as video calls, faster browsing services, 2d and 3d games, Camera, Banking Services, GPS services, sending or receiving SMS, music, billing online shopping, online booking, playing games, web browsing, suing different apps like Whatsapp, Facebook or Applock etc. Hence a large amount of user sensitive data is stored within the devices. The changes in mobile technology may be due to Operating System or Hardware or Network or Memory. This paper presents a survey on evolutions in mobile developments, especially on mobile operating system Architectures, challenges and Issues in various mobile operating Systems.*

I. INTRODUCTION

A Mobile operator is a System Software that is specifically designed to run on handheld devices such as Mobile Phones, PDA's. It is a platform on top of which the application programs run on mobile devices. Each Operating System follows its own Architecture. Mobile devices evolved the way users to across the globe leverage services on the go from voice calls to smart devices are able to provide various services to users, but still suffers from issues include performance, Security and Privacy, Reliability and Bandwidth costs. In this paper, we pointed out the issues, challenges, Advantages and Disadvantages of various Mobile Operating Systems in terms of their Architecture. The earlier mobile operating systems were fairly simple, since the capabilities of the phones they supported were limited.

II. MOBILE OPERATING SYSTEMS

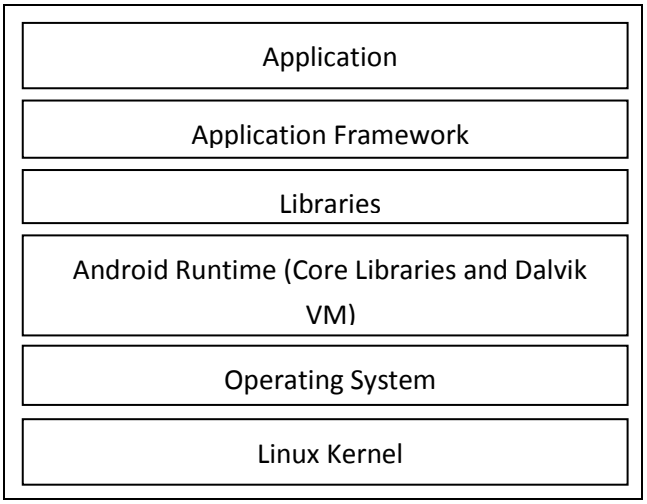
In this paper, we categorized the Mobile Operating Systems into Current platforms and Discontinued Platforms.

Current Platforms	Discontinued Platforms
Android	Symbian OS
IOS	Palm OS
Windows Phone	Maemo OS

Firefox OS	Meego OS
Black Berry OS	

1. Android OS: Android OS for mobile devices is developed by the Open Handset Alliance, which is led by Google, Google unveiled the Android distribution in November 2007. Most of the Android core is released under the open-source Apache License but a large amount of software on Android devices (such as such, as Play Store, Google Search, Google Play Services, Google Music, and so on) are proprietary and licensed. The most popular mobile operating system today in mobile market. Linux kernel acts as an abstraction layer between the hardware and the rest of the software stack. Android runtime includes core libraries and Dalvik VM Core libraries have a set of libraries to provide the functionality of JAVA PL. Every Application runs on its own Dalvik VM which executes files in text format. Android has a set of c/c++ libraries used by various components of the operating system. It ships with a set of core applications that offers developers the ability to build various applications with an open development.

Architecture:



1.1 Advantages: Open Source Platform supported by a wide range of mobile device manufacturer. Multitasking, Ease of access to thousands of applications, Diverse Phone options.

1.2 Disadvantages: Needed Continuous Internet Connection, advertising, range of applications can still be expanded.

The packages present are as given below:

a. Activity manager
b. Resource manager
c. Notification manager
d. Location manager
e. Package manager
f. Telephone manager
g. Window manger

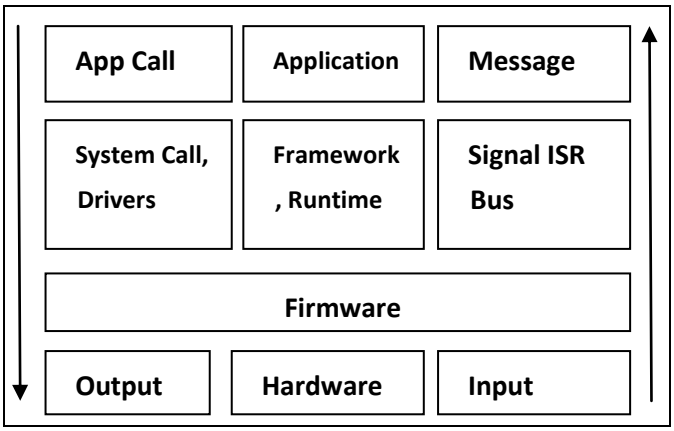
2. IOS:

IOS (previously iPhone OS) is a mobile operating system developed by Apple Inc. and distributed exclusively for Apple hardware. It is the operating system that powers iPhone, iPod Touch, and Apple TV. IOS is derived from

Mac OS X, and shares its basic Darwin foundation, an open source POSIX- compliant UNIX OS. In this sense IOS can be considered a variant of UNIX; iOS are made up of four abstraction layers. Hardware refers to the physical chip soldered to iPhone circuitry. Firmware refers to chip specific code that is either contained in with memory in/around the peripheral itself or within the drive for said peripheral. Processor refers to ARM Instruction set and interrupt descriptor descriptor table as set up by the OS during boot process. IPhone OS is the kernel, drivers and services that sits between user space and Hardware.

Runtime is composed of dynamic link libraries as well as underlying C libraries. Frameworks / API has API call which is apple distributed headers with the iPhone SDK. The Application stored, in my phone has to be purchased through App store, This App was compiled to native code by a compiler and linked with runtime by the linker. The application runs entirely within a user space environment set up by the iPhone OS.

Architecture



2.1. Advantages:

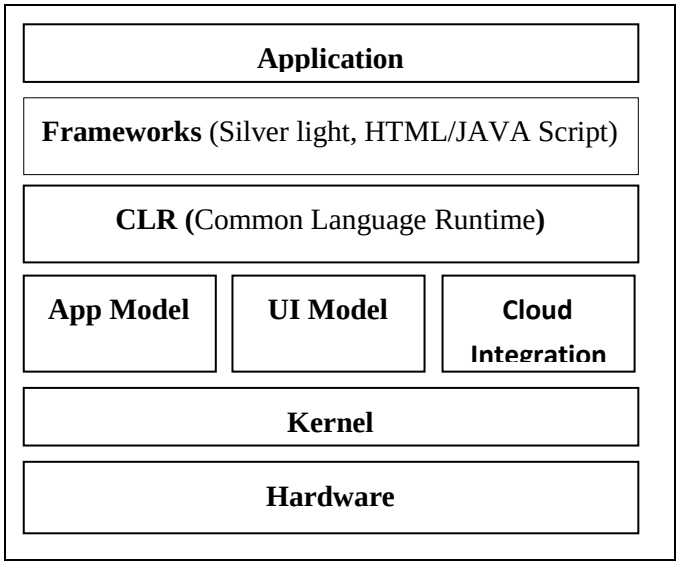
- Better Support for Cloud Storage.
- High Support for latest web standards**.**
- Less Bugs and Secure OS because of high standardization followed when developing applications.
- Direct Twitter, Integration, Advance Voice Recognition, Face time to make Video calls.

2.2. Disadvantages: No flash Support, Dependent on Apple hardware, App Approval process is largely a black box for developers, face time is exclusive to IOS powered devices. More Costly.

3. Windows Phone OS: Windows Phone is a proprietary Smartphone Operating System development by Microsoft. It is the successor to Windows Mobile, although it is incompatible with the earlier platform. It was launched in 2010 under the name Windows Phone 7. Various hardware manufacturers including HTC, Samsung, LG, and Nokia are developing Windows Phone devices. Windows Phone architecture required a hardware layer that meets Microsoft minimum system requirement: an ARM7 CPU, a DirectX 9-capable GPU, 256 MB RAM and 8GB of flash memory, a 5-megapixel camera, a multi-touch capacitive display, an A-GPS, an accelerometer, a compass, proximity and light sensors, and six physical buttons: back start, and search; camera, power/sleep, and volume [23]. The Windows Phone kernel handles low-level device driver access as well as basic security, networking, and storage. Three libraries: an App Model for application management, a UI model for user-interface management, and a Cloud Integration Module for web search via Bing, location services, push notification, and so

on sit above the kernel [15]. Application-facing APIs include Sliver light, XNA, HTML/JavaScript and the Common Language runtime (CLR) that support C# or VB. Net applications.

Architecture



3.1. Advantages: Support Multi-core Processors.

Innovative and New interface with small Tiles.

Inbuilt Bar Code Scanner.

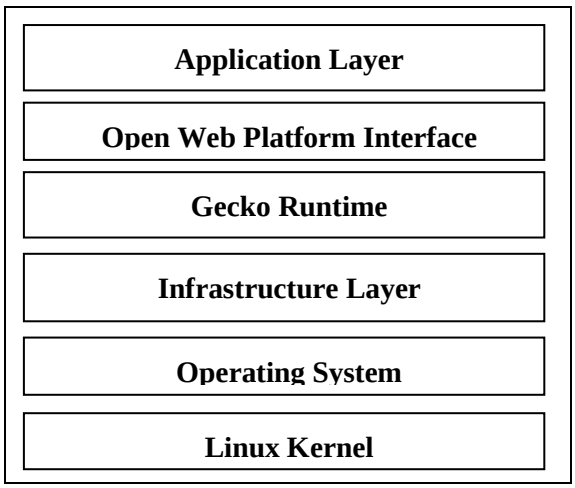
3.2. Disadvantages: No Flash Player Support.

NO Single default Video player.

Limited Video Code Such as like .mp4, .Avi and .3gp.

4. Firefox OS: Developed by Mozilla Corporation exclusively for web based mobile devices. Application layer consists of user interface implementation based on building blocks and JS libraries. Web platform Layer provides runtime and middleware that provide capabilities needed by the application layer. Infrastructure layer provides the lower layer operating System services, libraries and other infrastructure services based on Linux and other open source software. It also provides security and privacy. "Gecko Runtime" is the application runtime of the Firefox operating system.

Architecture

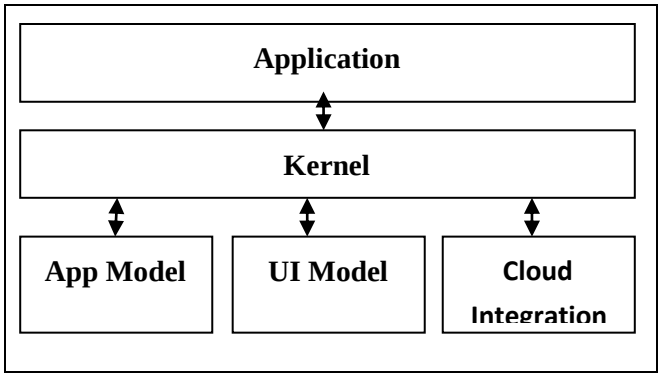


4.1. Advantage: Dynamic Application Search Can be upgraded with parts.

4.2. Disadvantage: Appearance and Performance.

5. Blackberry O.S: Blackberry OS is developed by Research in Motion (RIM) for their BlackBerry smart phones and tablet devices [20]. BlackBerry OS 1.0 debuted in January 1999 as part of BlackBerry's pager/email devices. One of the main strengths of BlackBerry devices is their ability to handle corporate email. BlackBerry OS supports the JAVA Mobile Information Device Profile (MIDP) and the Wireless Application Profile (WAP). These protocols are used to synchronize through a BlackBerry Enterprise Server (BES) with push-based calendar, task, contact, email, and note exchange. BES provides the security capacity, remote wipe, and other features that corporations require for mobile devices that access internal networks and/or corporate data. BlackBerry OS also provides the BlackBerry Internet Service (BIS), a client-specific method to allow Internet access or individual users [15]. The Blackberry operating system has a Java Based Kernel and utilizes ARM 7 architecture with an Intel X Scale Processor. It supports multitasking operating system and its device memory cannot be allocated to supplement the allocation memory. In this OS, memory management is divided into three sections, namely Application Memory, Device, Memory and Memory Card (optional).

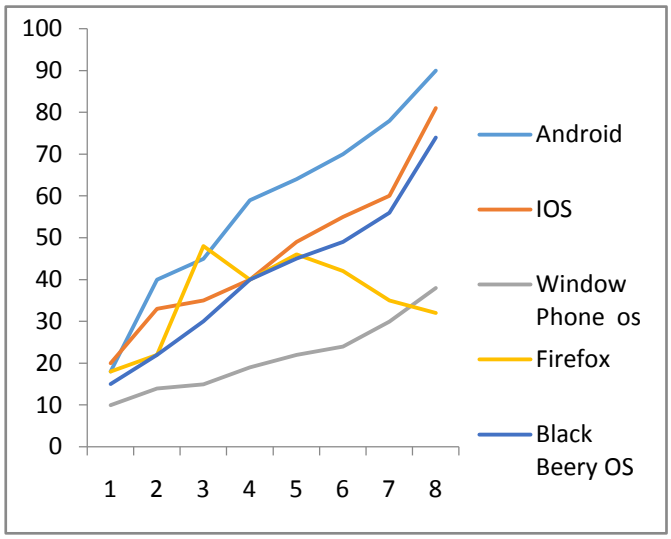
Architecture



5.1. Advantage: Faster web browsing, Handy for reading mails, and Multitasking.

5.2. Disadvantage: Memory Manager doesn't release memory even after the application is closed which leads to the slowdown of the device. Application

Graphical representation of mobile OS



III. CONCLUSION

Smartphone like personal computer various functionalities like use of application, usability, web browsing, running a GPS, Expendable memory; multitasking, multiprocessing, playing games, social networking, etc. In this paper, we have presented a derail review and comparative analysis of the different Smartphone operating system. We have made comparisons between android, iOS, Windows Phone, Firefox OS, Blackberry OS.

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