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A REVIEW ON DIFFERENT HANDHELD DEVICES OPERATING SYSTEMS

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Abstract
Mobile Application development and use have exploded. The new releases of Google's Android running system. The improvement of the applications is simpler than beforehand mobile utility developments. Because it is open-source and it is freely working machine primarily found on Linux, it is on the whole used for cell terminals, such as phones. The development of android is done through Open Handset Alliance collection of larger than 35science agencies and also smartphone mobile companies. Android trying to increase the user's journey by providing the first-rate of quality, and facilitate the developers to get a greater open stage for more convenient software program development. Thus cellular purposes with many features are to be developed by using Android programming. The paper firstly offers the different varieties of mobile or tabs operating systems and the distinct features of the developments in mobile operating systems. In addition, it also provides better aspects of upcoming mobile operating systems.

Keywords: Android, Symbian, iOS.

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INTRODUCTION

Mobile Operating System:

The phone has modified the definition of mobile phones. In the olden days, the peoples used the mobiles solely for communication. But in current days the usage of cellular smartphones for conversation is decreased and it consists of many new applications. The popular platforms/are as follows: a)Android OS - Google Inc. b)Bada - Samsung Electronics c)BlackBerry OS - Research In Motion d)iPhone OS/iOS -Apple e)MeeGo OS-Nokia and Intel f)Palm OS-Garnet OS g)Symbian OS-Nokia h)webOS-Palm/HP i)Windows Mobile-Windows Phone.

Versions:

Android, Inc. was once established with the aid of Andy Rubin in the year of 2005. Later Google takes it and then the group led through this developed android, a cell of gadget platform developed via the Linux kernel operating system. Finally, On Nov 5th, 2007 the OHA (Open Handset Alliance), is formed. It is an enterprise alliance of quite a few companies. Those are Google, Intel, HTC, LG, and other 70 companies unveiled itself. The first commercial accessible smartphone is implemented and to run on the Android working gadget is HTC Dream, launched on 22nd, October 2008. Android is a software program stack set of software subsystems that need to supply entire useful answers for cell devices. This stack also includes a working system, middleware based on Java programming, and key apps such as an internet accessing browser and a contact manager. Android is consisting of five layers.

Architecture:

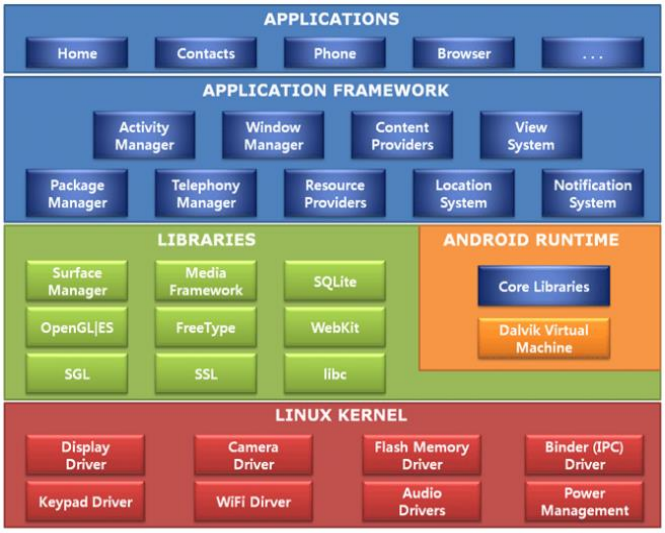

Fig 1: Detailed five-layer Android Architecture

Android Versions:

Table 1: Versions of Android

Version Number	API Level	Alphabet	Name
1.0	1	A	ALPHA
1.1	2	B	BASE
1.5	3	C	CUPCAKE
1.6	4	D	DONUT
2.0	5	E	ÉCLAIR
2.0.1	6		ECLAIR_0_1
2.1.X	7		ECLAIR_MR1
2.2.X	8	F	FROYO
2.3 2.3.1 2.3.2	9	G	GINGERBREAD
2.3.3 2.3.4	10		GINGERBREAD_MR1
3.0.X	11	H	HONEYCOMB
3.1.X	12		HONEYCOMB_MR1
3.2	13		HONEYCOMB_MR2
4.0 4.0.1 4.0.2	14	I	ICE_CREAM_SANDWICH
4.0.3 4.0.4	15		ICE_CREAM_SANDWICH_MR1
4.1 4.1.1	16	J	JELLY_BEAN
4.2 4.2.2	17		JELLY_BEAN_MR1
4.3	18		JELLY_BEAN_MR2
4.4	19	K	KITKAT
4.4 W	20		KITKAT_WATCH
5.0	21	L	LOLLIPOP
5.1	22		LOLLIPOP_MR1
6.0	23	M	MARSHMALL
7.0	24	N	NOUGAT
7.1	25		NOUGAT
8.0	26	O	OREO
8.1	27		OREO
9	28	P	PIE

Features of Android:

- Open Source— Android is a freely available operating system. So that all the people can work on android not only the one company developers.
- Storage — For data storage, we use SQLite, a small weight database of storing information in the form of tables.
- Connectivity — Supports GSM/EDGE, Evolution-Data Optimized EV-DO, UinversalMobile Telecommunication System, Bluetooth, WiFi, IDEN, CDMA, LTE, and WiMAX.
- Messaging — It supports both Messaging and Multimedia support.
- Media support — includes support for the following media: H.263, H.264 (in 3GP or MP4 container), MPEG-4 SP, MP3, MIDI, WAV, JPEG, PNG, GIF, and BMP.
- Hardware support — It supports different facilities of applications as follows: Accelerometer Sensor, Proximity Sensor, Camera, Digital Compass, and GPS
- Multi-touch — It Supports multi-touch.
- Multi-tasking — Supports different multi-tasking applications like displaying two apps side by side in a single user interface design.
- Flash— It supports Flash 10.1and different android versions.
- Tethering—It also shares the Internet with the mobiles and other devices by using a wired/wireless hotspot facility.
- Accessibility— Built-in text to speech conversion is also to be provided by Talkback for the people with lower or no vision.
- External storage —external storing is also provided to store a large amount of information in mobiles. Most Android devices include a MicroSD slot and can read microSD cards formatted with FAT32, Ext3 or Ext4 file system.
- Voice-based features—Google search through voice is also been developed and available. Later on, it provides the Voice activities for navigation, calling, texting, etc. in version 2.2 onwards.

iOS:

iOS is an operating machine based on the UNIX environment constructed for Apple's iPhone, iPod touch and iPad of different cell devices. It is also used to manage the hardware of a gadget and for supplying applied sciences required to enhance each and every application and internet applications also. Not many humans understand that IOS is at the start of Cisco's core working system it has been in use for almost 25 years. Cisco licensed the trademark "iOS" to Apple in the month of March, the year 2010. Cisco's science was once not covered in the license. iOS used to be first introduced and launched as the operating system gadget of the iPhone introduce on the twenty-ninth of June, in the year2007. The iOS has also consisted of apps like phone, messaging, core services of CF network, security services as keychain and certificate and trust services and core os.

iOSArchicture:

Fig 2: iOSArchitecture

Features of iOS:

- It is very easy to get admission to free apps in the Apple Store.
- Ultra mode of internet and high help for the people.
- A stable Operating System for different cell phones.
- The attractive user interface design for cell OS in the market. These beautifully Designed computing devices and the corresponding app icons go hand to hand with the attractive looks of Apple devices.
- Fewer bugs because of high-quality standardization and are followed when developing Apps or updates.
- Giving a Good assist for cloud storage.

Symbian Os

Symbian OS is one of the leading running structures for smartphones. 19.6 million Symbian cellular telephones have been shipped globally in 2008. The quantity increased with the aid of 5% from the identical duration of 2007. Smartphones (in addition to typical call and messaging functionality) contain a set of rich media applications comparable to computers. However, the performance and usability of cellular functions is nonetheless a huge concern. This is in particular genuine with technologies at the beginning designed to run on traditional PCs.

Symbian Architecture:

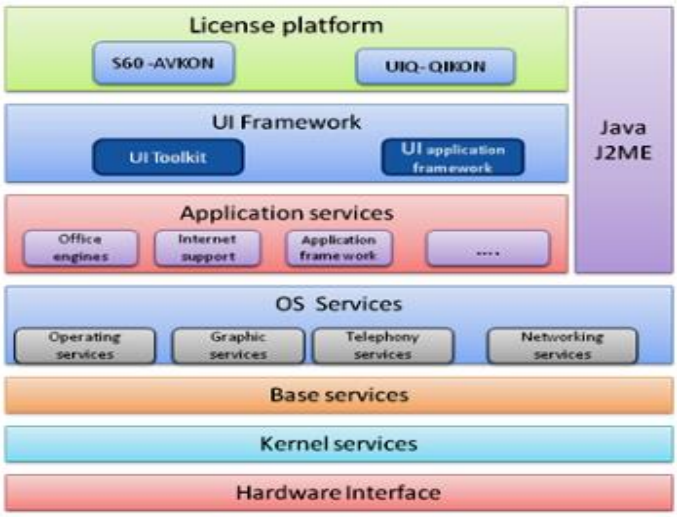

Fig 3: Symbian Architecture

In December 2010, Nokia was once a world leader who was once dropping recognition of Google Android and Apple iOS. Android phones were selling extra than Symbian phones. Google activated spherical about 350,000 telephones every day and Nokia Symbian phones truly reduced to be even in contrast after 2010. The Symbian confronted fail in the market: article from the developers says the reasons why we are failed and why others succeeded in generating telephones in the market and have now become knowledge with convention. iPhone virtually cited it was once designed to be a computer first, rather than being referred to as a phone. The same utilized for Android OS. This can be a major purpose what Nokia neglected out. Nokia's designed a theory that smartphones had been telephones first. Nokia is been based on Symbian Operating System, which is definitely no longer the motive why it failed, however, negligence to boost a working machine advance it with the person interface over the years is the place it lacked. This is how the Symbian began dropping in the competition. The cause of the problem should additionally be its software architecture.

The Symbian OS on the initial stage was once written to work on even surprisingly low strength CPUs which helped the least processing of electricity than Linux OS or iOS for similar tasks. To obtain this Symbian has its very own way of working. The planned way was damned tough to learn, the place most coders faced all the troubles. This can be also concluded that Symbian was challenging to code to the novices this made the availability of them decrease for the manufacturers. The consequence can be viewed in the overall performance on the machine it stated that these are the different results of developers doing matters in an optimal way. In actual lifestyles, a lot of manufacturing code is been combined by contractors who are working as short-term and people new to a platform. This makes it tough to get the actual and expert coders for Symbian.

Features of Symbian:

- Real-time: It is having real-time, multiple threads executed simultaneously in a kernel.
- Multimedia support: It also supports audio, recording of video, playback and streaming, and photograph conversions.
- Platform Security: Symbian presents protection mechanisms towards malware. It accepts sensitive operations and can be accessed through applications that have been licensed by a signing authority. And also, it helps full encrypted and certificates management also.
- Internationalization support: It supports international encoding standards with scripts as Unicode.
- Client-server architecture: It also efforts a simple and high possible inter-process communication. This function additionally eases the porting of code written for other structures to the Symbian OS also.
- Fully data-oriented and component-based operating system.
- Optimized memory management of mobile devices.
- More Flexible consumer design interface.
- Multi-tasking: Multitasking, in an operating system, and it is allowing a user to perform more than one computer **task** (such as the operation of an application program) at a time.

The paper is structured as follows. In Section III, we provide a short background on Android alongside specific variations and features. Section IV consists of the Symbian OS and along with Architecture, features. Section V, it carries the evaluation of the selected parameters with three cellular platforms. Section VI, concludes the paper with a summary of key factors and future research directions.

LITERATURE REVIEW:

The usage of mobile phones is increasing every day, so mobile OS as an outstanding area of research in recent years. Research activities are concentrated in areas such as reverse engineering, machine learning, Deep learning, operating system, and security. The proposed work is focused on different operating systems that are used in the application environment of mobile operating systems.

In 2015, Namanshusankhyadhar, Ms.ShikhaGarg [1], described the Android OS advantages, iOS advantages, usage statistics and comparison between security techniques, models of the app market analysis. The OS has other applications present in the market. In iOS applications apps are developed by Mac OS, and Apple Apps are mostly piracy free.

In 2015, Kiran Bala, Sumit Sharma &GurpreetKaur [2], discuss the comparison of various mobile platforms and these parameters give the new research scope to upcoming trends of smartphone-based mobile operating systems. In that paper, they proposed the detection of malware before installing any application on the smartphone.

In 2014, Tor-Morten Gronli, Jarle Hansen &GheorghitaGhinea [3], describes the strengths and weakness of different mobile operating systems. Along with that they deeply discuss the Architectures of Windows, Symbian, ios, and Android operating systems. And they provide the platform comparison Matrix in a detailed way.

In 2014, SHAO Guo-hong1 [4], presents the architecture of android with the introduction of different layers along with the usage and development of audio/video file procurement and file execution speed.

In 2016, Aditya Jain, Samridha Raj &Dr.BalaBuksh [5], presents the comparative study of handheld devices operating systems with different aspects. They say that windows and android phone usage are high than compared to other operating systems. Android OS better because its feature is open-source i.e we can install this operating system at no cost. And it can allow any applications.

In 2017, J.kirankumar, D.Yugandhar [6], describes the current mobile operating systems such as ios, Android, Windows10 Mobile, Tizen, Sailfish OS, and Ubuntu Touch. They explained the advantages and disadvantages of those mobile operating systems. And they provide the one feature comparison model of these different operating systems.

In 2015, Jyostna Dei, AnindyaSen [7], provides the knowledge about different smartphone operating systems and provides different parameters analysis by the advantages and disadvantages of different operating systems like windows, Symbian, and android, etc…

In 2015, Naseer Ahmad, Muhammad WaqasBoota& Abdul HyeMasoom [8], says that we cannot determine which mobile operating system is better for utilization. The reason behind this statement is in that paper they have compared the different features like concurrency, memory use, network and security of different operating systems. These features are differently rated based on the performances. From this, we can't say that which is not preferred for the next generation.

PROPOSED METHODOLOGY

Comparison of Symbian, iOS, and Android :

Table 2:Comparison of Symbian, iOS, and Android different features

PARAMETERS	SYMBIAN	IOS	ANDROID
OS family	RTOS	Darwin	Linux
Vendor	Symbian Ltd. And Symbian foundation	Apple	Open Handset Alliance, Google
Official Site	http://licensing.symbian.org/	www.apple.com\ios	www.android.com
Developed in Programming language	C,C++,ME, Python, Ruby, Flash Lite	C,C++,Objective –C, Swift	C,C++,Java
App Store	Nokia Ove Store	App Store	Google Play
License	Proprietary	Proprietary	Open source
Battery Demand	Less	Less	Highest
Security	Hard to crack	Hard to crack	Softest to crack
Voice Assistant	Vlingo 3.2	Siri	Google now
Sideloading	Available	Done by installing Xcode7	Available
Environment	QT, Carbide, Vistamax, Eclipse	XCode(Apple), Appcode	Eclipse(Google)
CPU Architecture	ARM, x86	ARM 64,ARM.	ARM, x86, MIPS

Android is having an OHA and is open-source and the other operating systems are not having those features. Sideloading is also one of the best features for android device's growth.

Comparison:

The following is the information about sales in different years with the following Android, iOS, and SymbianOS. And we are constructing the relationship between the years and the sales information.

Table 3:Comparison of Symbian, iOS, and Android in the market

Date	Android	iOS	SymbianOS
2012	24.77	8.05	19.08
2013	38.64	9.33	11.1
2014	55.41	10.6	4.75
2015	68.34	11.37	1.76
2016	73.54	11.83	0.72
2017	78.51	11.66	0.27
2018	83.15	11.6	0.15
2019	84.02	13.33	0.05

Market share in the previous years are considered as follows:

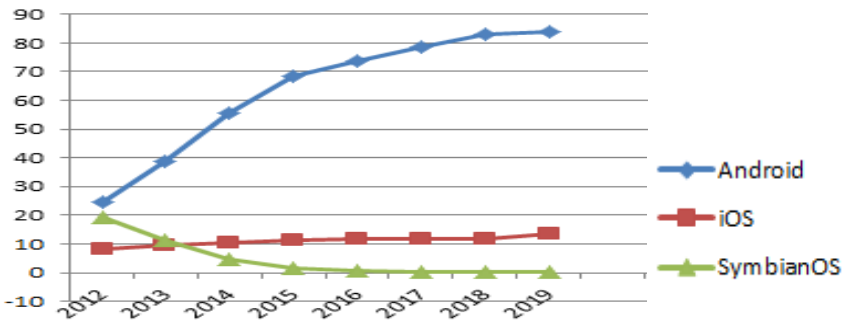

Fig 4: Analysis of Symbian, iOs and Android market shares

CONCLUSION AND FUTURE WORK:

In this paper, we are compared about different OS which is used in mobile application development. And we have compared the techniques, models, market analysis, etc. By analyzing the features and market analysis we say that the growth of the Android os is more than compared to remaining another os such as Symbian, iOS.Furthermore, this work is to predict which OS is better for the new generation and based on the drawbacks we can improve the features according to the people's interests. One more area of research is to facilitate the power management of the battery and the other is to reduce malware attacks to the files stored in smart handheld devices and the last area is to increase the lifetime of a battery by reducing its cost.

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