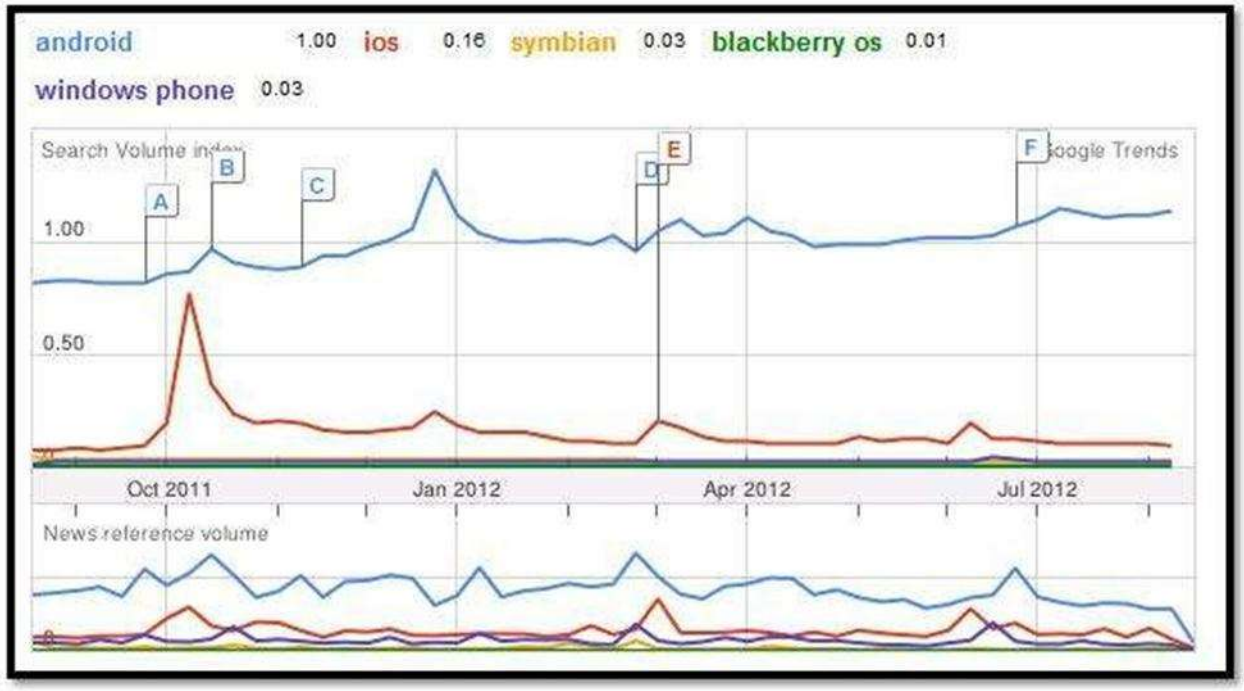
CS8601 -MOBILE COMPUTING

UNIT 5

MOBILE PLATFORMS AND APPLICATIONS

5.3. Commercial Mobile Operating Systems

Many people have ample knowledge about different mobile phones and their companies, but a very few of them know something about operating systems. It is vital to learn about different **mobile OS** used by many companies so that you can know that what is behind your smartphone‘s smooth and colorful touchscreen



Above is the popularity graph, which represents last 12 months trends. It is apparent that Android is beating up all other operating systems, even the IOS. Symbian, which was once an industry leader, is also observing a diminishing slope. IOS might continue to compete Android, and with the release of Windows Phone 8, we might see some healthy competition in future.

Comparison of Top Mobile OS

Symbian

Symbian OS is officially the property of Nokia. It means that any other company will have to take permission from Nokia before using this operating system. Nokia has remained a giant in the low-end mobile market, so after Java Symbian was the most used in the mobile phones till a couple of years ago. Still Symbian is widely used in **low-end phones** but the demand rate has ben continuously decreasing. By upgrading Symbian mobile OS, Nokia has made it capable to run smartphones efficiently. **Symbian ANNA and BELLE** are the two latest updates that are currently used in Nokia's smartphones. Overall, the Symbian OS is excellently designed and is very user-friendly.

Unfortunately, Symbian OS graph is going downwards nowadays due to the immense popularity of Android and iOS. Some of the phones currently running on Symbian OS are Nokia C6-01, Nokia 603, Nokia 700, Nokia 808 Pure View, Nokia E6 (ANNA) and Nokia 701 (BELLE). Symbian is a popular choice among Nokia dual sim mobile phones as well.

Android

September 20th, 2008 was the date when Google released the first Android OS by the name of ‗Astro'. After sometime next upgraded versions ‗Bender' and ‗Cupcake' were also released. Google then adopted the trend of naming Android versions after any dessert or a sweet in alphabetical order. The other releases are Donut, Éclair, Froyo, Gingerbread, Honeycomb, Ice Cream Sandwich and Jelly Bean.Marshmallow (Android 6.0) is so far the latest Android version from Google.

Since the platform is not closed like iOS, there are too many great Android apps built by developers. Just after stepping into the smartphone and tablets market Android gained immense popularity due to its beautiful appearance and efficient working. Many new features were introduced which played a significant role in Android's success. Google Play is an

official app market that contains millions of different apps for Android devices. Samsung, HTC, Motorola and many other top manufacturers are using Android in their devices. Currently, Android is one of the top operating systems and is considered serious threat for iPhone.

Some of the smartphones operating on Android are HTC Desire, Samsung Galaxy Gio, Motorola Droid Razr, Samsung Galaxy S3 and HTC Wildfire.

Apple iOS

iOS was introduced in 29th June 2007 when the first iPhone was developed. Since then iOS has been under gone many upgrades and currently the latest one is the iOS 9. Apple has still not allowed any other manufacturer to lay hands on its operating system. Unlike Android, Apple has more concentrated on the performance along with appearance. This is the reason that the basic appearance of iOS is almost the same as it was in 2007. Overall it is very user-friendly and is one of the mobile best operating systems in the world. So far iOS has been used in all iPhones, iPod &iPad.

Blackberry OS

Blackberry OS is the property of RIM (Research In Motion) and was first released in 1999. RIM has developed this operating system for its Blackberry line of smartphones. Blackberry is much different from other operating systems. The interface style, as well as the Smartphone design, is also different having a trackball for moving on the menu and a qwerty keyboard.

Like Apple, Blackberry OS is a close source OS and is not available for any other manufacturer. Currently, the latest release of this operating system isBlackberry OS 7.1 which was introduced in May 2011 and is used inBlackberry Bold 9930. It is a very reliable OS and is immune to almost all the viruses.

Some of the smartphones operating on Blackberry OS are Blackberry Bold, Blackberry Curve, Blackberry Torch and Blackberry 8520.

Windows OS

All of you will be familiar with Windows OS because it is used in computers all over the world. Windows OS has also been used in mobile phones, but normal mobile phone users find it a bit difficult to operate it but at the same time it was very popular among people who were used to it.

This was the case until Nokia and Microsoft joined hands to work together. The latest Windows release by Microsoft is known as Windows 7 which has gained immense popularity among all kind of users. With its colorful and user-friendly interface, it has given Windows OS a new life and is currently in demand all over the world. Another reason behind its success is that this latest OS is used in very powerful devices made by Nokia. The computer like look has totally vanished from the windows phones with the release of Windows 7. Samsung and HTC also released some Windows-based phones, but they could not many places in the market.

Nokia Lumia series is completely windows based. Some of the latest Windows Phones are Nokia Lumia 800, Nokia Lumia 900, Samsung Focus and HTC Titan 2.

BADA

Like others, Samsung also owns an operating system that is known as BADA. It is designed for mid-range and high-end smartphones. Bada is a quiet user-friendly and efficient operating system, much like Android, but unfortunately Samsung did not use Bada on a large scale for unknown reasons.

The latest version Bada 2.0.5 was released on March 15th, 2012. There are only three phones that are operating on Bada. These three smartphones are Samsung Wave, Samsung Wave 2 and Samsung Wave 3. I believe that Bada would have achieved much greater success if Samsung had promoted it properly.

Palm OS (Garnet OS)

Palm OS was developed by Palm Inc in 1996 especially for PDAs (Personal Digital Assistance). Palm OS was designed to work on touchscreen GUI. Some Years later it was upgraded and was able to support smartphones. Unfortunately, it could not make a mark on the market and currently is not being used in any of the latest top devices.

It has been 5 and half years since we saw the latest update of Palm OS in 2007. Palm OS was used by many companies including Lenovo, Legend Group, Janam, Kyocera and IBM.

Open WebOS

Open WebOS also known as Hp WebOS or just WebOS which was developed by Palm Inc but after some years it became the property of Hewlett-Packard. WebOS was launched in 2009 and was used in a number of smartphones and tablets.

Hp promoted WebOS at a very high level by using it in high-end smartphones and tablets. The latest device working on WebOS was the Hp Touch Pad. With the introduction of Android in the market sales of Hp WebOS, based tablets got very less. At last Hp announced to discontinue WebOS-based devices, but the existing users were assured that they will get regular updates of the operating system.

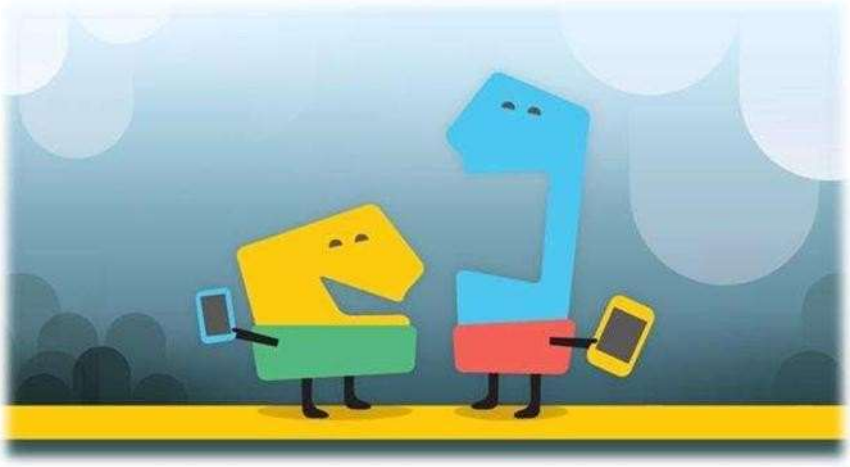
Maemo

Nokia and Maemo Community joined hands to produce an operating system for smartphones and internet tablets, known as Maemo. Like other devices, the user interface of Maemo also comprised of a menu from which the user can go to any location.

Like today‘s Android the home screen is divided into multiple sections that show Internet Search bar, different shortcut icons, RSS Feed and other such things. Later in 2010 at the MWC (Mobile World Congress) it was revealed that now Maemo project will be merged with Mobilin to create a fresh operating system known as MeeGo.

MeeGo

MeeGo was called a mobile platform, but it was designed to run multiple electronic devices including handhelds, in-car devices, television sets, and net books. All the devices on which MeeGo can have the same core but the user interface is entirely different according to the device. In 2010, Moorestown Tablet PC was introduced at COMPUTEX Taipei, which was also a MeeGo powered device. Most of you will have heard the name Nokia N9, but you will not be aware of the fact that this large selling device is operating on MeeGo.



CS8601 -MOBILE COMPUTING

UNIT 5

MOBILE PLATFORMS AND APPLICATIONS

5.6. MCommerce - Structure - Pros & Cons

The traditional Web interaction model evolved on desktop computers, making its user interface assumptions uniquely suited to a desktop or laptop computer. Mobile Web services span a range of capabilities. Mobile appliances can display many lines of text and graphics in a single screen. Accessing Web information on these tiny appliances falls into three categories. This approach employs manually authored page templates for each device type and populates these templates with content from a database.

Because of the labour required, only a small fraction of Web content in Europe and Japan is manually authored for any particular device. In Japan, the i-mode service provides many Web phone users with access to specifically authored compact HTML pages. Automated techniques for re-authoring Web content have become popular because they are cost-effective and they allow access to content that providers have not manually authored for very small devices.

Transforming system Making Web content compatible with device formats, transforming systems modify content to transform the structure of interacting with the content. The Digestor system, for example, attempts to imitate an expert Web designer faced with the task of re-authoring Web pages for PDAs . This study also modifies the Web page layout, splitting it into multiple sub-pages and adding navigation links so that the user can navigate the sub-pages. z Multipurpose system M-Links is a representative of this category. Figure shows the m-Links architecture proposed by Intel.

The three main processing components are the link engine, which creates the navigation interface; the service manager, which creates the action interface, and the user interface generator, which converts the interfaces into forms suitable for the requesting device and browser.

Formats include HTML, Wireless Markup Language (WML), Handheld Device Markup Language (HDML) and Compact HTML (CHTML).

M-Commerce Framework

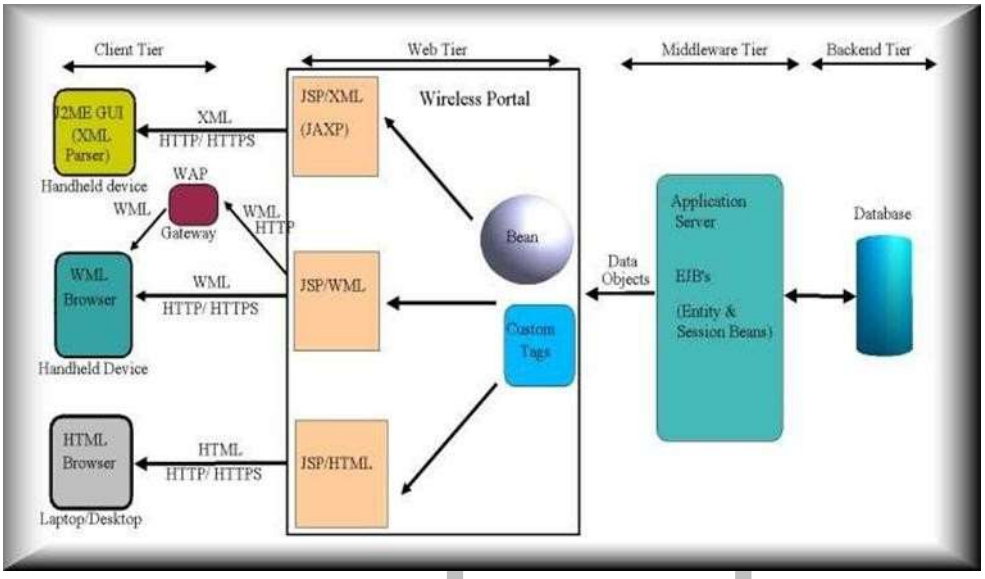


Figure illustrates an m-commerce system architecture that shows how this study combined advance technologies according to the previous works. The architecture consists of the Web client, XML server, and back-end processing modules. Figure depicts the operation scenario between tiny wireless devices and servers, based on WS technologies.

Web Client WS technologies describe the specific business functionality exposed by a company, through an Internet connection, to provide a way for another company to use business services. WS consists of many software building blocks that can be assembled to construct distributed applications. They are in particular defined by their interfaces about how they describe their functionality, how they register their presence, and how they communicate with other WS. Restated, individuals wanting to use WS could connect to the UDDI center to search for the required services.

The information described by the WSDL can be acquired. The users could also use the SOAP to transfer the required information and receive the real service. This study adopts the mobile agen

technology into the architecture to mobilize this information . WS procedures can be mastered with mobile agents. Users only need to send simple commands of their requirements. The mobile agents perform the actions according to these commands and interact with WS technologies.

All users must wait for the response from the service provider and then enjoy the services. z QoS consideration An m-commerce service could be successful; the QoS will be one of the ultimate criteria. For example, location awareness, data burst control, and unpredictable bit error rate. Additionally, QoS combines several qualities or properties of a service, such as availability, security properties, response time and throughput.

Many providers compete to offer the same WS, implying that users can decide to select providers based on the QoS to which they can commit. This observation suggests that users and providers must be able to engage in QoS negotiation. The interaction between users and WS providers occurs via XML-based SOAP messages. z SOAP security Several service scenarios in which security function is provided by the transport layer are insufficient. SOAP security is useful for application developers.

Their functionalities include end-to-end security, application independence, transport independence, and stored message security . The code translator module ensures that the module with correct coding for device. The security goal of a service-oriented architecture attempts to enable trusted interactions among the roles. If security is defined as protection against threats, a WS identifies its set of perceived threats and propose methods of preventing threats to WS interactions.

Two parties can establish trust when they understand the risks, having identified the threats and vulnerabilities and conferred on a set of countermeasures and safeguards for protecting themselves in doing business. A WS architecture implementation should allow for incremental security and QoS models facilitated by configuring a set of environmental prerequisites to control and manage the interactions. In addition, users can access their personal and services folders once they have logged into the system using a pass phrase (Certificate Authority; CA).

The client also has other functions, including changing the pass phrase; customizing the appearance of information in the personal folder, and specifying when the client should lock

information. Web Services Flow Language (WSFL) is an XML language describing WS compositions. WSFL considers two types. The first type specifies the appropriate usage pattern of a collection of WS, such that the resulting composition describes how to achieve a particular business goal; typically, the result describes a business process.

The second type specifies the interaction pattern of a collection of WS; in this case, the result is a description of the overall partner interactions. Object Store creates a _proxy' object, which communicates with the actual service to process the application request. The proxy creation and usage is transparent to the client and its complexity shielded by the underlying WS.XML server includes the following functionalities: transforming data in the database into XML data; making many different XML documents according to different Document Type Definition (DTD); and receiving requests from web server and producing HTML files corresponding to the back-end processing modules. The study develops a user interface generator, which uses a combination of screen template substitution and program inheritance to produce the appropriate markup interface for each device.

It begins by identifying the device making the request, and then determines the appropriate type of response markup and dispatches to a markup handler. The handler subsequently uses a screen template to help generate the content appropriate for the device. The generator uses the same process for both the navigation and the action interfaces, as well as a few associated screens.

Figure illustrates the operation scenario, described in the following. 1) A mobile device sends a request to Filter and Filter relays the request to the WS via HTTP protocol. 2) The filter authenticates the identity of the user and device, relays the user's request to the WS and forwards authentication data to the style generator at the same time. The style generator then determines the style-sheet to be used according to verify received data with user data and device data. 3) When receiving the request, the WS generates the appropriate XML documents and style sheet to send to the rendering module. 4) When receiving the XML documents and XSLT, the rendering module generates documents with the XML parser and XSL engine.

PROS AND CONS OF MOBILE COMMERCE

Pros:

- Increased access to user data (e.g. by requesting Facebook login).
- Better use of the screen (not inside the browser window).
- Better use of smartphone features / tools (e.g. camera, GPS).
- Can access without an internet connection, using 3G for example.
- More control on how it is being shown.

Cons:

- Apps need to be downloaded.
- Apps need to be upgraded.
- There is a low repeated usage of apps.
- Needs to be built for each platform (iOS, Android, Windows).
- Needs to be right the first time – reviews stay —forever.

CS8601 -MOBILE COMPUTING

UNIT 5

MOBILE PLATFORMS AND APPLICATIONS

5.5. MCommerce

The phrase mobile commerce was originally coined in 1997 by Kevin Duffey at the launch of the Global Mobile Commerce Forum, to mean "the delivery of electronic commerce capabilities directly into the consumer‘s hand, anywhere, via wireless technology." Many choose to think of Mobile Commerce as meaning "a retail outlet in your customer‘s pocket."

Mobile commerce is worth US$230 billion, with Asia representing almost half of the market, and has been forecast to reach US$700 billion in 2017. According to BI Intelligence in January 2013, 29% of mobile users have now made a purchase with their phones. Walmart estimated that 40% of all visits to their internet shopping site in December

2012 was from a mobile device. Bank of America predicts $67.1 billion in purchases will be made from mobile devices by European and U.S. shoppers in 2015. Mobile retailers in UK alone are expected to increase revenues up to 31% in FY 2013–14.

The Global Mobile Commerce Forum, which came to include over 100 organisations, had its fully minuted launch in London on 10 November 1997. Kevin Duffey was elected as the Executive Chairman at the first meeting in November 1997. The meeting was opened by Dr Mike Short, former chairman of the GSM Association, with the very first forecasts for mobile commerce from Kevin Duffey (Group Telecoms Director of Logica) and Tom Alexander (later CEO of Virgin Mobile and then of Orange).

Over 100 companies joined the Forum within a year, many forming mobile commerce teams of their own, e.g. MasterCard and Motorola. Of these one hundred companies, the first two were Logica and Cellnet (which later became O2). Member organisations such as Nokia, Apple, Alcatel, and Vodafone began a series of trials and collaborations.

Mobile commerce services were first delivered in 1997, when the first two mobile- phone enabled Coca Cola vending machines were installed in the Helsinki area in Finland. The machines accepted payment via SMS text messages. This work evolved to several new mobile applications such as the first mobile phone-based banking service was launched in 1997 by Merita Bank of Finland, also using SMS. Finnair mobile check-in was also a major milestone, first introduced in 2001.

The m-Commerce(tm) server developed in late 1997 by Kevin Duffey and Andrew Tobin at Logica won the 1998 Financial Times award for "most innovative mobile product," in a solution implemented with De La Rue, Motorola and Logica. The Financial Times commended the solution for "turning mobile commerce into a reality." The trademark for m- Commerce was filed on 7 April 2008

In 1998, the first sales of digital content as downloads to mobile phones were made possible when the first commercial downloadable ringtones were launched in Finland by Radiolinja (now part of Elisa Oyj). Two major national commercial platforms for mobile commerce were launched in 1999: Smart Money (http://smart.com.ph/money/) in the Philippines, and NTT DoCoMo's i-Mode Internet service in Japan. i-Mode offered a revolutionary revenue-sharing plan where NTT DoCoMo kept 9 percent of the fee users paid for content, and returned 91 percent to the content owner.

Mobile-commerce-related services spread rapidly in early 2000. Norway launched mobile parking payments. Austria offered train ticketing via mobile device. Japan offered mobile purchases of airline tickets. In April 2002, building on the work of the Global Mobile Commerce Forum (GMCF), the European Telecommunications Standards Institute (ETSI) appointed Joachim Hoffmann of Motorola to develop official standards for mobile commerce. In appointing Mr Hoffman, ETSI quoted industry analysts as predicting "that m- commerce is poised for such an exponential growth over the next few years that could reach US$200 billion by 2004".

The first book to cover mobile commerce was Tomi Ahonen's M-profits in 2002. The first university short course to discuss mobile commerce was held at the University of Oxford

in 2003, with Tomi Ahonen and Steve Jones lecturing. As of 2008, UCL Computer Science and Peter J. Bentley demonstrated the potential for medical applications on mobile devices.

PDAs and cellular phones have become so popular that many businesses are beginning to use mobile commerce as a more efficient way to communicate with their customers. In order to exploit the potential mobile commerce market, mobile phone manufacturers such as Nokia, Ericsson, Motorola, and Qualcomm are working with carriers such as AT&T Wireless and Sprint to develop WAP-enabled smartphones. Smartphones offer fax, e-mail, and phone capabilities.

"Profitability for device vendors and carriers hinges on high-end mobile devices and the accompanying killer applications," said Burchett. Perennial early adopters, such as the youth market, which are the least price sensitive, as well as more open to premium mobile content and applications, must also be a key target for device vendors.

Since the launch of the iPhone, mobile commerce has moved away from SMS systems and into actual applications. SMS has significant security vulnerabilities and congestion problems, even though it is widely available and accessible. In addition, improvements in the capabilities of modern mobile devices make it prudent to place more of the resource burden on the mobile device.

More recently, brick and mortar business owners, and big-box retailers in particular, have made an effort to take advantage of mobile commerce by utilizing a number of mobile capabilities such as location-based services, barcode scanning, and push notifications to improve the customer experience of shopping in physical stores. By creating what is referred to as a 'bricks & clicks' environment, physical retailers can allow customers to access the common benefits of shopping online (such as product reviews, information, and coupons) while still shopping in the physical store.

This is seen as a bridge between the gap created by e-commerce and in-store shopping, and is being utilized by physical retailers as a way to compete with the lower prices typically seen through online retailers. By mid summer 2013, "omni channel" retailers (those with significant e-commerce and in-store sales) were seeing between 25% and 30% of traffic to their online properties originating from mobile devices. Some other pure play/online-only retail sites

(especially those in the travel category) as well as flash sales sites and deal sites were seeing between 40% and 50% of traffic (and sometimes significantly more) originate from mobile devices.

The Google Wallet Mobile App launched in September 2011 and the m-Commerce joint venture formed in June 2011 between Vodafone, O2, Orange and T-Mobile are recent developments of note. Reflecting the importance of m-Commerce, in April 2012 the Competition Commissioner of the European Commission ordered an in-depth investigation of the m-Commerce joint venture between Vodafone, O2, Orange and T-Mobile. A recent survey states that 2012, 41% of smartphone customers have purchased retail products with their mobile devices.

CS8601 -MOBILE COMPUTING

UNIT 5

MOBILE PLATFORMS AND APPLICATIONS

5.1. Mobile Device Operating Systems

A **mobile operating system** (or **mobile OS**) is an operating system for smart phones, tablets, PDAs, or other mobile devices. While computers such as the typical laptop are mobile, the operating systems usually used on them are not considered mobile ones as they were originally designed for bigger stationary desktop computers that historically did not have or need specific "mobile" features. This distinction is getting blurred in some newer operating systems that are hybrids made for both uses

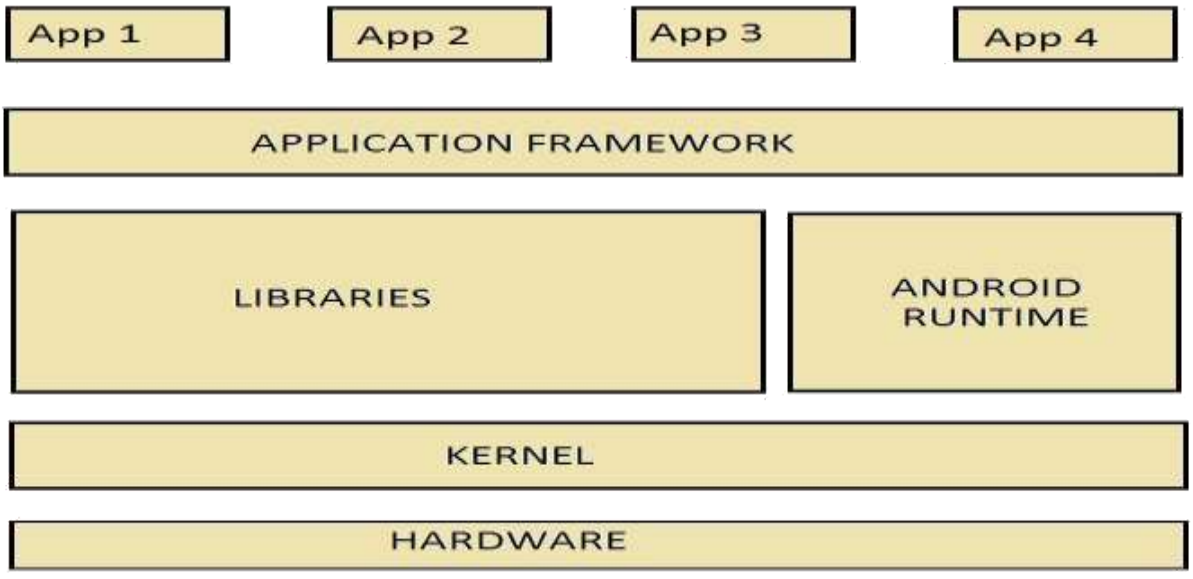
Mobile operating systems combine features of a personal computer operating system with other features useful for mobile or handheld use; usually including, and most of the following considered essential in modern mobile systems; a touch screen, cellular, Bluetooth, Wi-Fi, GPS mobile navigation, camera, video camera, speech recognition, voice recorder, music player, near field communication and infrared blaster.

Mobile devices with mobile communications capabilities (e.g. smartphones) contain two mobile operating systems – the main user-facing software platform is supplemented by a second low-level proprietary real-time operating system which operates the radio and other hardware. Research has shown that these low-level systems may contain a range of security vulnerabilities permitting malicious base stations to gain high levels of control over the mobile device

A mobile operating system, also called a mobile OS, is an operating system that is specifically designed to run on mobile devices such as mobile phones, smartphones, PDAs, tablet computers and other handheld devices. The mobile operating system is the software platform on top of which other programs, called application programs, can run on mobile devices.

Mobile devices with mobile communications capabilities (e.g. smartphones) contain two mobile operating systems – the main user-facing software platform is supplemented by a second low- level proprietary real-time operating system which operates the radio and other hardware. Research has shown that these low-level systems may contain a range of security vulnerabilities permitting malicious base stations to gain high levels of control over the mobile device.

A mobile OS is a software platform on top of which other programs called application programs, can run on mobile devices such as PDA, cellular phones, smartphone and etc. A Mobile operating system 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 across the globe leverage services on the go from voice calls to smart devices which enables users to access value added services anytime and anywhere. At present, the mobile devices are able to provide various services to users but still suffers from issues include Performance, security and Privacy, Reliability and Band width costs. In this paper, we pointed out the issues, challenges, Advantages and Disadvantages of various Mobile Operating systems in terms of their Architectures.



Applications

The diagram shows four basic apps (App 1, App 2, App 3 and App 4), just to give the idea that there can be multiple apps sitting on top of Android. These apps are like any user interface you use on Android; for example, when you use a music player, the GUI on which there are buttons to play, pause, seek, etc is an application. Similarly, is an app for making calls, a camera app, and so on. All these apps are not necessarily from Google. Anyone can develop an app and make it available to everyone through Google Play Store. These apps are developed in Java, and are installed directly, without the need to integrate with Android OS.

Application Framework

Scratching further below the applications, we reach the application framework, which application developers can leverage in developing Android applications. The framework offers a huge set of APIs used by developers for various standard purposes, so that they don't have to code every basic task. The framework consists of certain entities; major ones are:

Activity Manager

This manages the activities that govern the application life cycle and has several states. An application may have multiple activities, which have their own life cycles. However, there is one main activity that starts when the application is launched.

- *Notification Manager*

  This manager enables the applications to create customized alerts

- *Views*

  Views are used to create layouts, including components such as grids, lists, buttons, etc.

- *Resource Managers*

  Applications do require external resources, such as graphics, external strings, etc. All these resources are managed by the resource manager, which makes them available in a standardized way.

- *Content Provider*

  Applications also share data. From time to time, one application may need some data from another application. For example, an international calling application will need to access the user's address book. This access to another application's data is enabled by the content providers.

- *Libraries*

  This layer holds the Android native libraries. These libraries are written in C/C++ and offer capabilities similar to the above layer, while sitting on top of the kernel. A few of the major native libraries include

  Surface Manager: Manages the display and compositing window-ing manager. - Media framework: Supports various audio and video formats and codecs including their playback and recording.

  System C Libraries: Standard C library like libc targeted for ARM or embedded devices.

  OpenGL ES Libraries : These are the graphics libraries for rendering 2D and 3D graphics.

  SQLite : A database engine for Android.

- *Kernel*

  The Android OS is derived from Linux Kernel 2.6 and is actually created from Linux source, compiled for mobile devices. The memory management, process management etc. are mostly similar. The kernel acts as a Hardware Abstraction Layer between hardware and the Android software stack.

CS8601 -MOBILE COMPUTING

UNIT 5

MOBILE PLATFORMS AND APPLICATIONS

5.7. Mobile Payment System and Security Issues.

The development of smartphones has gone and replaced a few things we grew up with: the watch, the alarm clock, the tape recorder, music players, and it seems that very soon, we can add cash and wallets to that list. It's hardly a surprise. Payment methods have been morphing through various channels: from cash to cheques, to credit cards and debit cards, and now to online banking and mobile commerce.

Close to 10 million mobile subscribers in Japan are already paying for purchases with their smartphones by the end of 2010, and reports are saying that the more than $200 billion dollar mobile payment industry willl be worth a trillion by 2015.

There are 6 billion mobile phone subscriptions in the world, and more than a billion smartphones already in the market. Perhaps it's just a matter of time before we embrace the idea of losing that wallet and opting for a digital one to buy flight tickets, lunch, coffee or even to pay the rent.

Digital Wallets

The verdict is still out on what to call these cashless wallets: digital wallet, electronic wallet, e-wallet, virtual wallet etc but they all work the same way. By downloading an app onto your phone, you can link the service or app account to your bank account or payment card. With that done, you can start paying for your wares with your digital wallet.

Paying is a Breeze

If your digital wallet is an NFC enabled Android phone, you can tap your smartphone at the card terminal at the checkout counter, like you would your debit card. But let's face it, not all Android phones carry NFC technology and it's hardly a strong reason for you to consider when it comes to picking your next smartphone. But fret not, other e-wallets, like Square Wallet, let you pay just by saying your name to the cashier. Systems like ERPLY allow you to check in at a store, and let the cashier identify you by facial recognition; your purchases are then auto-deducted from your PayPal account.

Restaurants and pubs would love platforms like Tabbedout, which lets their diners check in when they arrive, and pay for their meal anytime without needing to wait for the bill or to bring their wallets along. All of this is made possible with smartphones and the right apps.

Digital Wallets not only carry payment details to allow their owners to make purchases, they also help them to better manage their loyalty cards. If your really want to go full digital (wallet) then it only makes sense that you need not carry around your loyalty cards either.

To cater for this, there are also apps that let users scan the information on the barcodes of their loyalty cards, then store them up in the phone. At the checkout counter, they can let the cashier scan the barcode displayed on their mobile screen to ensure that they don't miss out on any rewards.

Loyalty Apps and Programs

But then other apps take it up a notch and become the reward platform itself. Loyalty platforms like LevelUp, Perka and rewardjunkie! give business owners the flexibility to customize reward programs for their loyal, paying customers, and to engage new customers for their booming business.

For the rest of us, this means that we don't have to carry around stacks of brand- specific loyalty cards that are used probably once every couple of months. Everything is in our smartphone, including new offers, discounts and deals offered by participating merchants. Alternative Payment Methods

If however you are cautious with your spending and prefer to not put all your chicken eggs in the same basket (i.e. what if you lose your smartphone?), then there are other online payment methods to use.

Carrier or Mobile Billing

The idea is to charge all your online purchases to your phone bill and clear that at the end of the month. The good thing with this method is that you need not even own a smartphone to start making online purchases. Having a mobile phone is enough as you can pay via sms. There are confirmation codes or authorization pins or text to punch in they are intended for security purposes.

Security Issues

Ultimately, the security of these mobile payment systems is always at the back of our heads. What happens if I transfer all my payment card details into the smartphone and the unthinkable happens: someone else gets hold of my lost or stolen smartphone?. Well, it's a good thing that most of these accounts, as well as your smartphone, can be remotely deactivated or wiped out. It is a good idea to have a passcode lock, at least to give your phone an extra layer of protection. Also, before you start linking your sensitive data to any mobile payment platform, do take a look at customer reviews or coverage of the platform from reliable sources first.

Resources for accepting mobile payment

To wrap up, here is a small list of resources developers can adapt to their online business to start accepting mobile payments from their online customers.

Card io

Tired of having to punch in line after line of credit card details? You can skip through all that with Card.io by taking a photo of your credit card, then punching in the CVV code manually. This help reduce fraud and developers can easily join the program by grabbing the SDK for card.io at the site.

Jumio

Here is another app that lets you take photos of your credit card as a payment method via Netswipe. It also has a similar online ID verification tool calledNetverify, which lets your customer's computer work in your favor as an ID scanning tool.

BancBox

BancBox is an all-in, one-stop solution for businesses that cater to the online marketplace. With the payment portal in place, the business owner can receive credit card payments, wire transfers and checks, among others. It also has a relatively low fee of 0.5% +30 cents per transaction for its services.

Stripe

Stripe helps developers take care of credit card payments online with a simple JS script. It lets you build your own payment forms, and avoid PCI requirements. Embedding the codes in the site lets Stripe to handle all your online payment needs at 2.9% + 30 cents per successful charge.

Zooz

ZooZ gives developers 3 lines of code, which they can integrate into their mobile applications. There is also a sandbox environment to let developers test out transactions at no charge. Prices are locked in at 2.8% + 19 cents per transaction.

CS8601 -MOBILE COMPUTING

UNIT 5

MOBILE PLATFORMS AND APPLICATIONS

5.4. Software Development Kit: iOS, Android, BlackBerry, Windows Phone

iOS:

iOS (originally iPhone OS) is a mobile operating system created and developed by Apple Inc. and distributed exclusively for Apple hardware. It is the operating system that presently powers many of the company's mobile devices, including the iPhone, iPad, and iPod touch. In October 2015, it was the most commonly used mobile operating system, in a few countries, such as in Canada, the United States, the United Kingdom, Norway, Sweden, Denmark, Japan, and Australia, while iOS is far behind Google's Android globally; iOS had a 19.7% share of the smartphone mobile operating system units shipped in the fourth quarter of 2014, behind Android with 76.6%. However, on tablets, iOS is the most commonly used tablet operating system in the world, while it has lost majority in many countries (e.g. the Africa continent and briefly lost Asia).

Originally unveiled in 2007, for the iPhone, it has been extended to support other Apple devices such as the iPod Touch (September 2007), iPad(January 2010), iPad Mini (November 2012) and second-generation Apple TV onward (September 2010). As of January 2015, Apple's App Store contained more than 1.4 million iOS applications, 725,000 of which are native for iPads. These mobile apps have collectively been downloaded more than 100 billion times.

The iOS user interface is based on the concept of direct manipulation, using multi- touch gestures. Interface control elements consist of sliders, switches, and buttons. Interaction with the OS includes gestures such as swipe, tap,pinch, and reverse pinch, all of which have specific definitions within the context of the iOS operating system and its multi-touch interface. Internal accelerometers are used by some applications to respond to shaking the device (one common result is the undo command) or rotating it in three dimensions (one common result is switching from portrait to landscape mode).

iOS shares with OS X some frameworks such as Core Foundation and Foundation Kit; however, its UI toolkit is Cocoa Touch rather than OS X's Cocoa, so that it provides the UIKit framework rather than the AppKit framework. It is therefore not compatible with OS X for applications. Also while iOS also shares the Darwin foundation with OS X, Unix-like shell access is not available for users and restricted for apps, making iOS not fully Unix-compatible either. Major versions of iOS are released annually. The current release, iOS 9.1, was released on October 21, 2015. In iOS, there are four abstraction layers: the Core OS layer, the Core Services layer, the Media layer, and the Cocoa Touch layer. The current version of the operating system (iOS 9), dedicates around 1.3 GB of the device's flash memory for iOS itself. It runs on the iPhone 4S and later, iPad 2 and later, iPad Pro, all models of the iPad Mini, and the 5th-generation iPod Touch and later.

Android:

Android is a mobile operating system (OS) currently developed by Google, based on the Linux kernel and designed primarily for touch screen mobile devices such as smart phones and tablets. Android's user interface is mainly based on direct manipulation, using touch gestures that loosely correspond to real-world actions, such as swiping, tapping and pinching, to manipulate on-screen objects, along with a virtual keyboard for text input.

In addition to touch screen devices, Google has further developed Android TV for televisions, Android Auto for cars, and Android Wear for wrist watches, each with a specialized user interface. Variants of Android are also used on notebooks, game consoles, digital cameras, and other electronics. As of 2015, Android has the largest installed base of all operating systems.

Initially developed by Android, Inc., which Google bought in 2005, Android was unveiled in 2007, along with the founding of the Open Handset Alliance – a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for mobile devices. As of July 2013, the Google Play store has had over one million Android applications ("apps") published, and over 50 billion applications downloaded. An April–May 2013 survey of mobile application developers found that 71% of developers create applications for Android, and a 2015 survey found that 40% of full-time professional developers see Android as their priority

target platform, which is comparable to Apple's iOS on 37% with both platforms far above others.

At Google I/O 2014, the company revealed that there were over one billion active monthly Android users, up from 538 million in June 2013. Android's source code is released by Google under open source licenses, although most Android devices ultimately ship with a combination of open source and proprietary software, including proprietary software required for accessing Google services. Android is popular with technology companies that require a ready-made, low-cost and customizable operating system for high-tech devices.

Its open nature has encouraged a large community of developers and enthusiasts to use the open-source code as a foundation for community-driven projects, which add new features for advanced users or bring Android to devices originally shipped with other operating systems. At the same time, as Android has no centralised update system most Android devices fail to receive security updates: research in 2015 concluded that almost 90% of Android phones in use had known but unpatched security vulnerabilities due to lack of updates and support.The success of Android has made it a target for patent litigation as part of the so-called "smartphone wars" between technology companies.

BlackBerry:

BlackBerry OS is a proprietary mobile operating system developed by BlackBerry Ltd for its BlackBerry line of smart phone handheld devices. The operating system provides multitasking and supports specialized input devices that have been adopted by BlackBerry Ltd. for use in its handhelds, particularly the track wheel, trackball, and most recently, the trackpad and touch screen.

The BlackBerry platform is perhaps best known for its native support for corporate email, through MIDP 1.0 and, more recently, a subset of MIDP 2.0, which allows complete wireless activation and synchronization with Microsoft Exchange, Lotus Domino, or Novell GroupWise email, calendar, tasks, notes, and contacts, when used with BlackBerry Enterprise Server. The operating system also supports WAP 1.2. Updates to the operating system may be automatically available from wireless carriers that support the BlackBerry over the air software loading

(OTASL) service.

Third-party developers can write software using the available BlackBerry APIclasses, although applications that make use of certain functionality must be digitally signed. Research from June 2011 indicated that approximately 45% of mobile developers were using the platform at the time of publication. BlackBerry OS was discontinued after the release of BlackBerry 10, but BlackBerry will continue support for the BlackBerry OS.

Windows Phone:

Windows Phone (WP) is a family of mobile operating systems developed by Microsoft for smart phones as the replacement successor to Windows Mobile and Zune. Windows Phone features a new user interface derived from Metro design language. Unlike Windows Mobile, it is primarily aimed at the consumer market rather than the enterprise market. It was first launched in October 2010 with Windows Phone 7. Windows Phone 8.1 was the last public release of the operating system, released to manufacturing on April 14, 2014

Work on a major Windows Mobile update may have begun as early as 2004 under the codename "Photon", but work moved slowly and the project was ultimately cancelled. In 2008, Microsoft reorganized the Windows Mobile group and started work on a new mobile operating system. The product was to be released in 2009 as Windows Phone, but several delays prompted Microsoft to develop Windows Mobile 6.5 as an interim release.

Windows Phone was developed quickly. One result was that the new OS would not be compatible with Windows Mobile applications. Larry Lieberman, senior product manager for Microsoft's Mobile Developer Experience, told eWeek: "If we'd had more time and resources, we may have been able to do something in terms of backward compatibility." Lieberman said that Microsoft was attempting to look at the mobile phone market in a new way, with the end user in mind as well as the enterprise network. Terry Myerson, corporate VP of Windows Phone engineering, said, "With the move to capacitive touch screens, away from the stylus, and the moves to some of the hardware choices we made for the Windows Phone 7 experience, we had to break application compatibility with Windows Mobile 6.5.

CS8601 -MOBILE COMPUTING

UNIT 5

MOBILE PLATFORMS AND APPLICATIONS

5.2. Special Constrains & Requirements

Design and capabilities of a Mobile OS (Operating System) is very different than a general purpose OS running on desktop machines

Physically Constrained

- ✓ Battery-powered device
- ✓ Small screens of varying shapes, sizes, and resolutions
- ✓ Memory
- ✓ Storage space

Working in Uncertainty

- Networks come and go
- Other devices appear and disappear
- OS need to provide robust methods for handling connections and coping with service interruptions and ad hoc attempts to communicate

Today's mobile devices are multifunctional devices capable of hosting a broad range of applications for both business and consumer use. Smartphones and tablets enable people to use their mobile device to access the Internet for email, instant messaging, text messaging and Web browsing, as well as work documents, contact lists and more.

Mobile devices are often seen as an extension to your own PC or laptop, and in some cases newer, more powerful mobile devices can even completely replace PCs. And when the devices are used together, work done remotely on a mobile device can be synchronized with PCs to reflect changes and new information while away from the computer.

Much like the Linux or Windows operating system controls your desktop or laptop computer, a mobile operating system is the software platform on top of which other programs can run on mobile devices.

A mobile operating system, also called a *mobile OS*, is an operating system that is specifically designed to run on mobile devices such as mobile phones, smartphones, PDAs, tablet computers and other handheld devices.

Mobile OS Special Constraints	
Smaller screen size	Stay focused on the user's immediate task. Display only the information that users need at any given moment. For example, a customer relationship management system can provide a massive amount of information, but users only require a small amount of that information at one time. Design the UI so that users can perform tasks easily and access information quickly.
One screen appears at a time	Use a single screen if possible. If your application requires multiple screens to be open at the same time, use a split screen or rethink the flow of your application.
Shorter battery life	Try to handle data transmission efficiently. The less often the device needs to transmit data, the longer the battery lasts.
Wireless network connections	Try to simplify how your application creates network connections.Compared with standard LANs, longer latency periods that are inherent in some wireless network connections can influence how quickly users receive information that is sent over the network.
Slower processor speeds	Avoid processor-intensive tasks where possible. Slower processorspeeds can affect how users perceive the responsiveness of an application.
Less available memory	Free up as much memory as possible. For example, while an application is not being used, try to keep it from using memory.