

CAP588: MOBILE APPLICATION DEVELOPMENT

L:3 T:0 P:0

Subject Teacher:

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Assistant Professor

School of Computer Applications



Syllabus: Before MTE

CAP588: MOBILE APPLICATION DEVELOPMENT

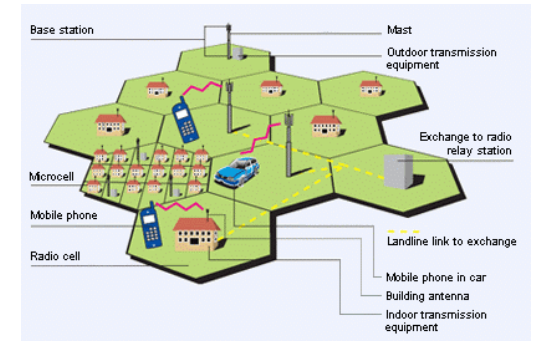
Unit – I Introduction to Mobile Application Development :

Definition of Mobile Computing, Devices, Web-Based Applications, Native Applications, History of Mobile Platforms, Internet Protocols for Mobile Apps, Content vs. Applications



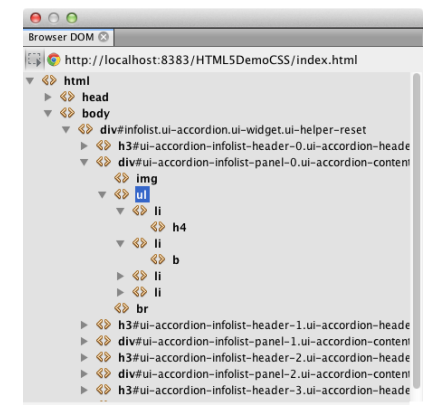
Unit – II Infrastructure:

Mobile and Cell Phone Technologies, Internet Terms, Transport Secure Connections, Proxies and Reverse Proxies



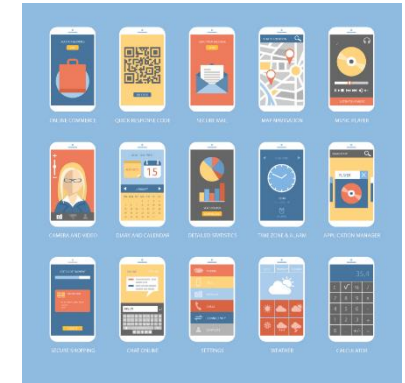
Unit – III HTML/CSS/DOM and Java Scripting, JQuery, Ajax:

HTML, Cascading Style Sheets (CSS), Document Object Model (DOM), JavaScript, advantages and limitations of Javascript, control statements, functions, events, JQuery, Overview of Ajax



Unit – IV Designing Mobile User Interfaces and Browsers:

Definition of Usability, Steps to Building a Good User Interface, Mobile User Interface Types, Mobile Application Development Design considerations, Mobile Device User Interaction Patterns, Evaluating Mobile User Interfaces, Mobile Browsers and Browsers, Mobile Browser Evolution



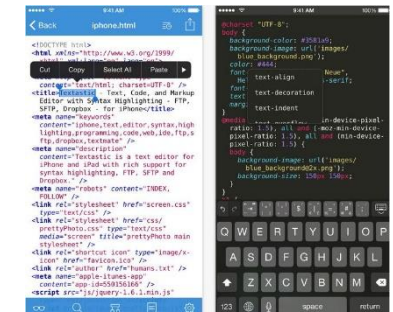
Unit – V Platforms and Storage and Geolocation:

URIs for Mobile Apps, Native Runtime Platforms, Cross Platform Development, HTML5, Hybrid Runtime Environments, Need for Storage, Local Storage with HTML5, Storage on the Web, Geolocation



Unit – VI iPhone/iPAD Development:

Object-C Primer, Windows-based Applications and MVC, View Controllers, Provisioning, Core Data, Gestures and data



Course Outcomes

- Apply various mobile techniques HTML/CSS/DOM and Java Scripting, JQuery, Ajax for designing Mobile User Interfaces
- Analyse various languages to be used for iPhone/iPAD Development
- Examine the leading edge developments in mobile application development

Scheme for Continuous Assessment (CA)

CA Category of this Course Code is:A0203 (2 best out of 3)

Component	Weightage
Term paper	50 %
Test	50 %
Test	50 %

Academic Task	Objective	Detail of Academic Task	Nature of Academic Task (group/individuals)	Academic Task Mode	Marks	Allotment / submission Week
Term paper	To evaluate the writing skills of the students	Total Marks: 30 (Report: 15, Presentation: 10 and Query Handling: 5) (Student to spend about 15 hrs on any one specified term paper)	Individual student	Online	30	3 / 11
Test 1	To evaluate the descriptive concepts of the students	Total marks = 30 (6 questions each of 5 marks or questions with marks in multiple of 5)	Individual student	Offline	30	4 / 5
Test 2	To evaluate the descriptive concepts of the students	Total marks = 30 (6 questions each of 5 marks or questions with marks in multiple of 5)	Individual student	Offline	30	11 / 12

Let's begin the Journey

Unit – I Introduction to Mobile Application Development

Definition of Mobile Computing:

Mobile Computing is a technology that allows...

... transmission of data, voice and video ...

... via a computer or any other wireless enabled device...

... without having to be connected to a fixed physical link.

Mobile computing is **human–computer interaction** by which a **computer** is expected to be **transported** during normal usage.

Mobile computing involves three things:

- i) Mobile communication
- ii) Mobile hardware
- iii) Mobile software

i) Mobile Communication

- The mobile communication refers to the **INFRASTRUCTURE** put in place...
... to ensure that seamless and reliable communication goes on.

- These would include :

- > Protocols
- > Service
- > Bandwidth
- > Portals

...necessary to facilitate and support of the stated services.



- The **Data Format** is also defined at this stage.
- This **ensures** that there is **no collision with other existing systems** which offer the same service.
- Since the **media is unguided/unbounded**, the overlaying infrastructure is more of **radio wave** oriented.

ii) Mobile Hardware (Various types of Mobile Computing Devices)

- Includes **Mobile Devices** or **Device Components** that receive or access the service of mobility.

- There would be a range from :

Portable laptops, Smartphones, Tablet Pc's, Personal Digital Assistants



having **receptor medium** that are capable of sensing and receiving signals

- These devices are configured to operate in full- duplex, whereby they are **capable of sending and receiving signals** at the same time.

iii) Mobile Software

- ✓ Mobile software is the **actual program that run on the mobile hardware**.
- ✓ It's the essential component that **makes the mobile device operate**.
- ✓ This is the **engine of a mobile device**. In other terms, it is the **operating system** of that appliance.
- ✓ It **deals with the characteristics and requirements** of mobile applications.
- ✓ Since portability is the main factor, this type of computing **ensures that users are** not tied or pinned to a single physical location, but are **able to operate from anywhere**.
- ✓ It will **incorporate all aspects of wireless communications**.



Mobile Computing - CURRENT TRENDS

✓ Today we see **different technologies** all around

✓ Need to be limited within one **physical location** has been **eradicated**

People are now able to **WORK FROM HOME** or the field but at the same time accessing resources as if someone is in the office.

The emergence of **portable computers** and laptops, personal digital Assistants (PDA), PC Tablets and Smartphones, has in turn **made mobile computing VERY CONVENIENT.**

New technology enables users to update documents, surf the internet, send and receive e-mail, stream live video files, take photographs and also support video and voice conferencing.

✓ With advancement in mobile computing, different manufacturers have come up with unique Mobile devices and are constantly competing to **offer better products** with each release.

The need for better, portable, affordable, and robust has also made manufacturers **to constantly be innovative** in terms of superior services such as **high speed internet and data access**, voice and video service etc. hence the adoption of different generations of networks like of **2G, 2.5G, 3G, 4G networks** services.

Mobile Computing - CURRENT TRENDS

...an example



Advantages of Mobile Computing:

Mobile computing has changed the complete landscape of human being life. Following are the clear advantages of Mobile Computing –

✓ **Location flexibility:**

- ☐ This has enabled user to **work from anywhere** as long as there is a connection established.
- ☐ A user can work **without being in a fixed position**.

✓ **Saves Time:**

- ☐ The time consumed or wasted by travelling from different locations or to the office and back, have been slashed.
- ☐ One can now **access all the important documents and files over a secure channel** or portal and work as if they were on their computer.
- ☐ It has **enhanced telecommuting** in many companies.
- ☐ This also **reduces unnecessary expenses** that might be incurred while travelling long distances.

✓ **Enhanced Productivity:**

- ☐ Productive nature has been boosted.
- ☐ A worker can simply **work efficiently and effectively from which ever location** they see comfortable and suitable.
- ☐ Users are able to **work with comfortable environments**.

✓ **Ease of research:**

- ❑ Research has been made easier.
- ❑ Field officer and researchers can collect and feed data from wherever they are without making unnecessary trip to and from the office to the field.

✓ **Entertainment:**

- ❑ Video and audio recordings can now be streamed on the go using mobile computing.
- ❑ It's easy to access a wide variety of movies, educational and informative material.
- ❑ With the improvement and availability of high speed data connections at considerable costs, one is able to get all the entertainment they want as they browser the internet for streamed data.
- ❑ One can be able to watch news, movies, and documentaries among other entertainment offers over the internet.

✓ **Streamlining of Business Processes:**

- ❑ Business processes are now easily available through secured connections.
- ❑ Some business functions can be run over secure links and also the sharing of information between business partners.
- ❑ Lengthy travelling has been reduced, since there is the use of voice and video conferencing.
- ❑ Meetings, seminars and other informative services can be conducted using the video and voice conferencing. This cuts down on travel time and expenditure.

Limitations of Mobile Computing

- ✓ **Insufficient Bandwidth:** Mobile Internet access is generally slower than direct cable connections, using technologies such as GPRS and more recently 3G networks. These networks are usually available within range of commercial cell phone towers. Higher speed wireless LANs are inexpensive but have very limited range.
- ✓ **Power consumption:** When a power outlet or portable generator is not available, mobile computers must rely entirely on battery power. Combined with the compact size of many mobile devices, this often means unusually expensive batteries must be used to obtain the necessary battery life. Mobile computing should also look into Greener IT, in such a way that it saves the power or increases the battery life.
- ✓ **Transmission interferences:** Weather, terrain, and the range from the nearest signal point can all interfere with signal reception. Reception in tunnels, some buildings, and rural areas is often poor.
- ✓ **Potential health hazards:** People who use mobile devices while driving are often distracted from driving and are thus assumed more likely to be involved in traffic accidents. Cell phones may interfere with sensitive medical devices. There are allegations that cell phone signals may cause health problems.
- ✓ **Human interface with device:** Screens and keyboards tend to be small, which may make them hard to use. Alternate input methods such as speech or handwriting recognition require training.

VARIOUS TYPES OF MOBILE COMPUTING DEVICES / MOBILE HARDWARE (Discussed earlier as well)

- Mobile hardware includes mobile devices or device components that receive or access the service of mobility.
- They would range from portable laptops, smartphones, tablet Pc's, Personal Digital Assistants.



- These devices will have a receptor medium that is capable of sensing and receiving signals.
- These devices are configured to operate in full-duplex, whereby they are capable of sending and receiving signals at the same time.
- They don't have to wait until one device has finished communicating for the other device to initiate communications.
- Above mentioned devices use an existing and established network to operate on.
- In most cases, it would be a wireless network.

MOBILE APPs

A mobile app is a [computer program](#) designed to run on [mobile devices](#) such as [smartphones](#) and [tablet computers](#).

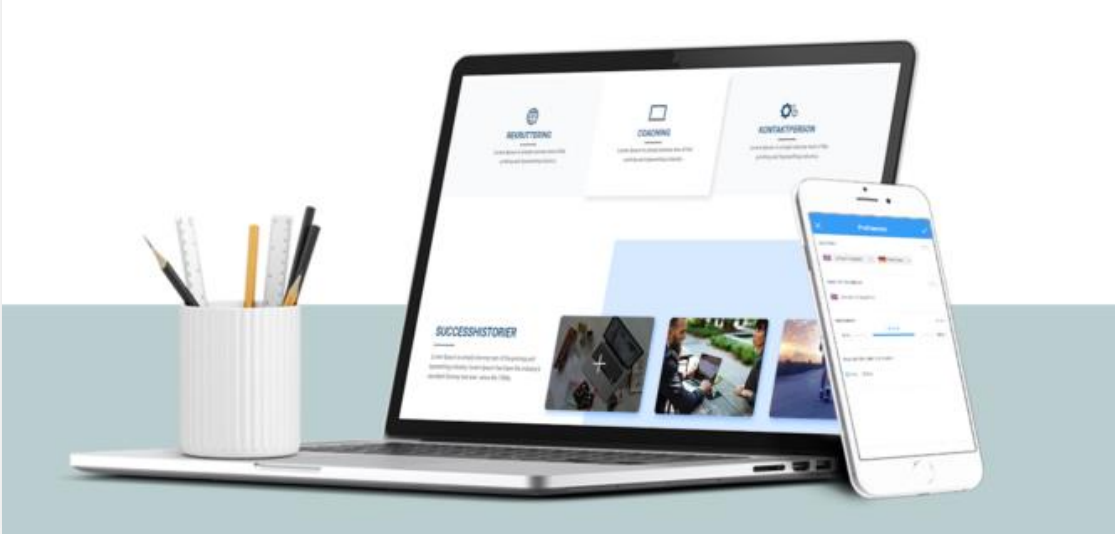
Application software (an application or app) is a set of [computer programs](#) designed to permit the user to perform a group of coordinated functions, tasks, or activities.

TYPES OF APPS

WEB BASED APPLICATIONS

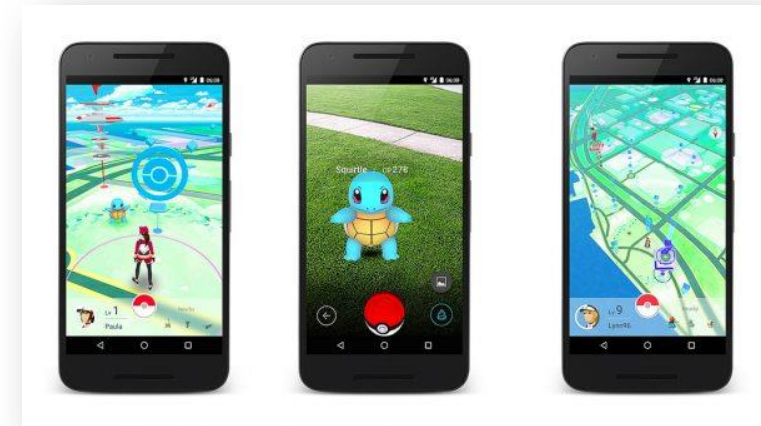
NATIVE APPLICATIONS

I) Mobile WEB APPS

- Mobile web apps refer to **Internet-enabled apps** that have **specific functionality** for mobile devices.
 - They're accessed through the **mobile device's web browser**.
- 
- The image shows a laptop and a smartphone on a light blue surface. The laptop screen displays a website with a header 'WEB APPS' in large blue letters. Below the header, there are three columns of content with icons and text. The smartphone screen displays a mobile version of the same website, showing a list of items with images. A white cup with pens and pencils is on the left side of the laptop.
- Web apps are **not real applications**.
 - These apps are really **websites** that, in many ways, **look and feel like native applications**, but are not implemented as such.
 - They are **run by a browser** and typically written in HTML5.
 - Users first access them as they would access any web page.
 - These apps **navigate to a special URL** and then have the option of **“installing” them on their home screen** by creating a bookmark to that page.
 - Web apps **became really popular when HTML5 came** around.

II) NATIVE APPS

- A native app is an **app for a certain mobile device** (smartphone, tablet, etc.)
- They're **installed directly onto the device**.
- Users **typically acquire** these apps **through an online store** or marketplace such as [The App Store](#) or [Android Apps on Google Play](#).
- Native apps **live on the device** and **are accessed through icons** on the device home screen.
- Native apps are **installed through an application store** (such as Google Play or Apple's App Store).
- They are **developed specifically for one platform**, and can take full advantage of all the device features.
- They **can use the camera, the GPS, the accelerometer, the compass, the list of contacts**, and so on.
- They can also incorporate [gestures](#) (either standard operating-system gestures or new, app-defined gestures).
- And native apps **can use the device's notification system** and **can work offline**.



NATIVE APPS

VS

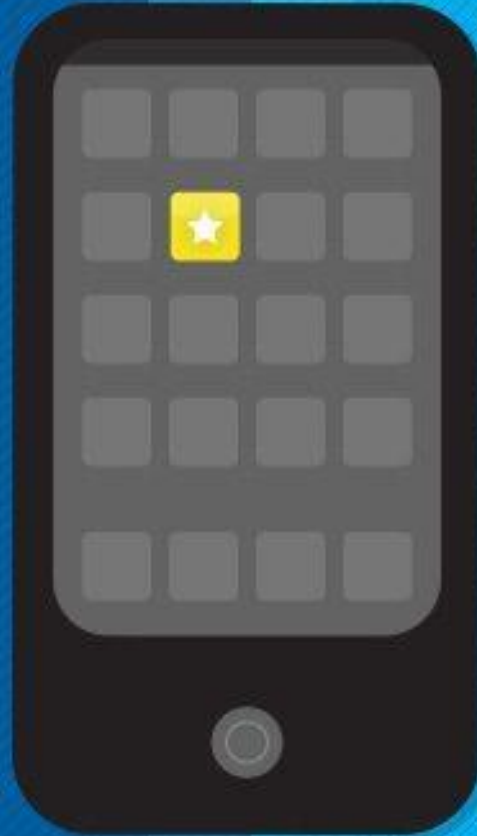
WEB APPS

PROS

- ✓ Allow function with no Internet connection
- ✓ Offer access to the underlying device platform for improved performance and additional functionality (push notifications, device camera, etc.)
- ✓ Distributed via app stores (Apple iTunes, Google Play, Windows Store, etc.)

CONS

- ✗ Developing only one native app excludes users on other platforms
- ✗ Can require considerably more time and money to develop for multiple platforms
- ✗ Require users to download and install updates



PROS

- ✓ Allow a single version to be developed and run on multiple platforms (Android, Apple iOS, Windows Mobile)
- ✓ May be updated instantly on the server side for rapid deployment

CONS

- ✗ Require Internet connection to function, and may perform erratically on low quality data connections
- ✗ HTML5 adoption is fragmented across platforms and web apps may not render consistently
- ✗ Do not support Digital Rights Management (DRM), background processing, or secure storage and push notifications

Comparison of MOBILE WEB APP vs. NATIVE APP

Let's do a quick rundown and evaluate MOBILE WEB APPS versus NATIVE APPS under these factors:

a. User interface

b. Development

c. Capabilities

d. Monetization

e. Method of delivery

f. Versioning of the app

g. Strengths

h. Weaknesses



a) USER INTERFACE

- Some companies choose to develop both a native app and a mobile web app like facebook.
- In terms of the general look-and-feel, there's little difference between the two.



Facebook example

b) DEVELOPMENT

NATIVE APPS	MOBILE WEB APPS
Each mobile application development platform (e.g. iOS, Android) requires its own development process	Runs in the mobile device's web browser and each may have its own features.
Each mobile application development platform has its own native programming language : <ul style="list-style-type: none">• Java (Android)• Objective-C (iOS)• and Visual C++ (Windows Mobile), etc.	Mobile web apps are written in : <ul style="list-style-type: none">• HTML5• CSS3• JavaScript• Server-side languages• Web application frameworks of the developer's choice (e.g. PHP, Rails, Python)
Standardized software development kits (SDKs), development tools and common user interface elements (buttons, text input fields, etc.) are often provided by the manufacturer of the platform.	There are no standard software development kits (SDKs) that developers are required to use to make a mobile web app

There are tools and frameworks to help in developing apps for deployment on multiple mobile OS platforms and web browsers (e.g. **PhoneGap**, **Sencha Touch 2**, **Appcelerator Titanium**, etc.)

c) CAPABILITIES

NATIVE APPS	MOBILE WEB APPS
Can interface with the device's native features, information and hardware (camera, accelerometer, etc.)	Mobile web apps can access a limited amount of the device's native features and information (orientation, geolocation, media, etc.)

d) MONETIZATION

NATIVE APPS	MOBILE WEB APPS
Mobile-specific ad platforms such as AdMob (though there can be restrictions set by the mobile device's manufacturer)	Mobile web apps can monetize through site advertisement and subscription fees
Developers have the ability to charge a download price and app stores will typically handle the payment process (in exchange for a percentage of sales)	Charging users to use the mobile web app requires you to set up your own paywall or subscription-based system

e) METHOD OF DELIVERY

NATIVE APPS	MOBILE WEB APPS
Downloaded onto a mobile device	Accessed through a mobile device's web browser
Installed and runs as a standalone application (no web browser needed)	No need to install new software
Users must manually download and install app updates	Updates are made to the web server without user intervention
There are stores and marketplaces to help users find your app	Since there is no app store for the Mobile Web, it can be harder for users to find your app

f) VERSIONING OF THE APP

NATIVE APPS	MOBILE WEB APPS
Some users may choose to ignore an update, resulting in different users running different versions of the app	All users are on the same version

g) STRENGTHS

NATIVE APPS	MOBILE WEB APPS
Typically perform faster than mobile web apps	Have a common code base across all platforms
App stores and marketplaces help users find native apps	Users don't have to go to a store or marketplace, download the app and install the app
App store approval processes can help assure users of the quality and safety of the app	Can be released in any form and any time as there isn't an app store that has to approve the app
Tools, support and standard development best practices provided by device manufacturers can help speed up development	If you already have a web app, you can retrofit it with a responsive web design

h) WEAKNESSES

NATIVE APPS	MOBILE WEB APPS
Are typically more expensive to develop, especially if you're supporting multiple mobile devices	Mobile web apps can't access all of the device's features (yet)
Supporting multiple platforms requires maintaining multiple code bases and can result in higher costs in development, maintenance, pushing out updates, etc.	Supporting multiple mobile web browsers can result in higher costs in development and maintenance, etc.
Users can be on different versions and can make your app harder to maintain and provide support for	Users can be on different mobile browsers and can make your app harder to maintain and provide support for
App store approval processes can delay the launch of the app or prevent the release of the app	For users, it may be harder to find a mobile web app because of the lack of a centralized app store (though listings do exist such as Apple's Web apps and you can request to be listed in them)

NATIVE APP VS. MOBILE WEB APP: How Do You Choose?

To help you decide how you should build your mobile app, ask yourself these questions:

- a) Does the mobile app require the use of any special device features (i.e., camera, the camera's flash, accelerometer, etc.)?
- b) What's my budget?
- c) Does the mobile app need to be Internet-enabled?
- d) Do I need to target all mobile devices or just certain devices?
- e) What programming languages do I already know?
- f) How important is speed and performance?
- g) How will this app be monetized effectively?

Answering these questions can help you make an informed decision.

HYBRID APPS:

- Hybrid apps are **PART NATIVE APPS, PART WEB APPS**.
- Like native apps, **they live in an app store** and can take advantage of the many device features available.
- Like web apps, **they rely on HTML** being rendered in a browser, with a warning that the browser is embedded within the app.

Why Hybrid Apps?

- Often, companies build hybrid apps as **wrappers for an existing web page**;
...in that way, the companies hope to **get a presence in the app store, without spending significant effort for developing a different app**.




Reason of Popularity of Hybrid Apps


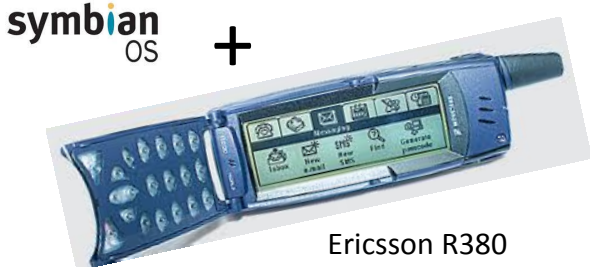


- Hybrid apps are popular because they **allow cross-platform development**.
- Developing Hybrid Apps significantly **reduce development costs**: that is, the **same HTML code components can be reused on different mobile operating systems**.
- **Tools** such as **PhoneGap** and **Sencha Touch** allow people **to design and code across platforms**, using the power of HTML.

HOME WORK



Give examples of mobile web apps, native apps and hybrid apps.

HISTORY OF MOBILE PLATFORMS




1973–1993	Mobile phones use embedded systems to control operation.	
1995	The first smartphone , the IBM Simon , has a touchscreen, email and PDA features.	
1996	Palm Pilot 1000 personal digital assistant (PDA) is introduced with the Palm OS mobile operating system.	
1996	First Windows CE Handheld PC devices are introduced	

<p>1999</p>	<p>Nokia S40 OS is officially introduced along with the Nokia 7110.</p>	 <p>Nokia 7110</p>
<p>2000</p>	<p>Symbian becomes the first modern mobile OS on a smartphone with the launch of the Ericsson R380.</p>	 <p>Ericsson R380</p>
<p>2001</p>	<p>The Kyocera 6035 is the first smartphone with Palm OS.</p>	 <p>Kyocera 6035</p>
<p>2002</p>	<p>Microsoft's first Windows CE (Pocket PC) smartphones are introduced.</p>	

<p>2002</p>	<p>BlackBerry releases its first smartphone.</p>	
<p>2005</p>	<p>Nokia introduces Maemo OS on the first internet tablet N770.</p>	
<p>2007</p>	<p>Apple iPhone with iOS is introduced as an iPhone, "mobile phone" and "internetCOMMUNICATOR".</p>	
<p>2007</p>	<p>Open Handset Alliance (OHA) formed by Google, HTC, Sony, Dell, Intel, Motorola, Samsung, LG, etc.</p>	

2008	OHA releases Android 1.0 (based on Linux Kernel) with the HTC Dream (T-Mobile G1) as the first Android phone.	 Astro Android 1.0 +  HTC Dream
2009	Palm introduces webOS with the Palm Pre.	
2009	Samsung announces the Bada OS with the introduction of the Samsung S8500 .	 +  Samsung S8500
2010	Windows Phone OS phones are released but are not compatible with the previous Windows Mobile OS.	 Windows phone 

<p>2011</p>	<p>MeeGo the first mobile Linux, combining Maemo and Moblin, is introduced with the Nokia N9, a COLLABORATION of Nokia, Intel and Linux Foundation</p>	
<p>2011</p>	<p>Samsung, Intel and the Linux Foundation announced, in September 2011, that their efforts will shift from Bada, MeeGo to Tizen OS during 2011 and 2012.</p>	
<p>2011</p>	<p>The Mer project was announced, in October 2011, centered around an ultra-portable Linux + HTML5/QML/JavaScript core for building products with, derived from the MeeGo codebase.</p>	
<p>2012</p>	<p>Mozilla announced in July 2012 that the project previously known as "Boot to Gecko" was now Firefox OS and had several handset OEMs on board.</p>	

<p>2013</p>	<p>Canonical announced Ubuntu Touch OS, a version of the Linux distribution expressly designed for smartphones.</p>	
<p>2013</p>	<p>BlackBerry releases their new operating system for smartphones, BlackBerry 10.</p>	
<p>2013</p>	<p>Google releases Android KitKat 4.4</p>	
<p>2014</p>	<p>Microsoft releases Windows Phone 8.1 in February 2014.</p>	

2014	Apple releases iOS 8 in September 2014.	
2014	BlackBerry release BlackBerry 10.3 with integration with the Amazon Appstore in September 2014	 
2014	Google releases Android 5.0 "Lollipop" in November 2014.	 Android 5.0, Lollipop

...and journey continues

iOS Vs Android

- For the most part, these days mobile devices run on iOS and Android.
- As of 2018, **Android controls about 88% of the mobile device market** worldwide, and Apple owns most of the rest.
- The number of **Android users has grown** from 1.8 billion devices in September 2015 to 2.7 billion by the end of 2017.

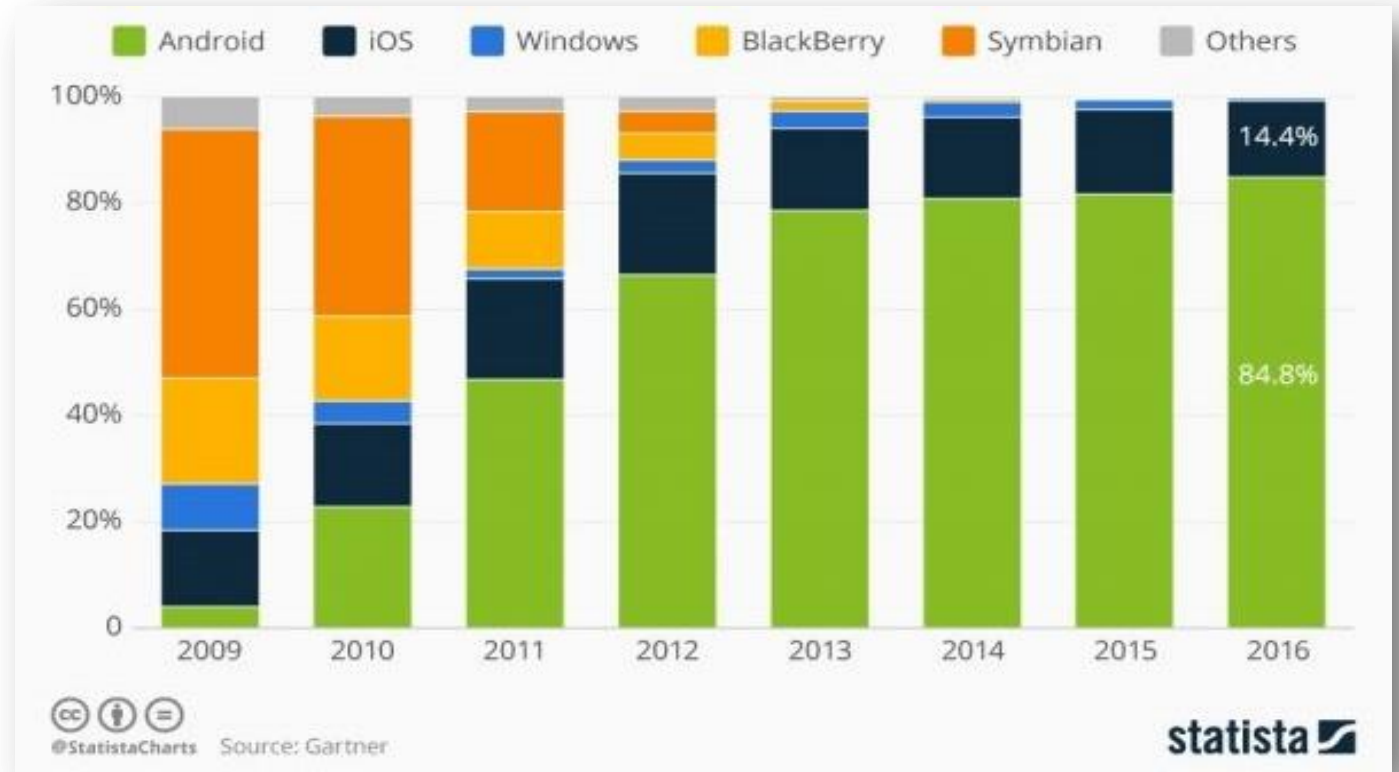


Illustration: Worldwide smartphone Market share of various Mobile Operating Systems (based on unit sales)

Source: <https://www.mobiloud.com/blog/native-web-or-hybrid-apps/>



VARIOUS VERSIONS OF ANDROID

Timeline



C

1.5
CupCake



D

1.6
Donut



E

2.0.1
Eclair



F

2.2
Froyo



G

2.3
Gingerbread



H

3.0
Honeycomb



I

4.0
Ice Cream
Sandwich



J

4.1
Jellybean



K

4.4
KitKat



L

5.0
Lollipop



M

Marshmallow
android 6.0



N

Nougat
android 7.0



Oreo
android 8.0



android 9.0