A

Seminar report

On

iPhone

Submitted in partial fulfillment of the requirement for the award of degree
of Bachelor of Technology in Computer Science

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Preface

I have made this report file on the topic **iPhone**,I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to ……..who assisting me throughout the prepration of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

Acknowledgement

I would like to thank respected Mr…….. and Mr. ……..for giving me such a wonderful opportunity to expand my knowledge for my own branch and giving me guidelines to present a seminar report. It helped me a lot to realize of what we study for.

Secondly, I would like to thank my parents who patiently helped me as i went through my work and helped to modify and eliminate some of the irrelevant or un-necessary stuffs.

Thirdly, I would like to thank my friends who helped me to make my work more organized and well-stacked till the end.

Next, I would thank Microsoft for developing such a wonderful tool like MS Word. It helped my work a lot to remain error-free.

Last but clearly not the least, I would thank The Almighty for giving me strength to complete my report on time.

Content

Introduction

The iPhone is a line of Internet and multimedia-enabled smartphones designed and marketed by Apple Inc. The first iPhone was introduced on January 9, 2007.

An iPhone functions as a camera phone, including text messaging and visual voicemail, a portable media player, and an Internet client, with e-mail, web browsing, and Wi-Fi connectivity. The user interface is built around the device's multi-touch screen, including a virtual keyboard rather than a physical one. Third-party applications are available from the App Store, which launched in mid-2008 and now has well over 200,000 "apps" approved by Apple. These apps have diverse functionalities, including games, reference, GPS navigation, social networking, and advertising for television shows, films, and celebrities.

There are four generations of iPhone models, and they were accompanied by four major releases of iOS (formerly iPhone OS). The original iPhone established design precedents like screen size and button placement that have persisted through all models. The iPhone 3G added 3G cellular network capabilities and A-GPS location. The iPhone 3GS added a compass, faster processor, and higher resolution camera, including video.

The iPhone 4 has two cameras for FaceTime video calling and a higher-resolution display. It was released on June 24, 2010. The Wall Street Journal stated on October 6, 2010 that a CDMA version of the iPhone 4 would be released 1st quarter 2011 allowing compatibility with the Verizon Wireless network.

History of iPhones

The history of iPhones began in 2005 when Apple CEO Steve Jobs' directed the engineers with Apple to investigate touchscreens. This is how the development of the iPhone began. He wanted to shift the focus of the buyer from the iPad, and towards a phone. During a cautious collaboration with AT&T Mobility, Apple made the device over thirty months. An approximate 150 million US dollars are said to have been spent on the project.

In 2007, Jobs introduced the the iPhone at the Macworld convention in San Francisco. Hundreds of customers lined up outside the stores in US when the iPhone went on sale. The media, seeing the passion in the buyers for the phone, even christened it the 'Jesus phone'. Soon the iPhone was available in other parts of the world like France, UK and Germany. Read on to know more about the history of iPhones, which is not very old.

In 2008, iPhone 3G I was released by Apple in more than twenty countries. iPhone 3G was announced by Apple in 2009 and planned to release it in major European countries along with US and Canada. As many buyers complained of the high price, Apple held on to the 8 GB iPhone 3G at a lower price. Thus the 3GS became the less pricey model when.Apple introduced the iPhone 4. Ever since the iPhone's release in 2007, Apple has reduced the price many times.

As the history of iPhones reflects, more than six million original iPhone devices have been sold over five quarters. Record high sales are seen year after year. About 74 million iPhones were sold by the end of 2010. Although the iPhone barely has a market of 4% of all cellphones, still Apple manages to make a neat 50% of the total profit that global cellphone sales are able to generate.

The original iPhone was made of aluminum with a black plastic back, while the iPhone 3G and 3GS support a complete plastic back to enhance the power of the GSM signals. The iPhone 4 features an aluminosilicate glass front and the back has a stainless steel edge serving as the antennas. We hope you enjoyed reading the brief history of iPhones.

iPhone Features

The front surface of the Apple iPhone has only one button -- the Home button. Pressing the Home button takes you to the main screen of the iPhone's graphical user interface. There, you can choose from the device's four primary functions using icons at the bottom of the phone:

- Phone: 3G, GSM or EDGE cellular phone service as well as a visual voice mail menu
- Mail: POP and IMAP e-mail access, including in-line pictures, HTML capabilities and push e-mail
- Web: Safari Web browser
- iPod: Music and videos

You can open the iPhone's other applications from the upper portion of the Home screen. These include a calendar, calculator, notepad, and widgets, or mini-applications made specifically for the iPhone. Older iPhones include a 2.0- or 3.2-megapixel camera and software you can use to organize your pictures -- the iPhone 4 ups the stakes with a 5-megapixel camera. You can also use an iPhone to check weather reports and stock quotes. Even though the iPhone doesn't support Flash, which the YouTube site relies on, you can watch YouTube videos using the corresponding application. The keys and buttons you need to navigate each application appear only when you need them.

The shape of the screen changes when you need it to as well -- you can shift the perspective from vertical to horizontal by tilting the phone. An accelerometer inside the iPhone lets the operating system know to change the orientation of the image on the screen. This means that you can scroll through long lists of music files on a long, narrow screen, and you can watch movies in a widescreen format. You can learn more about accelerometers in How the Wii Works.

The iPhone principle

Yesterday Apple introduced the new iPhone. It features a very precise touch screen and some other sensors. On the first look it may *only* seem like a fancy phone that manages to get rid of buttons and integrate features of an iPod. But I think it is much more than that.

I believe Apple has really defined a new type of device. Just think for a second that it is not called iPhone — let's say you don't have any idea what an iPod, PDA or Smartphone is. So you have a device, that does communicate wirelessly through certain protocols, stores 8 Gigabyte of data, comes with this multi-touch display, mircophone, earphones, camera, speaker, volume control and a singular button on the front. The iPhone is not only a universal device — is a principle.

Now – just imagine apple would have *just* delivered the hardware to the open source community maybe with that OS X basis and some development tools to create apps. The screen could show any interface for whatever application you can think of. It is called "phone" so people can connect it to certain activities and they see an instant reason why they may buy one.

But let's assume it is called "iHeld" or "iTouch". Can you see why people will loose the competition against Apple in the very moment they try to make a competing *phone*?

I am very eager to see what tools Apple is going to provide for developers to create new applications for the "iPhone principle".

Types Of iPhone

Apple was a company dwindling at the cliff of doom, looming towards a certain bankruptcy and joining the likes of many software companies, which fell in the new era of Microsoft dominated PC world. However, Apple bounced back with the Macs, the Powerbooks, the iPods and finally the product which brought them their ultimate success the iPhone. Though Apple had ventured into the consumer appliances scenario in the late 1980's, the official name of the company remained Apple Computer, Inc. up until 2007, when they launched the iPhone and changed their official name to Apple Inc. at the Macworld Expo on January 9. This itself shows the importance that Apple had given to iPhone, which has fared much better than its parent's expectation, catapulting Apple to the third position in global mobile manufacturers (based on sales) in 2008. iPhone spawned three more iterations in years to come, with its dominance in mobile world not the one to be easily challenged. The fact that no one can beat the iPhone in the smartphone genre is becoming more and more evident, as all the rival products, launched by competitor companies, have failed to produce the mass following that Apple iPhone enjoys in all age groups and in over 80 countries across the planet. Let us take a look at various models of iPhones that are sold in the market.

Different Models Of iPhone

iPhone

We start with the one who started it all, the original iPhone. Though launched in January of 2007, the first iPhones were officially released only on June 29, with two variants featuring 4GB and 8GB of storage. The phone featured the revolutionary (then unnamed) iPhone OS 1.0, which completely altered the way touch phones were handled. Weighing 135 g, the phone with the dimensions of 115 × 61 × 11.6 mm was made of aluminum, glass and plastic and featured a 2MP camera on the back with geotagging, but no video. The phone had a powerful 620 MHz Samsung 32-bit RISC ARM 1176JZ (F)-S v1.0 processor, which was underclocked to 412 MHz and supported by a 128 MB DRAM. It featured all the latest connectivity technologies, including Wi-Fi (802.11b/g), USB 2.0/Dock connector, Bluetooth 2.0 + EDR Cambridge Bluecore4. The phone communicated on Quad band GSM/GPRS/EDGE (850, 900, 1800, 1900 MHz). The audio codec used was the versatile Wolfson Microelectronics WM8758BG. But the most awe-inspiring part was its 3.5 inch, scratch-resistant glossy glass covered 262,144-color LCD screen, which featured a 3:2 aspect ratio and 480 × 320 px (HVGA) resolution at 163 ppi. The 4GB model was discontinued on September 5, 2007 before launching a 16 GB model on February 5, 2008. But

the journey was short lived as the whole iPhone original range was discontinued as of July 11, 2008 with the iPhone 3G taking over the reigns.

iPhone 3G
The second iteration literally took it to the big wigs riding high on its 3G-compliant technology and the iPhone OS2.0 (later upgradeable to iOS4.1). Though the phone was bigger than the original (now 115.5 × 62.1 × 12.3 mm), it weighed 2 grams lesser than the old phone, primarily due to use of only glass and plastic in construction. With extended battery life and storage options of 8 GB and 16 GB, the phone was an instant hit with the consumers; post its launch on July 11, 2008.

The new phone featured Assisted GPS and Tri-band communication over UMTS/HSDPA (850, 1900, 2100 MHz) and came pakcaged with a set of earphones with mic. All other technical aspects were the same including the PowerVR MBX Lite 3D GPU, which powered the brilliant display, except that the audio codec was changed to a peppier Wolfson Microelectronics WM6180C. The iPhone 3G was available in two colors black and white for 16 GB variant, while only black was available for 8 GB models. The 16 GB version was discontinued on June 8, 2009, but the 8 GB model remained in production (mostly for non-US and non European markets) till June 4, 2010.

iPhone 3GS
The iPhone 3GS debuted on June 19, 2009, just 8 days after the plug was pulled on the iPhone 3G 16 GB model with 16GB and 32 GB models. It had the same dimensions of the last model, but the weight was back to 135g. The shift in weight was due to the new technical additions. The processor was upgraded to the 833 MHz ARM Cortex-A8 Samsung S5PC100, which was underclocked to 600 MHz and supported by an increased 256 MB DRAM. The graphics processor was also changed to the new PowerVR SGX535 GPU. This provided better imagery to the screen, which had an extra fingerprint-resistant oleophobic coating. The phone also introduced the revamped iPhone OS 3.0. The major breakthrough was the new 3.0 MP back camera with VGA video at 30 fps, geotagging, tap to focus, and focus, white balance, macro focus & exposure capabilities. The phone also added 7.2 Mbit/s HSDPA, Voice Control, Digital compass, Nike+ and Bluetooth 2.1 + EDR Broadcom 4325 to its arsenal. The new earphone and mic set also featured a remote. A new Audio codec, Cirrus Logic CS42L61 was also included. The 16 GB and 32 GB models were discontinued on June 24, 2010, while a smaller 8GB black model was launched as a lower end option to the debuting iPhone 4G.

iPhone 4G
In the middle of 2010, amidst great expectations iPhone 4G was launched on June 24, 2010 with two variants; 16GB and 32 GB. Ever since its launch, it has met with positive reviews all throughout. This smartphone is an absolute gem. The phone available in black and white colors, featuring the iOS4.0 now upgraded to iOS4.1. The new Aluminosilicate glass covered display is of the same dimensions as the old one, but with an IPS LCD screen supporting a 960 × 640 px display at 326 ppi, with a 3:2 aspect ratio and 800:1 contrast ratio.

Armed with Apple's own (but Samsung manufactured) ARM Cortex-A8 Apple A4 1 GHz processor and a memory of 512 MB DRAM, this phone really kicks some serious smartphone

bottom. The graphic processor used is the same as in 3GS. The phone jumped from the old triband to a Pentaband system with UMTS/HSDPA (800, 850, 900, 1900, 2100 MHz), and also added 5.76 Mbit/s HSUPA, 2.4 GHz 802.11n, 3-axis gyroscope, Dual-mic noise suppression and microSIM capabilities.

The most important breakthrough was the introduction of the Rear 5.0 MP camera, which has a backside illuminated CMOS image sensor and LED flash. It is also capable of recording 720p HD video at 30 fps. Also the Front VGA camera with geotagging and tap to focus was a welcome introduction. The front cam can record videos at 480p in SD video at 30 fps. Though the phone is sleeker than its predecessors (115.2 × 58.6 × 9.3 mm); the weight of the phone is slightly increased to 137 g, due to all the additions and construction using Aluminosilicate glass and stainless steel.

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iPhone 4S

The iPhone 4S was released October 2011 by Apple.

The phone is identical in design to the iPhone 4, but features a more powerful Dual-core A5 processor and the groundbreaking voice-recognition app Siri.

The iPhone 4S features an improved 8 mega-pixel camera and 1080p HD video recording.

The iPhone 4S is available in both black and white, in the following sizes:

- 16GB

- 32GB
- 64GB

iPhone 5

The new iPhone 5 was announced by Apple on the 12th September, 2012 – and was launched on September 21st.

The iPhone 5 moved to a new new docking system with less pins, much to the dismay of the iPhone accessories industry.

The iPhone 5 features a striking new and updated design different to the previous iPhone 4/4S.

The iPhone features a larger – longer – new 4 inch 16:9 aspect ratio screen. The screen uses Apple's retina display with 640 x 1,136 pixels at 326 ppi.

The new iPhone 5 uses the latest version of Apple's mobile operating system iOS 6.

Like the iPhone 4S the iPhone 5 has Siri the voice search system.

The iPhone 5 is powered by the Apple A6 processor which is 1.3 GHz and dual core. This is combined with 1GB of DDR2-RAM.

The introduction of the iPhone 5 has been generally positive, though users have complained about the removal of Google Maps and the new replacement mapping system from Apple.

The iPhone 5 is available is two colours: *black & slate* and *white & silver*.

The iPhone 5 is available in three sizes: 16GB, 32GB and 64GB.

In the UK the phone can be bought SIM-free, with Pay as You Go, or on a monthly contract.

Hardware

Screen and input

The touchscreen on the first five generations is a 9 cm (3.5 in) liquid crystal display with scratch-resistant glass, while the one on the iPhone 5 is 4 inches.The capacitive touchscreen is designed for a bare finger, or multiple fingers for multi-touch sensing. The screens on the first three generations have a resolution of 320×480 (HVGA) at 163 ppi; those on the iPhone 4 and iPhone 4S have a resolution of 640×960 at 326 ppi, and the iPhone 5, 640×1136 at 326 ppi. All iPhones were and still are equipped with LCDs. The initial models were using twisted-nematic (TN) LCDs. Starting with iPhone 4, the technology was changed to in-plane switching (IPS) LCDs. The iPhone 5 model's screen results in an aspect ratio of approximately 16:9.

The touch and gesture features of the iPhone are based on technology originally developed by FingerWorks. Most gloves and styli prevent the necessary electrical conductivity; although capacitive styli can be used with iPhone's finger-touch screen. The iPhone 3GS and later also feature a fingerprint-resistant oleophobic coating.

The top and side of an iPhone 5S, externally identical to the iPhone 5. From left to right, sides: wake/sleep button, silence switch, volume controls.

The iPhone has a minimal hardware user interface, featuring five buttons. The only physical menu button is situated directly below the display, and is called the "Home button" because it closes the active app and navigates to the home screen of the interface. The home button is denoted not by a house, as on many other similar devices, but a rounded square, reminiscent of the shape of icons on the home screen.

A multifunction sleep/wake button is located on the top of the device. It serves as the unit's power button, and also controls phone calls. When a call is received, pressing the sleep/wake button once silences the ringtone, and when pressed twice transfers the call to voicemail.

Situated on the left spine are the volume adjustment controls. The iPhone 4 has two separate circular buttons to increase and decrease the volume; all earlier models house two switches under a single plastic panel, known as a rocker switch, which could reasonably be counted as either one or two buttons.

Directly above the volume controls is a ring/silent switch that when engaged mutes telephone ringing, alert sounds from new & sent emails, text messages, and other push notifications, camera shutter sounds, Voice Memo sound effects, phone lock/unlock sounds, keyboard clicks, and spoken autocorrections. This switch does not mute alarm sounds from the Clock application, and in some countries or regions it will not mute the camera shutter or Voice Memo sound effects. All buttons except Home were made of plastic on the original first generation iPhone and metal on all later models. The touchscreen furnishes the remainder of the user interface.

A software update in January 2008allowed the first-generation iPhone to use cell tower and Wi-Fi network locations trilateration, despite lacking GPS hardware. Since the iPhone 3G generation, the iPhone employs A-GPS operated by the United States. Since the iPhone 4S generation the device also supports the GLONASS global positioning system, which is operated by Russia.

Sensors

The display responds to three sensors (four since the iPhone 4). Moving the iPhone around triggers two other sensors (three since the iPhone 4), which are used to enable motion-controlled gaming applications and location-based services.

Proximity sensor

A proximity sensor deactivates the display and touchscreen when the device is brought near the face during a call. This is done to save battery power and to prevent inadvertent inputs from the user's face and ears.

Ambient light sensor

An ambient light sensor adjusts the display brightness which in turn saves battery power.

Accelerometer

A 3-axis accelerometer senses the orientation of the phone and changes the screen accordingly, allowing the user to easily switch between portrait and landscape mode. Photo browsing, web browsing, and music playing support both upright and left or right widescreen orientations. Unlike the iPad, the iPhone does not rotate the screen when turned upside-down, with the Home button above the screen, unless the running program has been specifically designed to do so. The 3.0 update added landscape support for still other applications, such as email, and introduced shaking the unit as a form of input. The accelerometer can also be used to control third-party apps, notably games.

Magnetometer

A magnetometer is built-in since the iPhone 3GS generation, which is used to measure the strength and/or direction of the magnetic field in the vicinity of the device. Sometimes certain devices or radio signals can interfere with the magnetometer requiring users to either move away from the interference or re-calibrate by moving the device in a figure 8 motion. Since the iPhone 3GS, the iPhone also features a Compass app which was unique at time of release, showing a compass that points in the direction of the magnetic field.

Gyroscopic sensor

Beginning with the iPhone 4 generation, Apple's smartphones also include a gyroscopic sensor, enhancing its perception of how it is moved.

Audio and output

From left to right is the headphone jack, microphone, Lightning connector, and built-in speaker on the base of the iPhone 5S.

On the bottom of the iPhone, there is a speaker to the left of the dock connector and a microphone to the right. There is an additional loudspeaker above the screen that serves as an earpiece during phone calls. The iPhone 4 includes an additional microphone at the top of the unit for noise cancellation, and switches the placement of the microphone and speaker on the base on the unit—the speaker is on the right. Volume controls are located on the left side of all iPhone models and as a slider in the iPod application.

The 3.5mm TRRS connector for the headphones is located on the top left corner of the device for the first five generations (original through 4S), after which time it was moved to the bottom left corner. The headphone socket on the 1st-generation iPhone is recessed into the casing, making it incompatible with most headsets without the use of an adapter. Subsequent generations eliminated the problem by using a flush-mounted headphone socket. Cars equipped with an auxiliary jack allow handsfree use of the iPhone while driving as a substitute for Bluetooth.

Apple's own headset has a multipurpose button near the microphone that can play or pause music, skip tracks, and answer or end phone calls without touching the iPhone. A small number of third-party headsets specifically designed for the iPhone also include the microphone and control button. The current headsets also provide volume controls, which are only compatible with more recent models. A fourth ring in the audio jack carries this extra information.

The built-in Bluetooth 2.x+EDR supports wireless earpieces and headphones, which requires the HSP profile. Stereo audio was added in the 3.0 update for hardware that supports A2DP. While non-sanctioned third-party solutions exist, the iPhone does not officially support the OBEX file transfer protocol. The lack of these profiles prevents iPhone users from exchanging multimedia files, such as pictures, music and videos, with other Bluetooth-enabled cell phones.

Composite or componentvideo at up to 576i and stereo audio can be output from the dock connector using an adapter sold by Apple. iPhone 4 also supports 1024×768 VGA outputwithout audio, and HDMI output, with stereo audio, via dock adapters. The iPhone did not support voice recording until the 3.0 software update.

Battery

Replacing the battery requires disassembling the iPhone unit and exposing the internal hardware

The iPhone features an internal rechargeable lithium-ion battery. Like an iPod, but unlike most other mobile phones at the time of its launch, the battery is not user-replaceable. The iPhone can be charged when connected to a computer for syncing across the included USB to dock connector cable, similar to charging an iPod. Alternatively, a USB to AC adapter (or "wall charger," also included) can be connected to the cable to charge directly from an AC outlet.

Apple runs tests on preproduction units to determine battery life. Apple's website says that the battery life "is designed to retain up to 80% of its original capacity after 400 full charge and discharge cycles", which is comparable to iPod batteries.

The battery life of early models of the iPhone has been criticized by several technology journalists as insufficient and less than Apple's claims. This is also reflected by a J. D. Power and

Associates customer satisfaction survey, which gave the "battery aspects" of the iPhone 3G its lowest rating of 2 out of 5 stars.

If the battery malfunctions or dies prematurely, the phone can be returned to Apple and replaced for free while still under warranty. The warranty lasts one year from purchase and can be extended to two years with AppleCare. The battery replacement service and its pricing was not made known to buyers until the day the product was launched; it is similar to how Apple (and third parties) replace batteries for iPods. The Foundation for Taxpayer and Consumer Rights, a consumer advocate group, has sent a complaint to Apple and AT&T over the fee that consumers have to pay to have the battery replaced.

Since July 2007, third-party battery replacement kits have been available at a much lower price than Apple's own battery replacement program. These kits often include a small screwdriver and an instruction leaflet, but as with many newer iPod models the battery in the first generation iPhone has been soldered in. Therefore a soldering iron is required to install the new battery. The iPhone 3G uses a different battery fitted with a connector that is easier to replace.

A patent filed by the corporation, published in late July 2013, revealed the development of a new iPhone battery system that uses location data in combination with data on the user's habits to moderate the handsets power settings accordingly.

Apple is working towards a power management system that will provide features such as the ability to estimate the length of time a user will be away from a power source to modify energy usage and a detection function that adjusts the charging rate to best suit the type of power source that is being used.

The iPhone 4 is the first generation to have two cameras. The LED flash for the rear-facing camera (top) and the forward-facing camera (bottom) are available on the iPhone 4 and subsequent models.

Camera

The 1st-generation iPhone and iPhone 3G have a fixed-focus 2.0-megapixel camera on the back for digital photos. It has no optical zoom, flash or autofocus, and does not natively support video recording. (iPhone 3G can record video via a third-party app available on the App Store, and jailbreaking also allows users to do so.) iPhone OS 2.0 introduced geotagging for photos.

The iPhone 3GS has a 3.2-megapixel camera with autofocus, auto white balance, and auto macro (up to 10 cm). Manufactured by OmniVision, the camera can also capture 640×480 (VGA resolution) video at 30 frames per second, although unlike higher-end CCD-based video cameras, it exhibits the rolling shutter effect. The video can be cropped on the iPhone and directly uploaded to YouTube, MobileMe, or other services.

The iPhone 4 introduced a 5.0-megapixel camera (2592×1936 pixels) that can record video at 720p resolution, considered high-definition. It also has a backside-illuminated sensor that can capture pictures in low light and an LED flash that can stay lit while recording video.

It is the first iPhone that can natively do high dynamic range photography. The iPhone 4 also has a second camera on the front that can take VGA photos and record SD video. Saved recordings may be synced to the host computer, attached to email, or (where supported) sent by MMS.

The iPhone 4S' camera can shoot 8-MP stills and 1080p video, can be accessed directly from the lock screen, and can be triggered using the volume-up button as a shutter trigger. The built-in gyroscope can stabilize the image while recording video.

The iPhone 5 and iPhone 4S, running iOS 6 or later, can take panoramas using the built-in camera app, and the iPhone 5 can also take still photos while recording video.

The camera on the iPhone 5 reportedly shows purple haze when the light source is just out of frame, although Consumer Reports said it "is no more prone to purple hazing on photos shot into a bright light source than its predecessor or than several Android phones with fine cameras..."

On all five model generations, the phone can be configured to bring up the camera app by quickly pressing the home key twice. On all iPhones running iOS 5, it can also be accessed from the lock screen directly.

Storage and SIM

An iPhone 5S with the SIM slot open. The SIM ejector tool is still placed in the eject hole.

The iPhone was initially released with two options for internal storage size: 4 GB or 8 GB. On September 5, 2007, Apple discontinued the 4 GB models. On February 5, 2008, Apple added a 16 GB model. The iPhone 3G was available in 16 GB and 8 GB. The iPhone 3GS came in 16 GB

and 32 GB variants and remained available in 8 GB until September 2012, more than three years after its launch.

The iPhone 4 was available in 16 GB and 32 GB variants, as well as an 8 GB variant to be sold alongside the iPhone 4S at a reduced price point. The iPhone 4S was available in three sizes: 16 GB, 32 GB and 64 GB. The iPhone 5 was available in the same three sizes previously available to the iPhone 4S: 16 GB, 32 GB, and 64 GB.

GSM models of the iPhone use a SIM card to identify themselves to the GSM network. The SIM sits in a tray, which is inserted into a slot at the top of the device. The SIM tray can be ejected with a paper clip or the "SIM ejector tool" (a simple piece of die-cut sheet metal) included with the iPhone 3G and 3GS in the United States and with all models elsewhere in the world.

Some iPhone models shipped with a SIM ejector tool which was fabricated from an alloy dubbed "Liquidmetal". In most countries, the iPhone is usually sold with a SIM lock, which prevents the iPhone from being used on a different mobile network.

The GSM iPhone 4 features a MicroSIM card that is located in a slot on the right side of the device.

The CDMA model of the iPhone 4, just the same as any other CDMA-only cell phone, does not use a SIM card or have a SIM card slot.

An iPhone 4S activated on a CDMA carrier, however, does have a SIM card slot but does not rely on a SIM card for activation on that CDMA network. A CDMA-activated iPhone 4S usually has a carrier-approved roaming SIM preloaded in its SIM slot at the time of purchase that is used for roaming on certain carrier-approved international GSM networks only. The SIM slot is locked to only use the roaming SIM card provided by the CDMA carrier.

In the case of Verizon, for example, one can request that the SIM slot be unlocked for international use by calling their support number and requesting an international unlock if their account has been in good standing for the past 60 days. This method only unlocks the iPhone 4S for use on international carriers. An iPhone 4S that has been unlocked in this way will reject any non international SIM cards (AT&T Mobility or T-Mobile USA, for example).

The iPhone 5 uses the nano-SIM, in order to save more space for internal components.

Liquid contact indicators

All iPhones (and many other devices by Apple) have a small disc at the bottom of the headphone jack that changes from white to red on contact with water; the iPhone 3G and later models also have a similar indicator at the bottom of the dock connector. Because Apple warranties do not cover water damage, employees examine the indicators before approving warranty repair or replacement.

The iPhone's indicators are more exposed than those in some mobile phones from other manufacturers, which carry them in a more protected location, such as beneath the battery behind a battery cover. The iPhone's can be triggered during routine use, by an owner's sweat, steam in a bathroom, and other light environmental moisture. Criticism led Apple to change its water damage policy for iPhones and similar products, allowing customers to request further internal inspection of the phone to verify if internal liquid damage sensors were triggered.

Included items

The contents of the box of an iPhone 4. From left to right: iPhone 4 in plastic holder, written documentation, and (top to bottom) headset, USB cable, wall charger.

All iPhone models include written documentation, and a dock connector to USB cable. The first generation and 3G iPhones also came with a cleaning cloth. The first generation iPhone included a stereo headset (earbuds and a microphone) and a plastic dock to hold the unit upright while charging and syncing.

The iPhone 3G includes a similar headset plus a SIM eject tool (the first generation model requires a paperclip). The iPhone 3GS includes the SIM eject tool and a revised headset, which adds volume buttons (not functional with previous iPhone versions).

The iPhone 3G and 3GS are compatible with the same dock, sold separately, but not the first generation model's dock. All versions include a USB power adapter, or "wall charger," which allows the iPhone to charge from an AC outlet. The iPhone 3G and iPhone 3GS sold in North America, Japan, Colombia, Ecuador, and Peru include an ultracompact USB power adapter.

Software

The iPhone Home screen of iOS 8 shows most of the applications provided by Apple. Users can download additional applications from the App store, create Web Clips, rearrange the icons, and create and delete folders.

The iPhone, iPod Touch and iPad run an operating system known as iOS (formerly iPhone OS). It is a variant of the same Darwin operating system core that is found in Mac OS X. Also included is the "Core Animation" software component from Mac OS X v10.5 Leopard. Together with the PowerVR hardware (and on the iPhone 3GS, OpenGL ES 2.0), it is responsible for the interface's motion graphics. The operating system takes up less than half a gigabyte.

It is capable of supporting bundled and future applications from Apple, as well as from third-party developers. Software applications cannot be copied directly from Mac OS X but must be written and compiled specifically for iOS.

Like the iPod, the iPhone is managed from a computer using iTunes. The earliest versions of the OS required version 7.3 or later, which is compatible with Mac OS X version 10.3.9 Panther or later, and 32-bit Windows XP or Vista. The release of iTunes 7.6 expanded this support to include 64-bit versions of XP and Vista, and a workaround has been discovered for previous 64-bit Windows operating systems.

Apple provides free updates to the OS for the iPhone through iTunes, and major updates have historically accompanied new models. Such updates often require a newer version of iTunes—for example, the 3.0 update requires iTunes 8.2—but the iTunes system requirements have stayed the same. Updates include bug fixes, security patches and new features. For example, iPhone 3G users initially experienced dropped calls until an update was issued.

Version 3.1 required iTunes 9.0, and iOS 4 required iTunes 9.2. iTunes 10.5, which is required to sync and activate iOS 5, requires Mac OS X 10.5.8 or Leopard on G4 or G5 computers on 800 MHz or higher; versions 10.3 and 10.4 and 10.5–10.5.7 are no longer supported.

From September 9, 2014 all new iPhone models released were expected to include a new mobile wallet feature developed in conjunction with major credit card issuers American Express, MasterCard, and Visa.

Interface

The interface is based around the home screen, a graphical list of available applications. iPhone applications normally run one at a time. Starting with the iPhone 4, a primitive version of multitasking came into play. Users could double click the home button to select recently opened applications. However, the apps never ran in the background. Starting with iOS 7, though, apps can truly multitask, and each open application runs in the background when not in use, although most functionality is still available when making a call or listening to music. The home screen can be accessed at any time by a hardware button below the screen, closing the open application in the process.

By default, the Home screen contains the following icons: Messages (SMS and MMS messaging), Calendar, Photos, Camera, YouTube, Stocks, Maps (Google Maps), Weather, Voice Memos, Notes, Clock, Calculator, Settings, iTunes (store), App Store, (on the iPhone 3GS and iPhone 4) Compass, FaceTime and GameCenter were added in iOS 4.0 and 4.1 respectively. In iOS 5, Reminders and Newsstand were added, as well as the iPod application split into separate Music and Videos applications. iOS 6 added Passbook as well as an updated version of Maps that relies on data provided by TomTom as well as other sources. iOS 6 also added a Clock application onto the iPad's homescreen. However, it also no longer supports YouTube. Docked at the base of the screen, four icons for Phone, Mail, Safari (Internet), and Music delineate the iPhone's main purposes.[On January 15, 2008, Apple released software update 1.1.3, allowing users to create "Web Clips", home screen icons that resemble apps that open a user-defined page in Safari. After the update, iPhone users can rearrange and place icons on up to nine other adjacent home screens, accessed by a horizontal swipe.

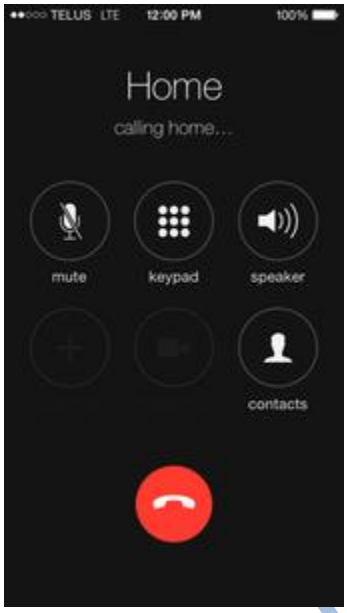
Users can also add and delete icons from the dock, which is the same on every home screen. Each home screen holds up to twenty icons for iPhone 2G, 3G, 4 and 4S, while each home screen for iPhone 5 holds up to twenty-four icons due to a larger screen display, and the dock holds up to four icons. Users can delete Web Clips and third-party applications at any time, and may select only certain applications for transfer from iTunes. Apple's default programs, however, may not be removed. The 3.0 update adds a system-wide search, known as Spotlight, to the left of the first home screen.

Almost all input is given through the touch screen, which understands complex gestures using multi-touch. The iPhone's interaction techniques enable the user to move the content up or down by a touch-drag motion of the finger. For example, zooming in and out of web pages and photos is done by placing two fingers on the screen and spreading them farther apart or bringing them closer together, a gesture known as "pinching".

Scrolling through a long list or menu is achieved by sliding a finger over the display from bottom to top, or vice versa to go back. In either case, the list moves as if it is pasted on the outer surface of a wheel, slowly decelerating as if affected by friction. In this way, the interface simulates the physics of a real object.

Other user-centered interactive effects include horizontally sliding sub-selection, the vertically sliding keyboard and bookmarks menu, and widgets that turn around to allow settings to be configured on the other side. Menu bars are found at the top and bottom of the screen when necessary. Their options vary by program, but always follow a consistent style motif. In menu hierarchies, a "back" button in the top-left corner of the screen displays the name of the parent folder.

Phone



When making a call, the iPhone presents a number of options; including FaceTime on supported models. The screen is automatically disabled when held close to the face.

The iPhone allows audio conferencing, call holding, call merging, caller ID, and integration with other cellular network features and iPhone functions. For example, if music is playing when a call is received, the music fades out, and fades back in when the call has ended.

The proximity sensor shuts off the screen and touch-sensitive circuitry when the iPhone is brought close to the face, both to save battery and prevent unintentional touches. The iPhone does not support video calling or videoconferencing on versions prior to the fourth generation, as there is only one camera on the opposite side of the screen.

The iPhone 4 supports video calling using either the front or back camera over Wi-Fi, a feature Apple calls FaceTime. Voice control, introduced in the iPhone 3GS, allows users to say a contact's name or number and the iPhone will dial it. The first two models only support voice dialing through third-party applications.

The iPhone includes a visual voicemail (in some countries) feature allowing users to view a list of current voicemail messages on-screen without having to call into their voicemail. Unlike most other systems, messages can be listened to and deleted in a non-chronological order by choosing any message from an on-screen list.

A music ringtone feature was introduced in the United States on September 5, 2007. Users can create custom ringtones from songs purchased from the iTunes Store for a small additional fee. The ringtones can be 3 to 30 seconds long from any part of a song, can fade in and out, pause from half a second to five seconds when looped, or loop continuously. All customizing can be done in iTunes, or alternatively with Apple's GarageBand software 4.1.1 or later (available only on Mac OS X) or third-party tools.

With the release of iOS 6, which was released on September 19, 2012, Apple added features that enable the user to have options to decline a phone call when a person is calling them. The user can reply with a message, or to set a reminder to call them back at a later time.

Multimedia

The layout of the music library is similar to that of an iPod or current Symbian S60 phones. The iPhone can sort its media library by songs, artists, albums, videos, playlists, genres, composers, podcasts, audiobooks, and compilations. Options are always presented alphabetically, except in playlists, which retain their order from iTunes. The iPhone uses a large font that allows users plenty of room to touch their selection.

Users can rotate their device horizontally to landscape mode to access Cover Flow. Like on iTunes, this feature shows the different album covers in a scroll-through photo library. Scrolling is achieved by swiping a finger across the screen. Alternatively, headset controls can be used to pause, play, skip, and repeat tracks. On the iPhone 3GS, the volume can be changed with the included Apple Earphones, and the Voice Control feature can be used to identify a track, play songs in a playlist or by a specific artist, or create a Genius playlist.

The iPhone supports gapless playback.[184] Like the fifth-generation iPods introduced in 2005, the iPhone can play digital video, allowing users to watch TV shows and movies in widescreen. Double-tapping switches between widescreen and fullscreen video playback.

The iPhone allows users to purchase and download songs from the iTunes Store directly to their iPhone. The feature originally required a Wi-Fi network, but now since 2012 can use the cellular data network if one is not available.

The iPhone includes software that allows the user to upload, view, and email photos taken with the camera. The user zooms in and out of photos by sliding two fingers further apart or closer together, much like Safari. The Camera application also lets users view the camera roll, the pictures that have been taken with the iPhone's camera. Those pictures are also available in the Photos application, along with any transferred from iPhoto or Aperture on a Mac, or Photoshop on a Windows PC.

Internet connectivity

Internet access is available when the iPhone is connected to a local area Wi-Fi or a wide area GSM or EDGE network, both second-generation (2G) wireless data standards. The iPhone 3G introduced support for third-generation UMTS and HSDPA 3.6, the iPhone 4S introduced support for HSUPA networks (14.4 Mbit/s), and support for HSDPA 7.2 was introduced in the iPhone 3GS .

AT&T introduced 3G in July 2004, but as late as 2007, Steve Jobs stated that it was still not widespread enough in the US, and the chipsets not energy efficient enough, to be included in the iPhone. Support for 802.1X, an authentication system commonly used by university and corporate Wi-Fi networks, was added in the 2.0 version update.

By default, the iPhone will ask to join newly discovered Wi-Fi networks and prompt for the password when required. Alternatively, it can join closed Wi-Fi networks manually. The iPhone will automatically choose the strongest network, connecting to Wi-Fi instead of EDGE when it is available. Similarly, the iPhone 3G and onwards prefer 3G to 2G, and Wi-Fi to either.

Wi-Fi, Bluetooth, and 3G (on the iPhone 3G onwards) can all be deactivated individually. Airplane mode disables all wireless connections at once, overriding other preferences. However, once in Airplane mode, one can explicitly enable Wi-Fi and/or Bluetooth modes to join and continue to operate over one or both of those networks while the cellular network transceivers remain off.

The iPhone 3GS has a maximum download rate of 7.2 Mbit/s. Furthermore, email attachments as well as apps and media from Apple's various stores must be smaller than 20 MB to be downloaded over a cellular network. Larger files, often email attachments or podcasts, must be downloaded over Wi-Fi (which has no file size limits). If Wi-Fi is unavailable, one workaround is to open the files directly in Safari.

Safari is the iPhone's native web browser, and it displays pages similar to its Mac and Windows counterparts. Web pages may be viewed in portrait or landscape mode and the device supports automatic zooming by pinching together or spreading apart fingertips on the screen, or by double-tapping text or images. Safari does not allow file downloads except for predefined extensions. The iPhone does not support Flash.

Consequently, the UK's Advertising Standards Authority adjudicated that an advertisement claiming the iPhone could access "all parts of the internet" should be withdrawn in its current form, on grounds of false advertising. In a rare public letter in April 2010, Apple CEO Steve Jobs outlined the reasoning behind the absence of Flash on the iPhone (and iPad). The iPhone supports SVG, CSS, HTML Canvas, and Bonjour.

Google Chrome was introduced to the iOS on June 26, 2012. In a review by Chitika on July 18, 2012, they announced that the Google Chrome web browser has 1.5% of the iOS web browser market since its release.

The maps application can access Google Maps in map, satellite, or hybrid form. It can also generate directions between two locations, while providing optional real-time traffic information. During the iPhone's announcement, Jobs demonstrated this feature by searching for nearby Starbucks locations and then placing a prank call to one with a single tap. Support for walking directions, public transit, and street view was added in the version 2.2 software update, but no voice-guided navigation.

The iPhone 3GS and iPhone 4 can orient the map with its digital compass. Apple also developed a separate application to view YouTube videos on the iPhone, which streams videos after encoding them using the H.264 codec. Simple weather and stock quotes applications also tap into the Internet.

iPhone users can and do access the Internet frequently, and in a variety of places. According to Google, in 2008, the iPhone generated 50 times more search requests than any other mobile handset. According to Deutsche Telekom CEO René Obermann, "The average Internet usage for an iPhone customer is more than 100 megabytes. This is 30 times the use for our average contract-based consumer customers." Nielsen found that 98% of iPhone users use data services, and 88% use the internet. In China, the iPhone 3G and iPhone 3GS were built and distributed without Wi-Fi.

With the introduction of the Verizon iPhone in January 2011, the issue of using internet while on the phone was brought to the public's attention. Under the two US carriers, internet and phone could be used simultaneously on AT&T networks, whereas Verizon networks only support the use of each separately.

However, in 2014 Verizon announced that the iPhone 6 and 6 Plus would allow simultaneous voice and data over its LTE Network. Additionally, Verizon, AT&T, and T-Mobile will be enabling voice calls over Wi-Fi.

Text input

The virtual keyboard on the first generation iPhone touchscreen

For text input, the iPhone implements a virtual keyboard on the touchscreen. It has automatic spell checking and correction, predictive word capabilities, and a dynamic dictionary that learns new words. The keyboard can predict what word the user is typing and complete it, and correct for the accidental pressing of keys near the presumed desired key.

The keys are somewhat larger and spaced farther apart when in landscape mode, which is supported by only a limited number of applications. Touching a section of text for a brief time brings up a magnifying glass, allowing users to place the cursor in the middle of existing text. The virtual keyboard can accommodate 21 languages, including character recognition for Chinese.

Alternate characters with accents (for example, letters from the alphabets of other languages) can be typed from the keyboard by pressing the letter for 2 seconds and selecting the alternate character from the popup. The 3.0 update brought support for cut, copy, or pasting text, as well as landscape keyboards in more applications. On iPhone 4S and above, Siri allows dictation.

Email and text messages

The iPhone also features an email program that supports HTML email, which enables the user to embed photos in an email message. PDF, Word, Excel, and PowerPoint attachments to mail messages can be viewed on the phone. Apple's MobileMe platform offers push email, which emulates the functionality of the popular BlackBerry email solution, for an annual subscription. Yahoo! offers a free push-email service for the iPhone. IMAP (although not Push-IMAP) and POP3 mail standards are also supported, including Microsoft Exchange and Kerio Connect.

In the first versions of the iPhone firmware, this was accomplished by opening up IMAP on the Exchange server. Apple has also licensed Microsoft ActiveSync and supports the platform (including push email) with the release of iPhone 2.0 firmware.[217][218] The iPhone will sync email account settings over from Apple's own Mail application, Microsoft Outlook, and Microsoft Entourage, or it can be manually configured on the device itself. The email program can access almost any IMAP or POP3 account.

Text messages are presented chronologically in a mailbox format similar to Mail, which places all text from recipients together with replies. Text messages are displayed in speech bubbles (similar to iChat) under each recipient's name. The iPhone has built-in support for email message forwarding, drafts, and direct internal camera-to-email picture sending. Support for multi-recipient SMS was added in the 1.1.3 software update. Support for MMS was added in the 3.0 update, but not for the original first generation iPhone and not in the US until September 25, 2009.

Third-party applications

At WWDC 2007 on June 11, 2007, Apple announced that the iPhone would support third-party web applications using Ajax that share the look and feel of the iPhone interface. On October 17, 2007, Steve Jobs, in an open letter posted to Apple's "Hot News" weblog, announced that a software development kit (SDK) would be made available to third-party developers in February

2008. The iPhone SDK was officially announced and released on March 6, 2008, at the Apple Town Hall facility.

It is a free download, with an Apple registration, that allows developers to develop native applications for the iPhone and iPod Touch, then test them in an "iPhone simulator". However, loading an application onto a real device is only possible after paying an Apple Developer Connection membership fee. Developers are free to set any price for their applications to be distributed through the App Store, of which they will receive a 70% share.

Developers can also opt to release the application for free and will not pay any costs to release or distribute the application beyond the membership fee. The App Store was launched with the release of iOS 2.0, on July 11, 2008.[The update was free for iPhone users; owners of older iPod Touches were required to pay US$10 for it.

Once a developer has submitted an application to the App Store, Apple holds firm control over its distribution. Apple can halt the distribution of applications it deems inappropriate, for example, I Am Rich, a US$1000 program that simply demonstrated the wealth of its user. Apple has been criticized for banning third-party applications that enable a functionality that Apple does not want the iPhone to have: In 2008, Apple rejected Podcaster, which allowed iPhone users to download podcasts directly to the iPhone claiming it duplicated the functionality of iTunes. Apple has since released a software update that grants this capability.

NetShare, another rejected app, would have enabled users to tether their iPhone to a laptop or desktop, using its cellular network to load data for the computer. Many carriers of the iPhone later globally allowed tethering before Apple officially supported it with the upgrade to the iOS 3.0, with AT&T Mobility being a relative latecomer in the United States. In most cases, the carrier charges extra for tethering an iPhone.

Before the SDK was released, third parties were permitted to design "Web Apps" that would run through Safari. Unsigned native applications are also available for "jailbroken" phones. The ability to install native applications onto the iPhone outside of the App Store is not supported by Apple, the stated reason being that such native applications could be broken by any software update, but Apple has stated it will not design software updates specifically to break native applications other than those that perform SIM unlocking.

As of October 2013, Apple has passed 60 billion app downloads.

Accessibility

The iPhone can enlarge text to make it more accessible for vision-impaired users, and can accommodate hearing-impaired users with closed captioning and external TTY devices. The iPhone 3GS also features white on black mode, VoiceOver (a screen reader), and zooming for impaired vision, and mono audio for limited hearing in one ear.[237] Apple regularly publishes Voluntary Product Accessibility Templates which explicitly state compliance with the US regulation "Section 508".

Vulnerability

In 2007, 2010, and 2011, developers released a series of tools called JailbreakMe that used security vulnerabilities in Mobile Safari rendering to jailbreak the device (which allows users to install any compatible software on the device instead of only App Store apps). These exploits were each soon fixed by iOS updates from Apple. Theoretically these flaws could have also been used for malicious purposes.

In July 2011, Apple released iOS 4.3.5 (4.2.10 for CDMA iPhone) to fix a security vulnerability with certificate validation.

The American and British intelligence agencies, the National Security Agency (NSA) and the Government Communications Headquarters (GCHQ) respectively, have access to the user data in iPhones. They can read almost all information on the phone, including SMS, location, emails, and notes. As of 2008 (shortly after the iPhone introduction), they also had a malware implant named *DROPOUTJEEP* in development, which can take complete control of iPhones, with the "ability to remotely push/pull files from the device, SMS retrieval, contact list retrieval, voicemail, geolocation, hot mic, camera capture, cell tower location, etc. ". While at the time of the document (2008), DROPOUTJEEP could only be installed using "close access methods", there were plans to enable remote installation.

Following the release of the iPhone 5s model, a group of German hackers called the Chaos Computer Club announced on September 21, 2013 that they had bypassed Apple's new Touch ID fingerprint sensor by using "easy everyday means." The group explained that the security system had been defeated by photographing a fingerprint from a glass surface and using that captured image as verification. The spokesman for the group stated: "We hope that this finally puts to rest the illusions people have about fingerprint biometrics. It is plain stupid to use something that you can't change and that you leave everywhere every day as a security token.

Limitations of an iPhone

Adobe Flash

Websites using Adobe Flash are not compatible with the iPhone, which has long since been the subject of hot debate. Apple CEO Steve Jobs stated in an open letter that the iPhone won't receive an upgrade to support Flash because he believed that, as of early 2010, Flash was a tool of the past and HTML 5 was the tool of the future. Ironically, Apple approved Skyfire in late 2010 -- the first app that lets users view Flash content on the iPhone by converting it to the HTML5 format.

Syncing Software

The iPhone is designed to sync with iTunes, Apple's digital music software management program. Few alternatives for syncing contact information, email accounts, music, photos and videos between your computer and your iPhone are available. MediaMonkey and SharePod are two alternatives with limited features available for Windows; as of February 2011, iTunes alternatives with syncing capability are not available for Mac OS X.

Battery Life

The iPhone comes with a built-in lithium battery that loses a significant amount of charging power over time if you don't practice proper charging maintenance, which includes charging your battery to 100 percent, running it until it dies and then charging it to 100 percent again. Heavy iPhone use, which includes using lots of applications and browsing the Internet frequently, causes battery life to decrease at a more rapid rate. As of 2010, Apple will replace your battery if it deems it necessary.

Multitasking and Older iPhone Models

The iPhone 4 comes with the iOS 4 operating system; the iPhone 3Gs is capable of being upgraded to iOS 4. iOS 4 includes multitasking, a feature that lets you have more than one app open at once. First- and second-generation iPhones, however, are not compatible with iOS 4 and therefore can't multitask. As a result, if you are playing a game on your first- or second-generation iPhone and want to check something online, you have to close the game to open another application.

Conclusion

To sum it all up, the Apple iPhone 4S is one of the best phones out in the market today, with a massive variety of apps and third-party developer support, a familiar industrial design that still works, and improved hardware to a year-old phone that was already great.

Now the big debate is if it is worth upgrading to if you are a current iPhone 4 owner. This is a tough question to answer because aside from Siri, there really isn't anything revolutionary about the iPhone 4S. And if you are an iPad 2 owner, you are already familiar with the capabilities of the A5 chip and the gaming experience is better on the tablet's larger screen.

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