ITEC 399
MOBILE APPLICATION DEVELOPMENT

CHAPTER 1 –INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT

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OBJECTIVES

- **Mobile devices and smartphones Mobile applications platforms**

- **Developing applications for small devices**

- **Best Practices for small device applications programming Exercises and reading**

WHAT IS A MOBILE DEVICE?

A mobile device is basically a portable handheld computer device designed to be able to connect to the internet and is easy and quick to use; it can be taken and used everywhere at any time, without any special considerations. Some mobile devices are more powerful than others, which allow users to do many things that can be done with a desktop or laptop computer. The main mobile devices currently available are:

- **Tablet computers,**
- **E-readers,**
- **Smartphones**

3

TABLET COMPUTERS

- A **tablet** is a mobile device that has a sensitive touchscreen that allows users to interact with the devices applications using a virtual keyboard and a finger as a mouse pointer.

- **Tablets** are optimized for tasks like social media, web browsing, watching videos, reading e-books, and playing games. Tablets may use a mobile operating system such as iOS and Android or a desktop operating system such as Windows.

- They are also usually built with solid-state drives, which allow the computer to boot up and open programs faster than the mainstream computers hard disk drives. Tablets are usually supported by Bluetooth and Wi-Fi 3G/4G internet connections as well.
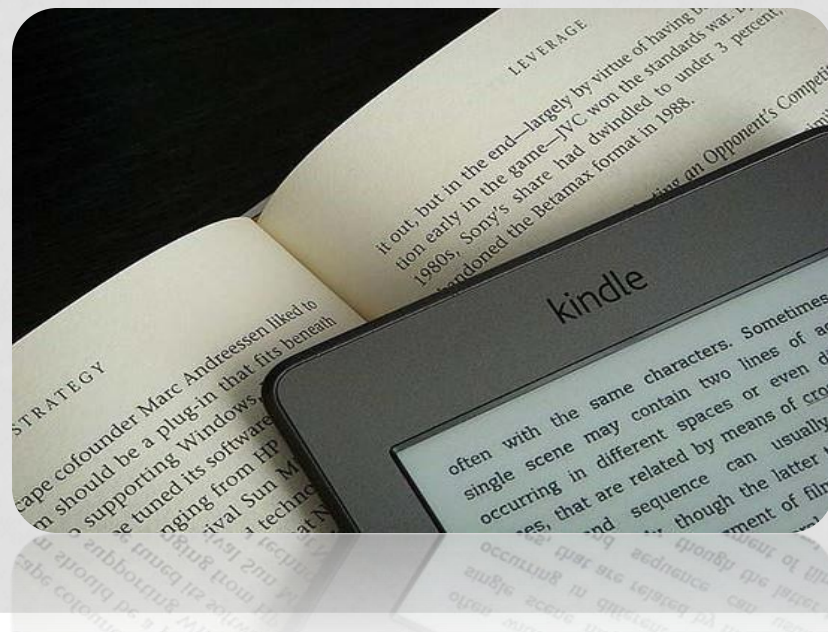
• E-READERS

E-book readers (also called e-readers) are similar to tablet computers except that they are mainly designed for reading e- books (digital, downloadable books), like the Kindle e-Book reader which has Internet connection support (both WiFi and 3G) and an affective web browser.

E-book readers have either an e-paper display or an LCD:

- **E-paper**
- **LCD**

• E-READERS

E-paper:

- This is short for electronic paper.
- This type of display can usually only be displayed in black and white.
- It is designed to look a lot like an actual page in a book.
- Unlike an LCD, it is not backlit, so the text is even readable outdoors, in full sun.
- Many people consider e-paper to be more pleasant to read because it does not cause eye strain. However, it generally can't be used for videos or other applications because the refresh rate is too low.

• E-READERS

LCD:

- This is the same type of screen found on tablet computers and laptops.
- It's more versatile than e-paper, but it's often more difficult to view in bright sunlight as the image becomes washed out.
- Since an LCD screen can display colors, this type of e-reader is better for viewing magazines or books with photos.
- Many LCD e-readers (such as the **Nook Color**) are basically tablet computers, as they can perform many different tasks in addition to displaying e-books.

• SMARTPHONES

Smartphones:

• Smartphones have the same functionalities as tablets, including touchscreens, multitasking operating systems, installed applications, and web browsers.

• Also smartphones have WiFi support (3G or 4G connections) and many other key features such as GPS (Global Positioning System), video camera, Bluetooth, touch support etc.

HISTORY OF SMARTPHONES

- Also, the first smart phone was announced for the general use by IBM in 1993 that was equipped with the features like calculator, world clock, calendar and contact book.

- The BlackBerry Smartphone released in 2002 was the next major achievement in the field of mobile application development and it was marked by BlackBerry Limited, formerly known as Research In Motion Limited (RIM) and integrated with the innovative concept of wireless email.

FEATURES OF SMARTPHONES

- They are very commonly used for **web browsing**, checking emails, interacting with social media, watching videos, reading e-books, playing games and trade.
  - The Apple iPhone, Android Samsung Galaxy series and the Windows Nokia Lumia are very prominent examples of smartphones.
- **Internet access** is an important feature of smartphones. Generally, you will need to purchase a 3G or 4G data plan in addition to a normal mobile contract service. Smartphones can also connect to Wi-Fi when it is available; this allows you to use the Internet without using up your monthly data plan.

PDA IN SMARTPHONES

PDA (Personal Digital Assistant):

- A PDA is also known as a **palmtop computer**.

- PDAs used for managing phone numbers, addresses, calendars, and other information.

- PDAs existed before smartphones,

- PDAs was usually a separate device.

- PDAs are largely considered obsolete with the widespread adoption of smartphones

- Today, smartphones combine the functionality of a PDA and a mobile phone.

Personal digital assistant

HISTORY OF MOBILE APPLICATION

HISTORY OF MOBILE APPLICATION

- The first public cellular phone call was made by **Martin Cooper**, and it introduced In **1973**, by **Motorola** to the public market and named it **DynaTAC**(Dynamic Adaptive Total Area Coverage).
  - The DynaTAC 8000X weighed in at around 2 pounds, cost $4,000 and didn't run any apps.

HISTORY OF MOBILE APPLICATION

- The first generation of mobile software applications were designed and developed by the **mobile handset manufacturers** as competition was fierce and trade secrets were closely protected so they were not exposed to rivals.

- early mobile devices had very **low-resolution screens** and **limited storage** and **processing power**, so they <u>**were not**</u> capable of handling the **data-intensive operations** required by traditional web browsers, where professional websites were designed with full color and were loaded with lots of text, images, and other types of media.

- Moreover, the **bandwidth requirements** for data transmission were relatively very **costly** to the customers

- However, customers began pushing for more features and games, other than games such as the famous **Tetris**, **Tic-Tac-Toe** and **Snake** which were mainly installed on Nokia devices, but the manufacturers did not have the motivation or resources to build the applications customers desired.

HISTORY OF MOBILE APPLICATION

- Therefore, the Wireless Application Protocol (WAP) standard was developed to run within the memory and bandwidth constraints of the mobile phone.

  - **WAP** was a stripped-down version of HTTP, which is a basic protocol, and the foundation of data communication for the World Wide Web (WWW).

  - Also, applications were developed using an XML based Wireless Markup Language (WML) which was invented by the WAP Forum for use with WAP

HISTORY OF MOBILE APPLICATION

Nevertheless, WAP **did not** meet the commercial expectations for several reasons, such as:

- WAP browsers were so slow, required typing in long URLs with the numeric keypad and did not adapt to the individual mobile specification, such as, screen size.

- They did not support the user experience, especially on small screens that were too small to allow surfing on the web.

- Also, reading a sentence fragment at a time and then waiting seconds for the next segment to download created critics amongst users who labelled WAP services as 'Wait and Pay'.

- It was almost impossible to develop graphic-intensive video game applications with WAP, although high quality games were available on gaming devices such as Nintendo.

MOBILE PLATFORMS

MOBILE PLATFORMS

PDAs and other embedded devices were beginning to run compact versions of common **operating systems** like **Linux** and **Windows**, which enabled the traditional desktop application developers to get involved in the development of mobile applications, especially for mobile phone technologies they found were familiar, like Windows Mobile.

Thus, variety of different proprietary mobile application platforms emerged and developers are actively creating applications for them.

MOBILE PLATFORMS

1. Psion EPOC

- The first recognizable apps came with Psion's range of handheld computers – mostly PDAs. It released in the **1980**.

- **EPOC**, programmed in OPL (Open Programming Language) and allowed users to create their own apps.

- **EPOC** allowed users programs such as a word processor, database, spreadsheet and diary.

- Later models in the range, running a 32-bit OS, would come with up to 2MB RAM and allow users to add additional apps via software packs (or via download if you were lucky enough to own a modem).

PALM OS

2. Palm OS

- Palm emerged as a major rival to Psion with its **cheaper**, **lower functionality** range of PDAs. It released in **1996**.

- This had a **touchscreen** GUI and came with a raft of basic apps as well as tons of third party apps programmed in C/C++.

- Palm OS became the ACCESS Linux Platform before being abandoned in favor of web-OS.

WML

3. WML

- **Wireless Markup Language** (WML) was based on XML and was developed by the WAP Forum for use in Wireless Application Protocol enabled devices.

- It was lightweight and good for the low bandwidths you got with mobile devices back in the late 90s because it stripped out much of the HTML that requires processing power.

J2ME/JME

4. J2ME/JME (Java 2 Platform, Micro Edition)

- It allowed programmers to use the Java programming language and related tools to develop programs for mobile wireless information devices such as cellular phones and personal digital assistants (PDAs) and other embedded devices like set top boxes

- As feature phones , the possibilities for phone apps expanded.
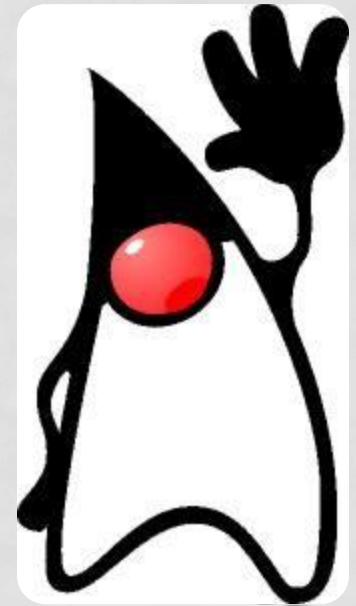
SYMBIAN

5. Symbian

- It was originally developed by Symbian Ltd – a joint venture of Psion, Ericsson, Motorola and Nokia – the operating system was almost ubiquitous.

- In 2009 250 million devices were running Symbian.

- The incompatibility of apps across platforms and the failure to fully move to open source are probably what sounded the death-knell for Symbian.

- There were also problems with malware, a browser which didn't support multiple windows or compress pages and a nightmare process for typing in non-Latin text.

The Current State of Mobile Application Development
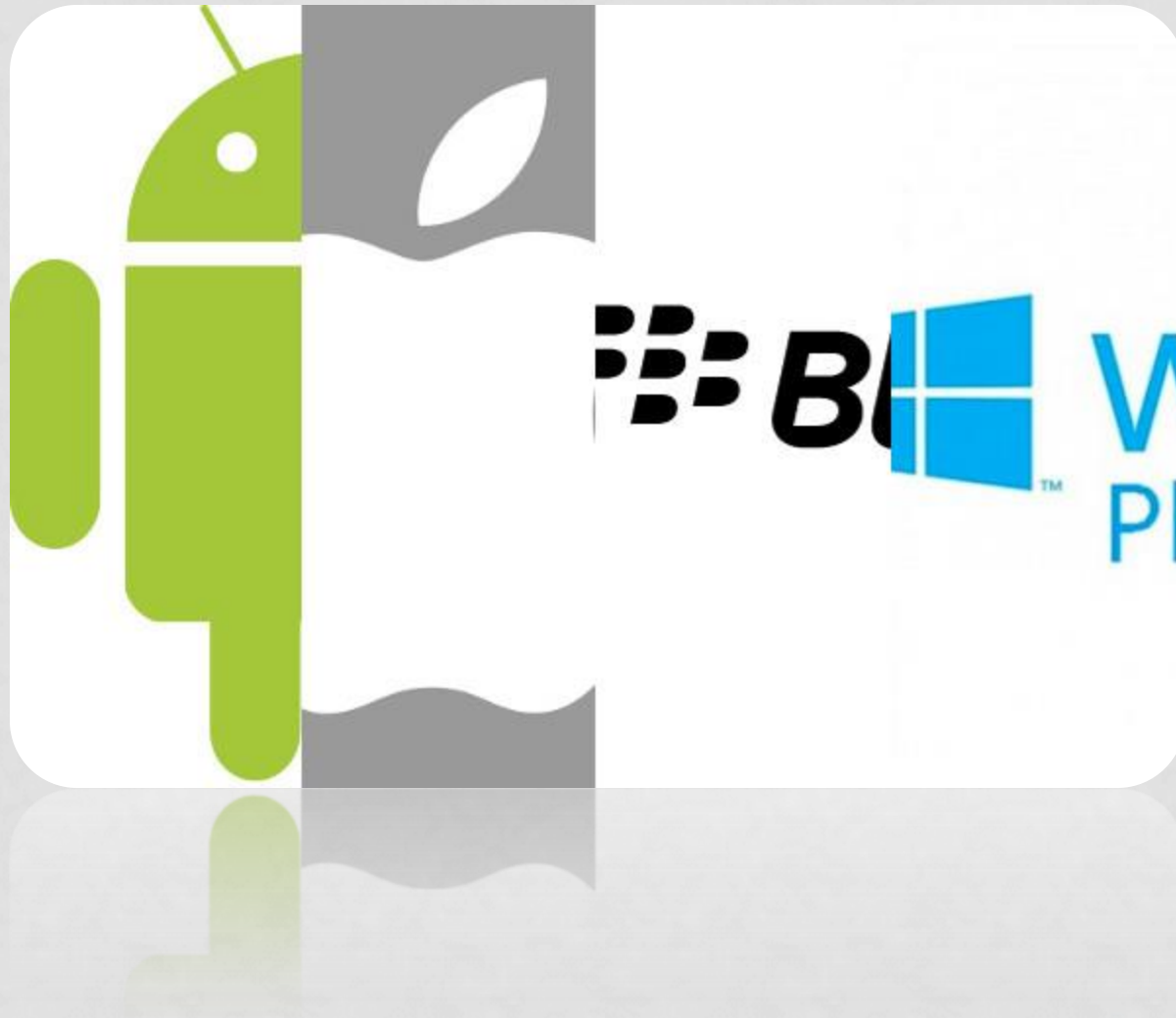
ANDROID

6. Android

- Google formed the Open Handset Alliance with 86 hardware, software and telecom companies which developed and announced Android as an open source mobile OS.

- It has been used as the OS for mobile devices such as tablets and smartphones.

- This OS is now being used by many handheld device manufacturers including Samsung, Motorola, HTC, LG and Sony.

ANDROID PROS

Pros

- Android has a dominant share of the mobile market – 81% of all devices shipped in 2013 were Android.
- While developers have previously generated much more revenue from iOS devices that gap narrowed significantly in 2013.
- You can develop on any platform.
- The environment is more open: call history is available to all apps; notifications between apps are possible as well as the sharing of content; apps can be installed from any source.
- Apps can be self-signed.
- You can publish to Google Play for a one-off fee of $25.

ANDROID CONS

Cons

- Fragmentation between different versions of the OS, which are often significantly different, are a major problem.
- Upgrades are passed through manufacturers and carriers who add their own customizations, delaying the process.
- App developers are forced to try to accommodate users whose OS versions are years apart.
- The Android process is often more manual than the iOS one.
- Graphics are often slower.

IOS

7. IOS (iPhone operation system)

- iPhone OS is based on Unix OS and renamed 'iOS', released in **2007**.

- Apple initially developed this OS for the iPhone and later extended it to iPad, iPod Touch and Apple TV.

- It consists of four layers namely the Core OS layer, the Core Services layer, the Media layer, and the Cocoa Touch layer, which will be explained further when we start developing applications for iOS using the xCode IDE.

- The iOS user interface is based on a multi-touch gesture concept.

IOS PROS

Pros

- Less fragmentation arising from upgrades – 80% of users are on the latest version.

- New features are usually available very quickly.

- The OpenGL API is standard for graphics across the platform.

- Navigation is non-prescriptive – you can decide how users will navigate within your app.

IOS CONS

Cons

- iOS is a more closed platform – there are limited possibilities for inter-app communication and private APIs are automatically rejected by the App Store.

- Development can only be done on a Mac.

- Duplicating core iPhone features is prohibited.

- You need to subscribe to the iOS developer program (annual fee) to publish apps and App Store guidelines can be difficult to understand.

- The process of signing apps is non-trivial.

- You need an Apple certificate to install to your own device.

8. Windows Phone 8

- Windows Mobile OS **renamed to Windows Phone,** released in **2010**.
- Windows Mobile is a family of mobile operating systems **developed** by **Microsoft** for handheld devices.
- This OS has a set of standard **features**, such as **multitasking** and the ability to **navigate a file system**.
- Much like its desktop counterpart, it is bundled with a set of applications to perform basic tasks.
- **Internet Explorer Mobile** is the default **web browser** and **Windows Media Player** is the default **media player** used for playing digital media.
- Also, Microsoft Office Mobile, the mobile version of Microsoft Office, is the default Office suite. It was one of the most popular OSs for smartphones, especially in 2007, however it dipped during the following years.

31

BLACKBERRY

9. BlackBerry OS

- The BlackBerry OS was developed by Canadian company limited BlackBerry for their proprietary handheld devices in **1999**.

- The OS provides **multitasking** and supports specialized BlackBerry input devices such as **trackpad** and **touchscreen**.

- BlackBerry OS was **discontinued after** the release of **BlackBerry 10 OS**, which uses a combination of **gestures** and **touches** for navigation and control, making it possible to enter commands without having to press any of the physical buttons, with the exception of the power button that switches the device on and off.

MOBILE APPLICATION DEVELOPMENT

OOP (Object oriented Programming)

- main mobile platforms are using object oriented programming languages to develop apps for small devices such as Java for Android, Objective C for iOS and C sharp for the Windows Phone.
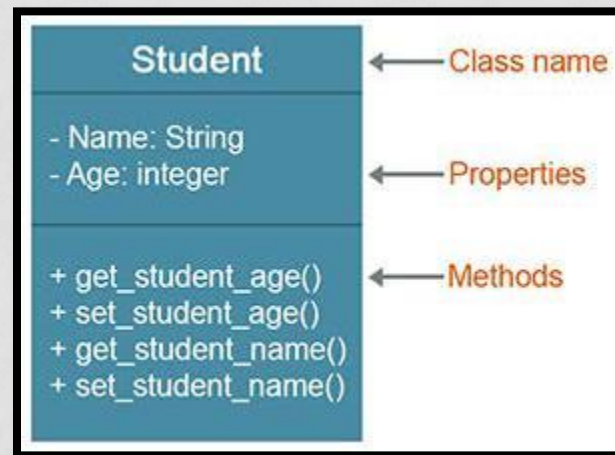
Class is the basic unit in OOP

MOBILE APPLICATION DEVELOPMENT

OOP (Object oriented Programming)

- The object-oriented languages focus on components that the user perceives with objects as the basic unit.

- Designers figure out all the objects by putting all the data and operations that describe the user's interaction with the data, which makes it easier to design, develop, test, debug, maintain, reuse and share software components and therefore leads to a more productive software applications development.

- The basic unit of OOP is a class that represents a blueprint/plan of an object.

- Each class has a name and encapsulates the object's data structures (in variables) and algorithms (in methods) within a 'box'.

MOBILE APPLICATION DEVELOPMENT

OOP (Object oriented Programming)

- Encapsulation of methods and data structure in a class is one of the four fundamental OOP concepts. The other three are:

  - **inheritance,**

  - **polymorphism,**

  - **abstraction.**

INHERITANCE

Inheritance

• It is a key concept of OOP.

• It allows something specific to be derived from something generic. For example, a '**teacher**' is a specific instance of the generic '**staff**' category.

• A '**father**' is a specific instance of the generic '**parent**' category.

• '**staff**' and '**parent**', both categories relate to each other by being specific instances of the even more generic '**person**' category.

• In other words, teachers and staff are **persons**.

• The figure schematizes the relationships between the 'teacher' **entity**, the 'staff' **category**, the '**father**' entity, the '**parent**' category, and the 'person' **super category**.
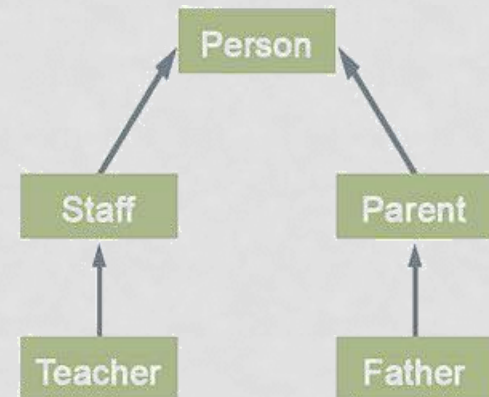
ABSTRACTION

Abstraction

- It refers to the ability to make a class abstract in OOP.
- An abstract class is one that **cannot** be represented.
- All other functionality of the class still exists, and its fields, methods, and constructors are all accessed in the same manner.
- You just **cannot** create an instance of the abstract class. In which case, the class does not have much use unless it is a subclass.
- This is typically how abstract classes come about during the design phase.
- A parent class contains the common functionality of a collection of child classes, but the parent class itself is too abstract to be used on its own.

POLYMORPHISM

Polymorphism

- It is another key concept in OOP and refers to the ability of an object to take on many forms.

- The most common use of polymorphism in OOP occurs when a parent class reference is used to refer to a child class object.

MODEL VIEW CONTROLLER

Model view controller

- Model–View–Controller is an architectural pattern commonly used for developing **user interfaces** that divides an application into three interconnected parts:

- **Model**
  - model, captures the application's behavior in terms of its problem domain

- **Controllers**
  - It can send commands to the model to update the model's state

- **views**
  - A model notifies its associated views and controllers when there has been a change in its state. This notification allows the views to produce updated output, and the controllers to change the available set of commands

39