Mobile Application IoT

Faculty of Ocean Engineering Technologies & Informatics
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MODULE OUTLINE

6.1

MODULE 6.1

Introduction to Mobile Apps Development

MODULE 6.2

Designing Mobile Apps Layout

6.2

6.3

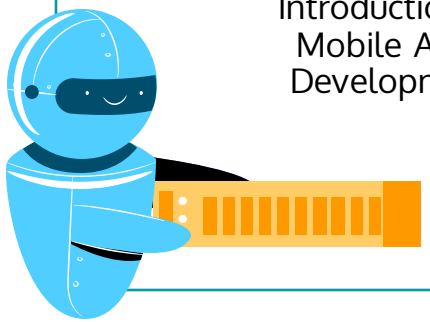
MODULE 6.3

IoT Data Storage for Mobile Apps

MODULE 6.4

Data Visualization for Mobile Apps

6.4



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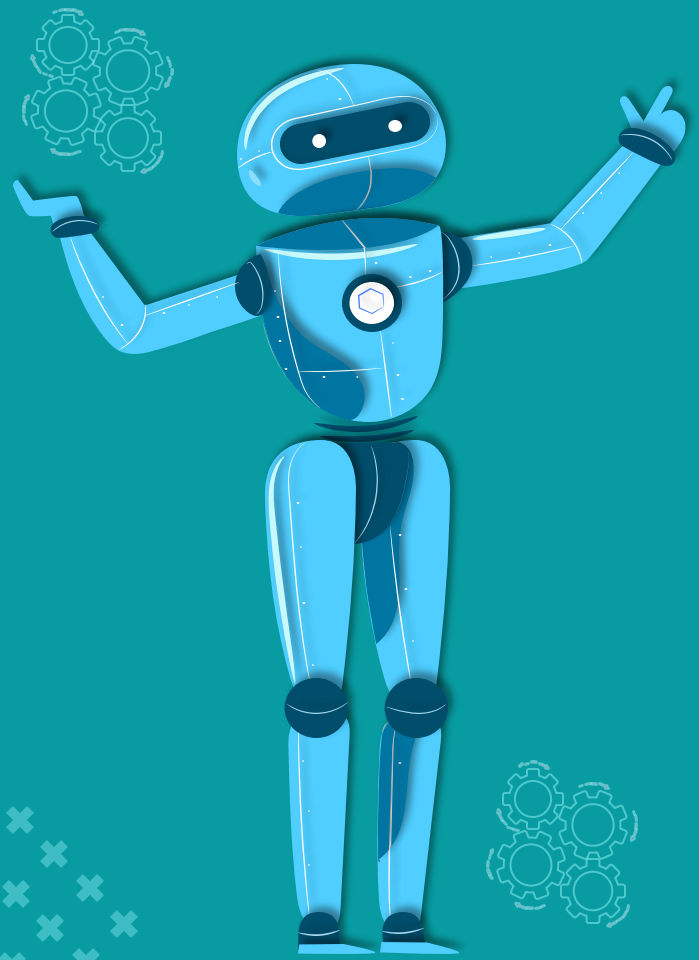


Introduction to Mobile Apps Development

- What is Mobile Devices?
- Evolution of Mobile Devices
- Architecture of Mobile Devices
- Types of Mobile Platforms
- Mobile Devices and IoT

6.1 Introduction to Mobile Apps Development

6.1.1 What is Mobile Devices

- The telephone is without a doubt the greatest invention for mankind.
- It changes the way we communicate and share information or ideas across great distances.
- It brings us closer without having to physically meet.
- In fact, the most defining technologies of the twentieth century and widely used electronic device is the telephone.

6.1 Introduction to Mobile Apps Development

6.1.1 What is Mobile Devices?

- Mobile devices are **handheld computing devices** that are **small** and **portable**. Typically, these devices have a **display screen** for user output and a **miniature keyboard** **and/or** a **touch screen** for user input.
- These devices can be equipped with Bluetooth, GSM, Wi-Fi, and GPS capabilities that allow user to **communicate**, **access and/or share data and information** at **any place and/or any time**.
- Also, it is worth noting that mobile devices are becoming more like our personal computers.

6.1 Introduction to Mobile Apps Development

6.1.1 What is Mobile Devices?

- It is difficult to shift our perception that our mobile devices are capable of replacing personal computers.
- The mobile industry of today are rapidly enhancing the functionality of our mobile devices and these devices are functioning more than just communicating from one end to another. There conflicting interest on each side of the mobile industry.
- First, the telecom infrastructure, required for everything to work but only focused on the network (i.e. 2g, 3g, 4g and 5g). Second, focused on how and when we interact with the network. Third, the context of how we are incorporating these devices into our daily activities (Siri, Cortana and Google Assistant).

6.1.2 Evolution of Mobile Devices

The Brick Era

- This era is around the year 1973 – 1988
- Figure shows the **Motorola DynaTAC** that were introduced in 1983.
- DynaTAC was an abbreviation of Dynamic Adaptive Total Area Coverage.
- Motorola discontinued the DynaTAC in the late 1994.
- The Brick Era requires enormous batteries to get power needed to reach the nearest cellular network site.
- The Brick Era phones were commonly used by stockbroker, salespeople or real estate agents.

6.1 Introduction to Mobile Apps Development

6.1.2 Evolution of Mobile Devices

The Candy Bar Era

- The second era which the Candy Bar Era started around the year 1988 – 1998
- The network shifted to second-generation (2G) technology, starting in Finland in 1991.
- The density of cellular sites caused by increased usage decreased the power demands of the device, making it small enough to fit in your pocket.
- The 2G GSM (Global System for Mobile communications) networks included the SMS (Short Message Service) capabilities.

6.1.2 Evolution of Mobile Devices

The Feature Phone Era

- The Feature Phone Era started around the year 1998 – 2008.
- Before, mobile phones are capable of three things; make voice calls, send text messages and play Snake game.
- The Motorola RAZR was probably the most iconic device from the Feature Phone Era.
- In this era, there are variety of applications and services were introduced on the phone such as listening to music and taking photos and introduced the use of the Internet on a phone.
- During this era, GSM network providers added GPRS (General Packet Radio Service), allowing packet-switched data services.
- This network evolution is most often referred to as 2.5G, or halfway between 2G and 3G networks.
- Also, camera were introduced into the higher-end feature phones.

6.1 Introduction to Mobile Apps Development

6.1.2 Evolution of Mobile Devices

The Smartphone Era

- The Smartphone Era occurred at the same time as the third and fifth eras and spans from around 2002 to the present.
- Smartphones are distinctive in that:
  - use a common operating system
  - a larger screen size
  - a QWERTY keyboard or stylus for input
  - Wi-Fi or another form of high-speed wireless connectivity.

6.1 Introduction to Mobile Apps Development

6.1.2 Evolution of Mobile Devices

The Touch Era

- On the morning of January 9, 2007, Steve Jobs went onstage at the MacWorld conference in San Francisco to usher in the fifth and final era and to change the mobile world. He introduced the world to the iPhone.
- The iPhone were equipped with 3G/3GS technology.
- The iPhone 3G had the ability to purchase and load applications onto the iPhone through the iTunes Apps Store.
- The introduction to iPhone 3G were revolutionary.
- The usage of internet skyrocketed and more company are making their presence available over the internet

6.1 Introduction to Mobile Apps Development

6.1.2 Evolution of Mobile Devices

The Superfast Wold Era

- In May 2019, the EE network launched the UK's first 5G service in 6 cities.
- The fifth generation network promises vastly superior data speeds and reliability, boosting ultra-high resolution for video streamlining and mobile gaming.
- Chipsets are getting faster to cope with the mobile gaming era and as well as mobile photography.
- Storage are also getting larger.

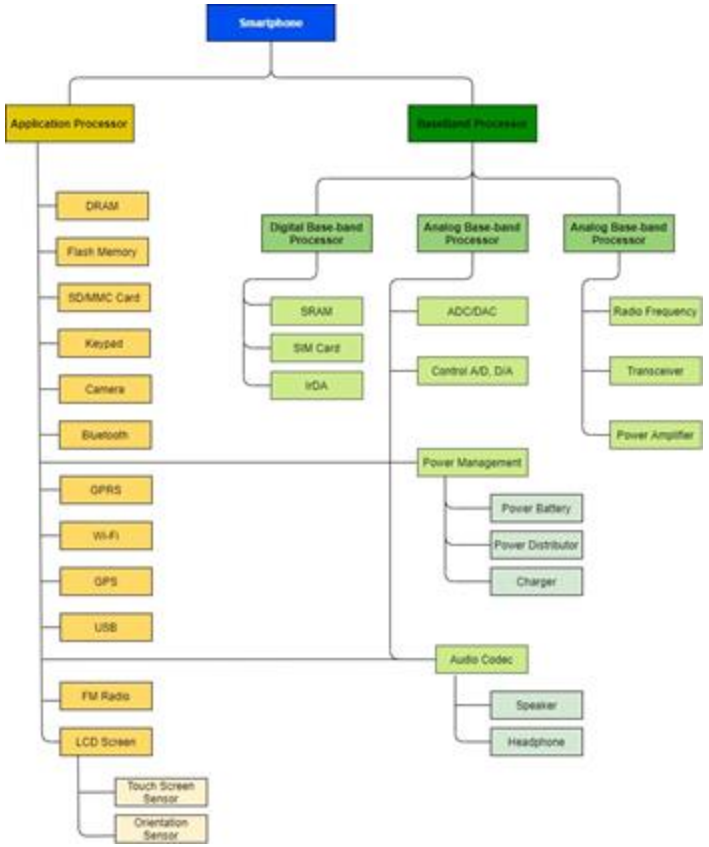
6.1.2 Evolution of Mobile Devices

- Back then, most of the computing power belongs to the computer but now thanks to powerful chipset, **our phones have the capability of computing** and rendering high resolution video and games.
- It changes how we perceived our mobile phones.
- We no longer need to reach for a computer to write a report, to start a conference meeting, to make a purchase at the grocery store (e-wallet) or even to date someone.
- Literally, everything is at the tip of our fingers.

6.1 Introduction to Mobile Apps Development

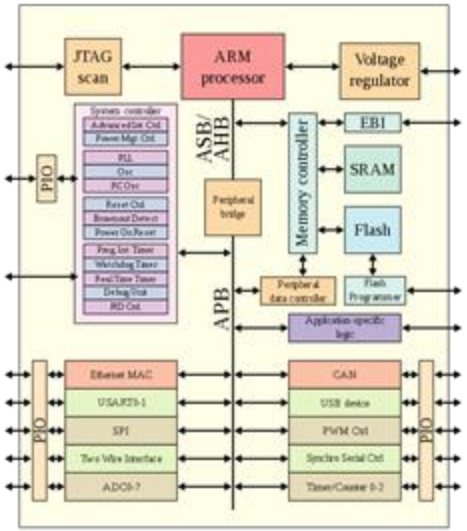
6.1.3 Architecture of Mobile Devices

Anatomy of a Smartphone



System on Chip

- A system on a chip, also known as an **SoC**, is essentially an integrated circuit or an IC that takes a single platform and integrates an entire electronic or computer system onto it.
- It is, exactly as its name suggests, an entire system on a single chip.
- The components that an SoC generally looks to incorporate within itself include a central processing unit, input and output ports, internal memory, as well as analog input and output blocks among other things.



System on Chip (SoC)

6.1.4 Types of Mobile Platforms – Operating System

Before Android OS and iOS, there are...

6.1.4 Types of Mobile Platforms – Operating System

Then, we have the ultimate battle of the mobile OS between...

VS

6.1.4 Types of Mobile Platforms – Android OS

What is Android?

- Mobile operating system based on Linux Kernel.
- User Interface for touch screens.
- Used on over 80% of all Smartphones.
- Powers devices such as watches, TVs and cars.
- Open source.

6.1 Introduction to Mobile Apps Development

6.1.4 Types of Mobile Platforms – Android OS Flavours

6.1 Introduction to Mobile Apps Development

6.1.5 Mobile Devices and IoT

Connectivity in a Smartphone

connectivity and **data protocols**

Integration of a Smartphone in IoT application

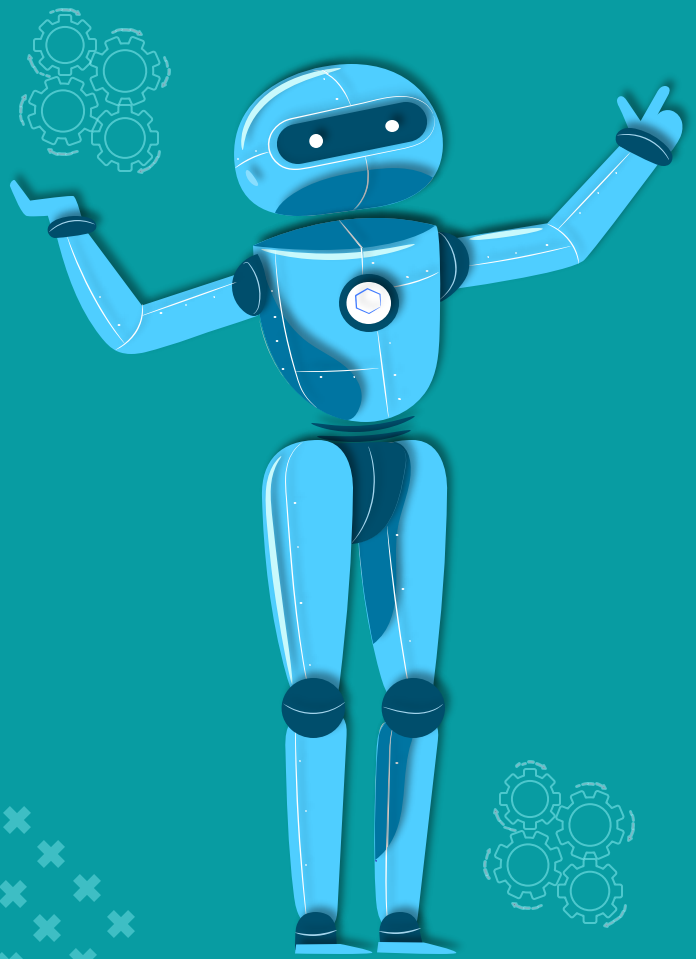
6.1.5 Mobile Devices and IoT

- Since mobile phone have the capability of accessing the internet, it possible for IoT devices to **share the data collected by the sensors to mobile applications**.
- Mobile devices are used to **monitor** as well as **control** the condition of the IoT devices.

QUICK RECAP!

1. When was the first mobile telephone were introduced?
2. What is the main difference between 2G and 3G?
3. Why do you think there are so many Android flavours/derivitives?

6.2



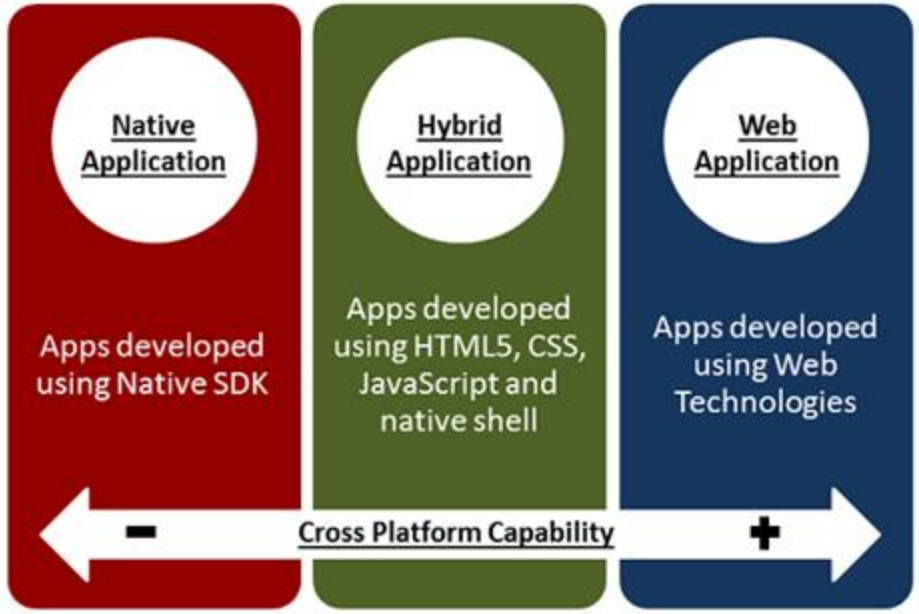
Designing Mobile Apps Layout

- How to start designing your mobile apps?
- UI and UX in Mobile Layout
- Importance of Designing Mobile Apps Layout

6.2 Designing Mobile Apps Layout

6.2.1 How to start designing your mobile apps?

- Before you can start on developing and designing and android apps, you have to decide on which platform that you want your user to use your applications.
- If you decided to develop a native application, you are recommended to develop the apps in a native environment.
- Whereas if you decided to develop a mobile web apps, then it is recommended to develop your app in a responsive environment since different phone are different in dimension.



6.1 Introduction to Mobile Apps Development

6.2.1 How to start designing your mobile apps?

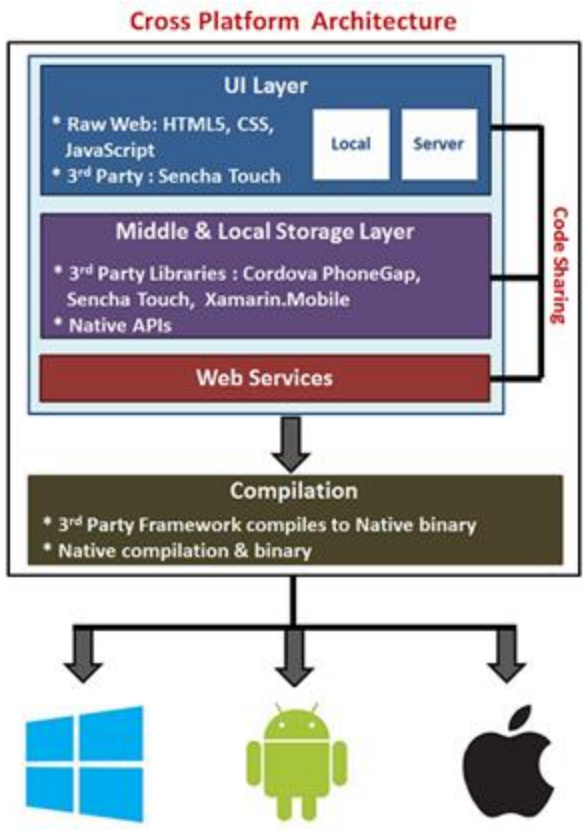
Native Apps vs Web Apps

- **A Native App** is an app developed essentially for one particular mobile device and is installed directly onto the device itself.
- Users of native apps usually download them via app stores online or the app marketplace, such as the Apple App Store, the Google Play store and so on

- **A Web App,** on the other hand, are basically Internet-enabled apps that are accessible via the mobile device's Web browser.
- They need not be downloaded onto the user's mobile device in order to be accessed. The Safari browser is a good example of a mobile Web app.

6.2 Designing Mobile Apps Layout

6.2.1 How to start designing your mobile apps?



- In cross platform architecture using Hybrid method (Hybrid Apps), the application is written using web technologies like ***HTML5, JavaScript and CSS*** but run inside the mobile platform native shell.

- Hybrid apps use a web control/web app template to present the web UI so that it can be coded in web technologies.

6.2 Designing Mobile Apps Layout

6.2.1 How to start designing your mobile apps?

If you decided to develop mobile apps in a **native environment**, you can use Android Studio to develop an Android app or Xcode to develop an iOS app respectively. Commonly, to develop an android app, you'll need a prior knowledge of programming language called **Java**. Whereas to develop an iOS app, you'll need to code it in **Objective-C** or **Swift**.

6.2 Designing Mobile Apps Layout

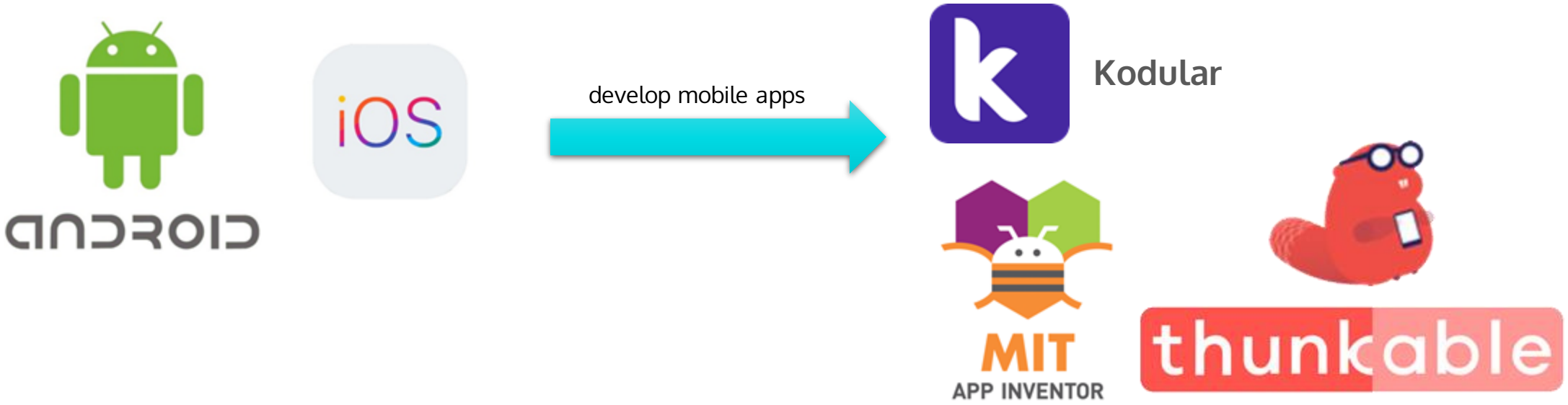
6.2.1 How to start designing your mobile apps?

Or alternatively, you can develop both app at the same time using a **cross platform** Android and iOS app development software such as Apache Cordova, Adobe PhoneGap, Qt and apppcelerator. The cross platform apps development software develop apps in **HTML**, **CSS** and **Javascript**.

6.2 Designing Mobile Apps Layout

6.2.1 How to start designing your mobile apps?

Or if you have no programming background, you can still develop an Android apps using MIT App Inventor, Kodular and Thunkable. It is **a drag and drop mobile app developer**.



6.2 Designing Mobile Apps Layout

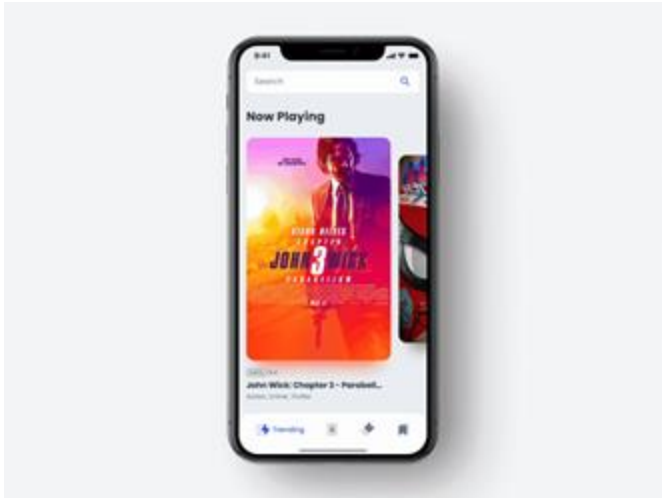
6.2.2 UI and UX in Mobile Layout

- **UI** is the abbreviation for **User Interface**, whereas UX stands for User Experience.
- UI is the layout which the **user sees** and where the **user interact**.
- **UX** is the whole **experience of using the application**. The **intuitive gesture and design** plays an important role in deciding whether your application will succeed or fail miserably.
- As mention previously, if you have decided on the developing your mobile apps in a native environment, all the gestures and icons are native to the phone.
- That is why when you compared the same app in an Android OS and iOS, you will be presented with a slight different in terms of interface and gestures/experience.

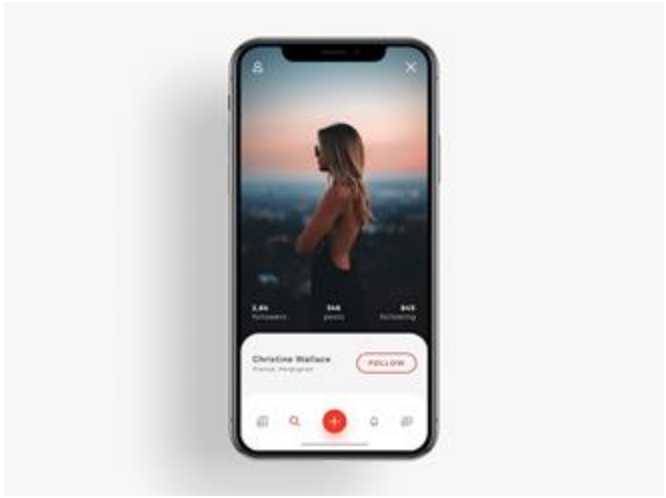
6.2 Designing Mobile Apps Layout

6.2.2 UI and UX in Mobile Layout

Example of native UI and UX in Apple iOS. The user interface are responsive to the user gesture. For example, swipe left and right for choosing and swipe up and tap for further information.



https://www.behance.net/gallery/82963291/Mobile-UI-UX-and-Animation-Design



https://www.behance.net/gallery/82963291/Mobile-UI-UX-and-Animation-Design

6.2 Designing Mobile Apps Layout

6.2.3 Importance of Designing Mobile Apps Layout

As a Malaysian, we love to dip our fries with sauce or with any fried food actually.
It is a match made in heaven...

6.2 Designing Mobile Apps Layout

6.2.3 Importance of Designing Mobile Apps Layout

http://www.patrickhansen.com/2017/09/01/ui-vs-ux-design-meme-problem/

But... most of the time we spend pouring the sauce angrily...

This situation only happens if we are pouring the sauce from a glass bottle.

Like this one...

6.2 Designing Mobile Apps Layout

6.2.3 Importance of Designing Mobile Apps Layout

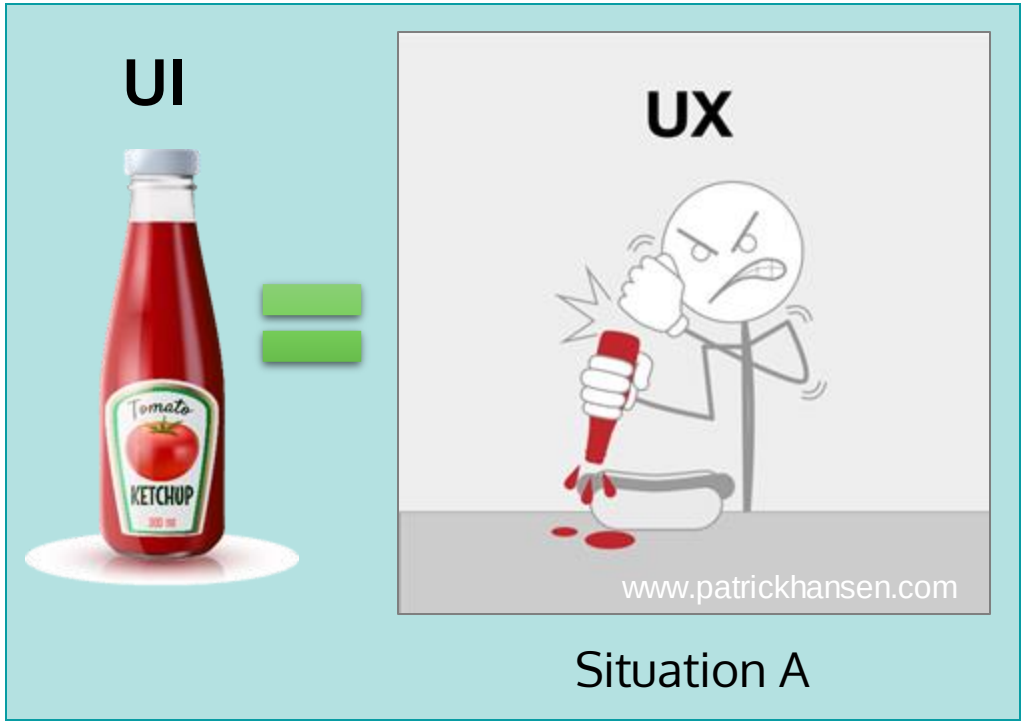
http://www.patrickhansen.com/2017/09/01/ui-vs-ux-design-meme-problem/

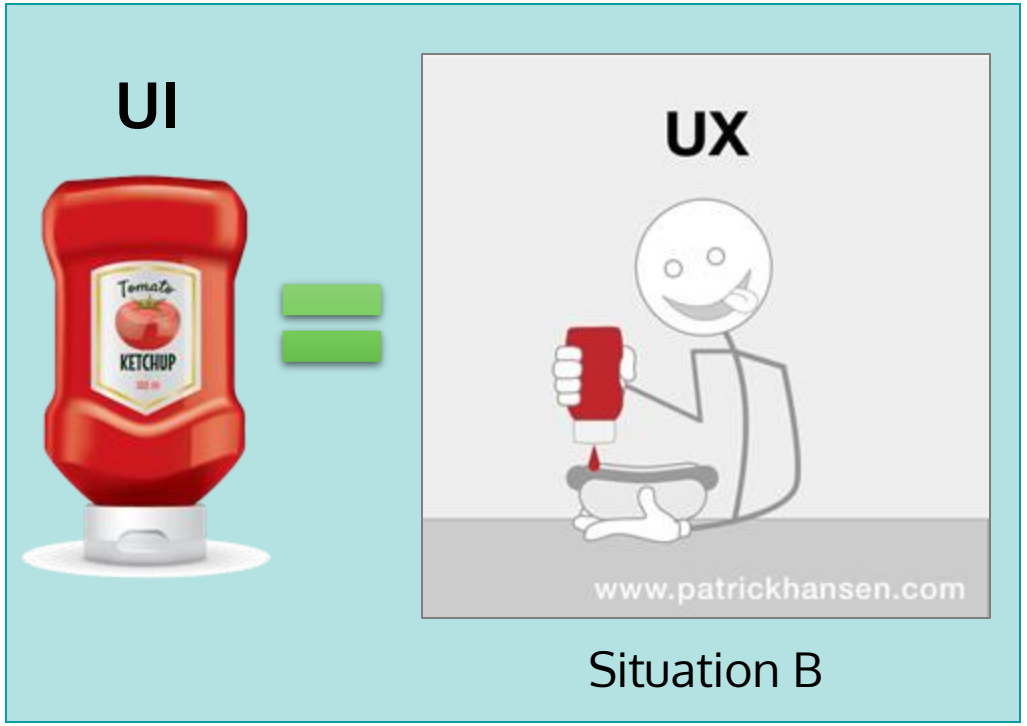
But to those who are pouring sauces from a plastic bottle will most likely enjoying their food happily with a splash or dash of sauce.

So, what can you conclude from these two situation?

6.2 Designing Mobile Apps Layout

6.2.3 Importance of Designing Mobile Apps Layout





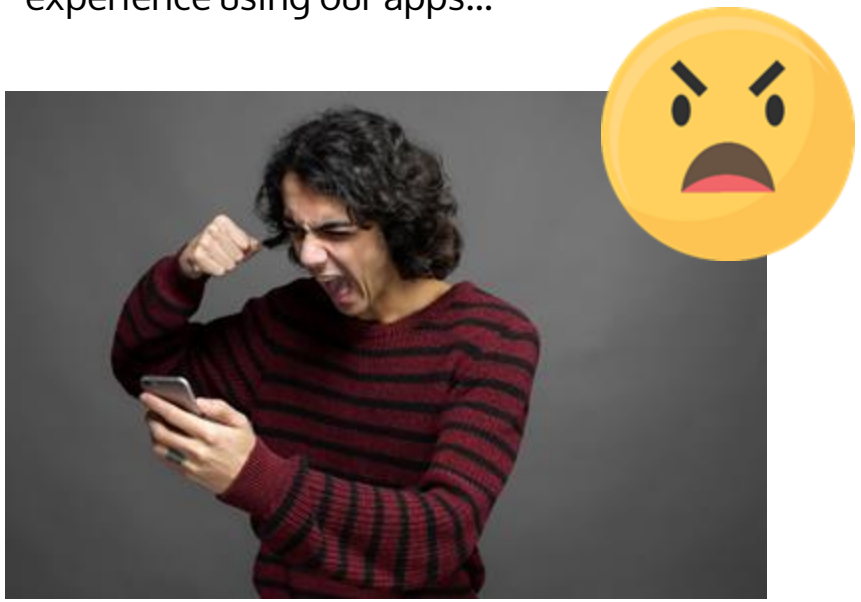
http://www.patrickhansen.com/2017/09/01/ui-vs-ux-design-meme-problem/

6.2 Designing Mobile Apps Layout

6.2.3 Importance of Designing Mobile Apps Layout

We want our user to have a **pleasant** experience using our apps...

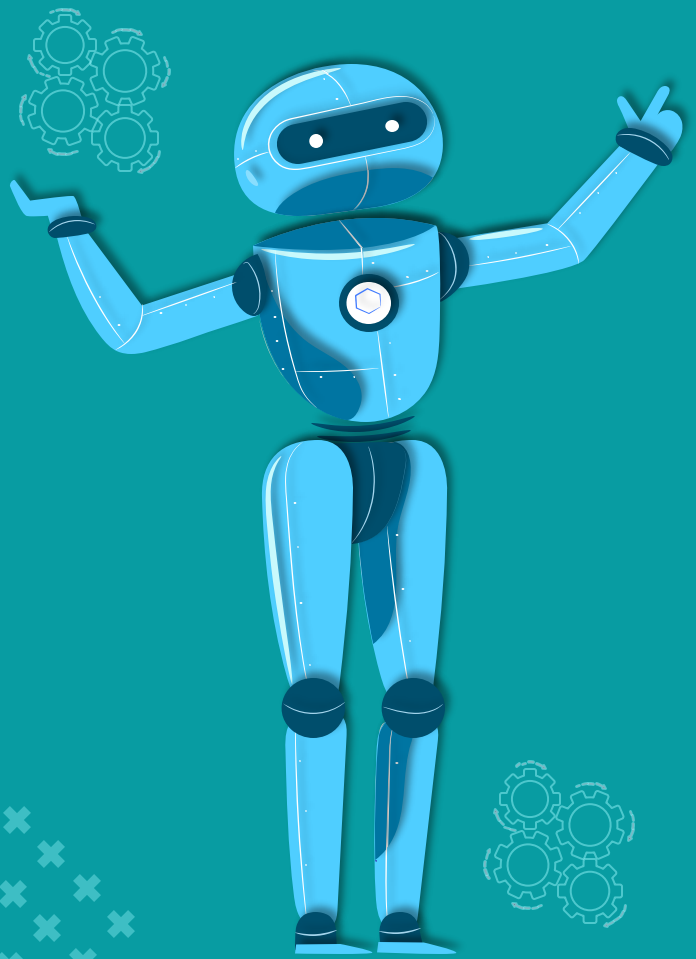
And not letting them having a **bad** experience using our apps...



QUICK RECAP!

1. What are the differences between native mobile apps and mobile web apps?
2. Why is it important for us to properly plan the design of our mobile apps?
3. List down 3 mobile apps that gives you a bad and a good experience.

6.3



IoT Data Storage in Mobile Apps

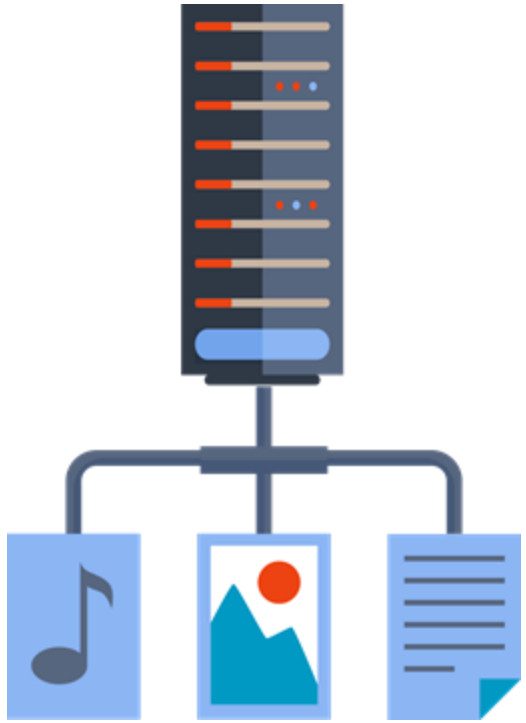
- What is a Data Storage and Database?
- Types of Data Storage and Database
- Data Storage for IoT Devices
- Why do we need a data storage for IoT Devices?

6.3 IoT Data Storage in Mobile Apps

6.3.1 What is a Data Storage?

- Data storage is the process by which information technology archives, organizes, and shares the bits and bytes that make up the things you depend on every day—from applications to network protocols, documents to media, and address books to user preferences.
- Data storage is a central component of big data.

https://www.redhat.com/en/topics/data-storage

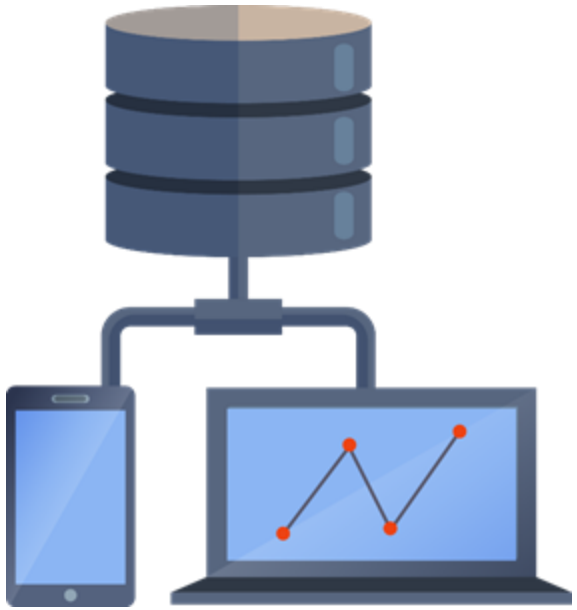


6.3 IoT Data Storage in Mobile Apps

6.3.1 What is a Database?

- A database is an organized collection of structured information, or data, typically stored electronically in a computer system. A database is usually controlled by a database management system (DBMS).

- Data within the most common types of databases in operation today is typically modeled in rows and columns in a series of tables to make processing and data querying efficient. The data can then be easily accessed, managed, modified, updated, controlled, and organized.

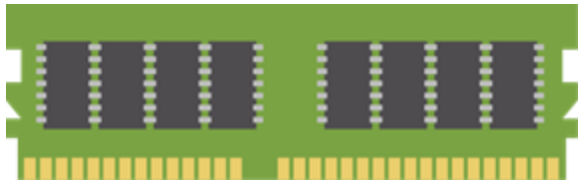


https://www.oracle.com/database/what-is-database.html

6.3 IoT Data Storage in Mobile Apps

6.3.2 Types of Data Storage

Hard Disk

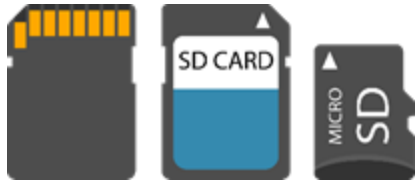


Memory Ram

Flash Drive

Floppy Disk

Optical Disk



SD Card

Cloud Storage

6.3 IoT Data Storage in Mobile Apps

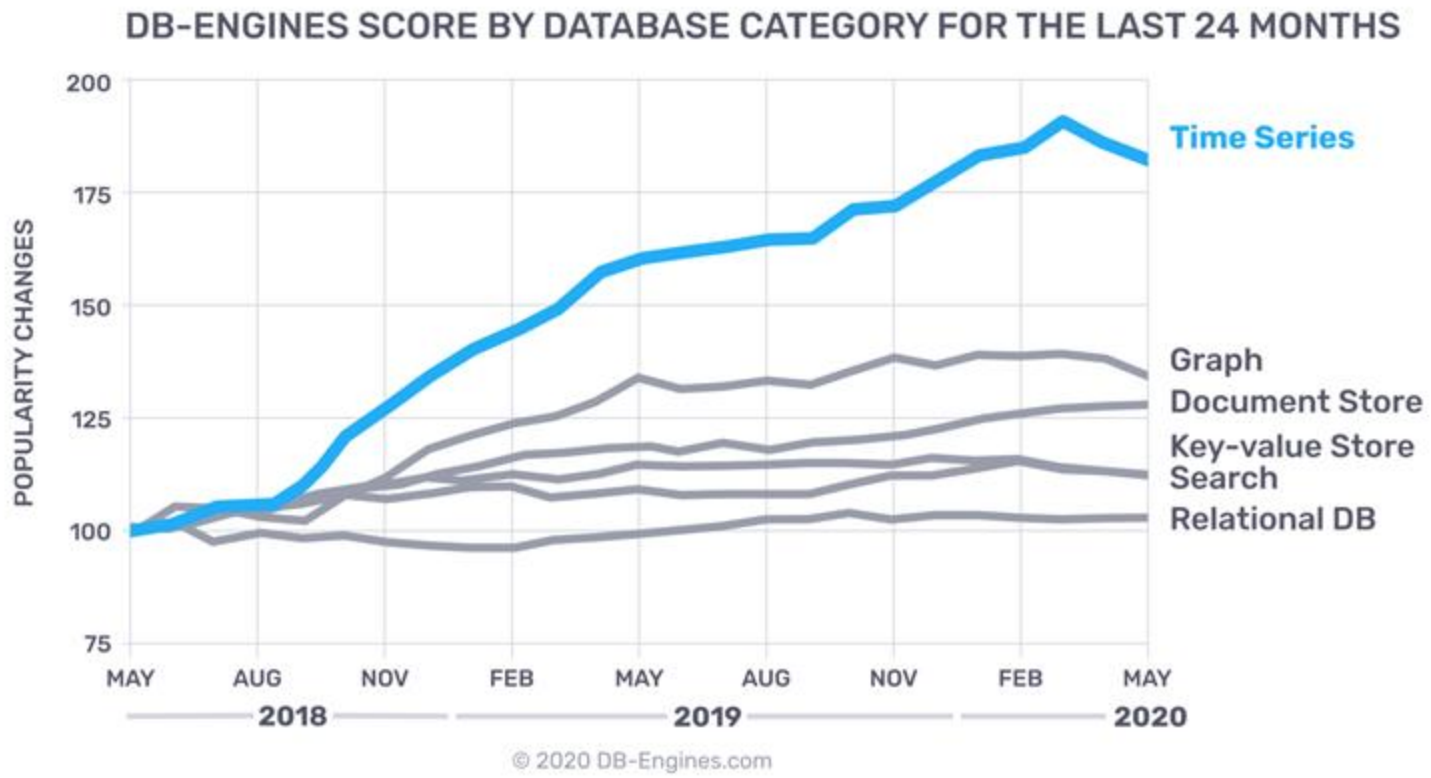
6.3.2 Types of Database

- **Relational databases**. Relational databases became dominant in the 1980s. Items in a relational database are organized as a set of tables with columns and rows. Relational database technology provides the most efficient and flexible way to access structured information.
- **Distributed databases**. A distributed database consists of two or more files located in different sites. The database may be stored on multiple computers, located in the same physical location, or scattered over different networks.
- **Data warehouses**. A central repository for data, a data warehouse is a type of database specifically designed for fast query and analysis.
- **NoSQL databases**. A NoSQL, or non-relational database, allows unstructured and semi-structured data to be stored and manipulated (in contrast to a relational database, which defines how all data inserted into the database must be composed). NoSQL databases grew popular as web applications became more common and more complex.
- **Graph databases**. A graph database stores data in terms of entities and the relationships between entities.
- **OLTP databases**. An OLTP database is a speedy, analytic database designed for large numbers of transactions performed by multiple users.

https://www.oracle.com/database/what-is-database.html

6.3 IoT Data Storage in Mobile Apps

6.3.3 Data Storage for IoT Devices



https://www.influxdata.com/time-series-database/

What is a Time Series Database?

A time series database (TSDB) is a database optimized for time-stamped or time series data. Time series data are simply measurements or events that are tracked, monitored, down sampled, and aggregated over time.
https://www.influxdata.com/time-series-database/

IoT devices collects data based on a sampling rate in unit of time whether in seconds or minutes.

Thus, it is recommended that for IoT devices to store data in a time series database

6.3 IoT Data Storage in Mobile Apps

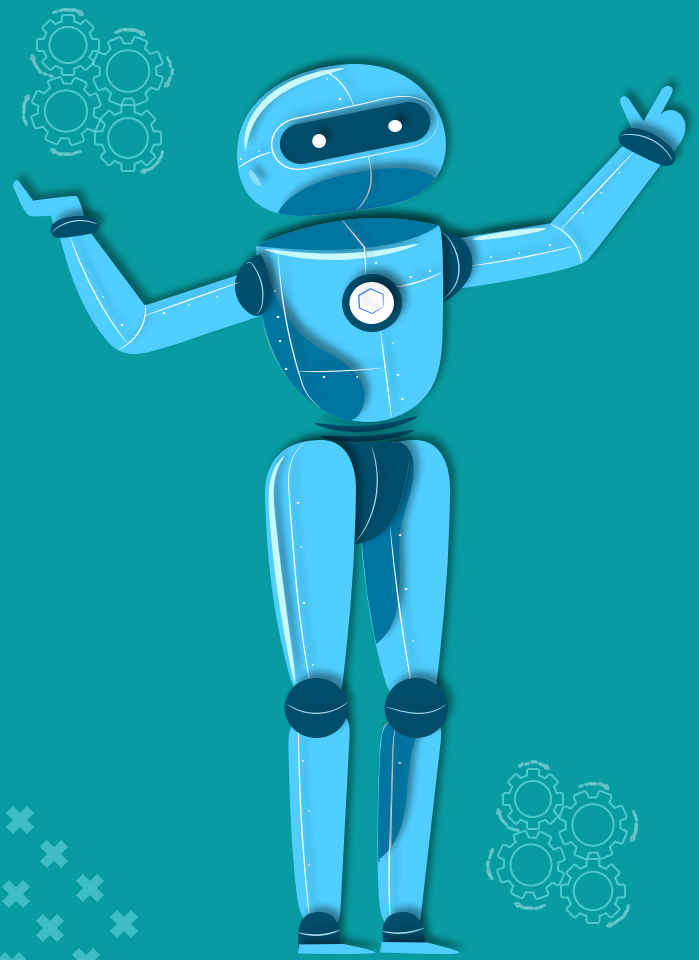
6.3.4 Why do we need a data storage for IoT Devices?

- Commonly in an IoT application, the devices or sensors collects data and publish it to a dashboard in a form of charts.
- The data displayed on dashboard are real-time data. Meaning, what we are doing basically monitoring the current situation using the real-time data.
- It is important for the data collected by the IoT devices to be kept in a data storage so that further **data analysis** can take place.

QUICK RECAP!

1. List down 2 types of data storage for mobile phones
2. List down 3 types of DBMS available
3. Explain in your own words about the time series database?

6.4



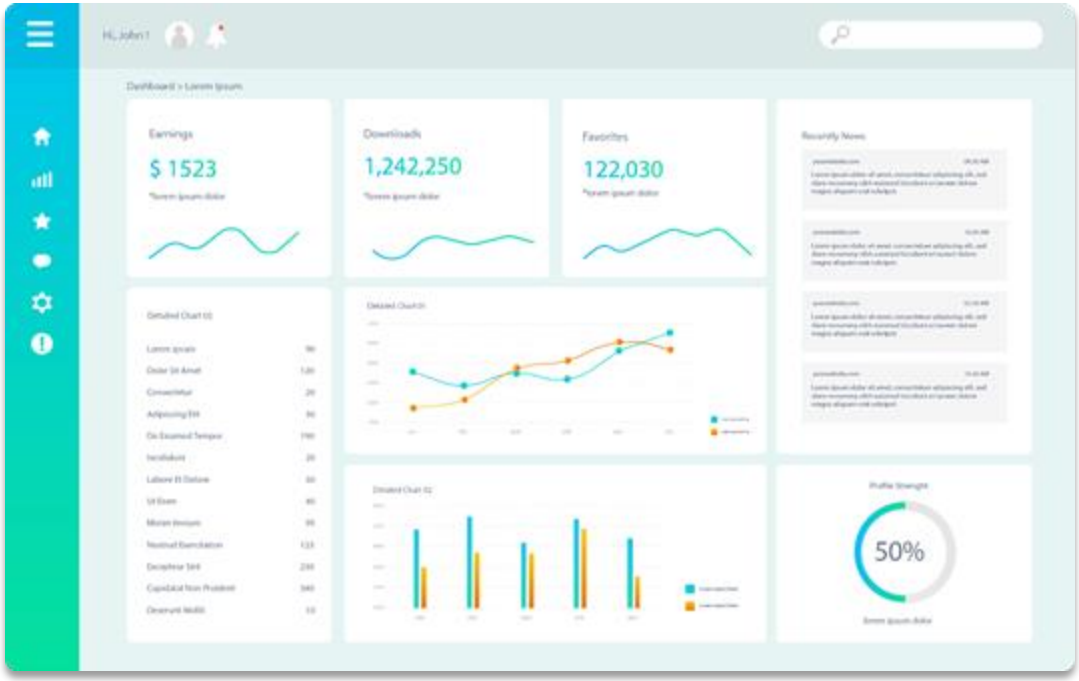
Data Visualization for Mobile Apps

- What is Data Visualization?
- Importance of Data Visualization
- Type of Data Visualization
- Data Visualization for Mobile Applications

6.4 Data Visualization for Mobile Apps

6.4.1 What is Data Visualization?

- Data Visualization is a way of **presenting your data**. Translating raw data into graphics presentation such as charts and gauge.
- **Dashboard Software** is the product of data visualization.
- Dashboards are easy to read graphics presentation of current status/data and historical data.



6.4 Data Visualization for Mobile Apps

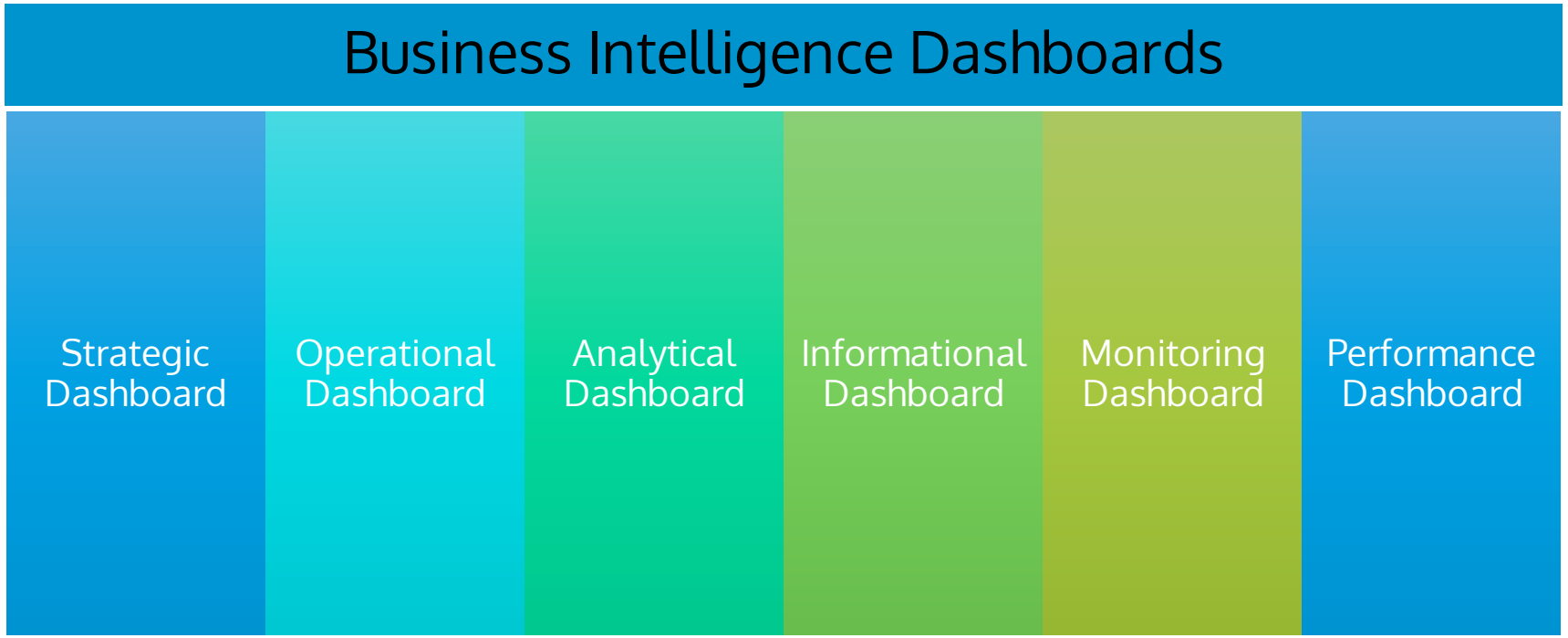
6.4.2 Importance of Data Visualization

- **Easily graspable information –** It is easier for user to understand data through graphic presentation comparing to viewing data in form of multiple rows and column.
- **Establish relationship –** Charts and graphs do not only show the data but also established co-relations between different data types and information.
- **Share –** Since data visualization is easily understandable, important trend in a chart can be shared across department in an organization.
- **Interactive and intuitive visualization –** Several dashboard allows user to zoom into the charts and graphs to dive into the data.

NOTE: For IoT Application, it is **important** and **necessary** to develop data visualization due to huge amount of data collected on a daily basis. It will be a long and tiresome scrolling if the data are in the form of rows and column.

6.4 Data Visualization for Mobile Apps

6.4.3 Type of Data Visualization



6.4 Data Visualization for Mobile Apps

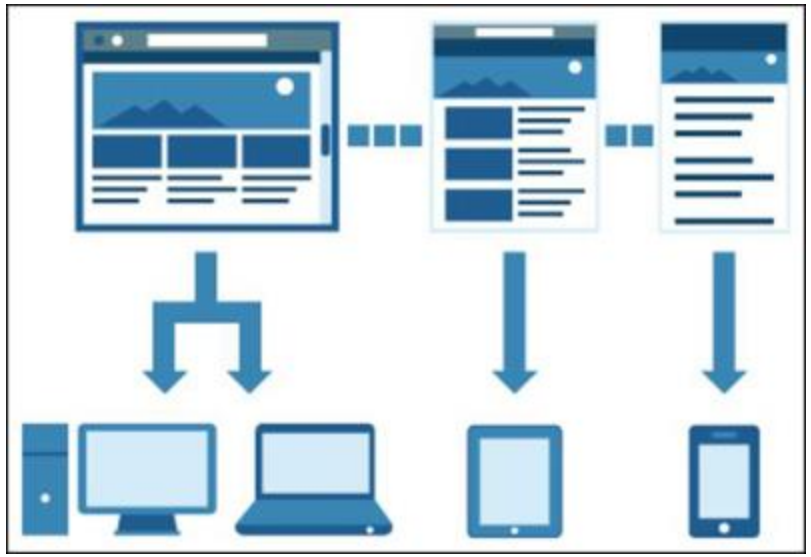
6.4.3 Types of Data Visualization

- Commonly, IoT application utilizes the **monitoring dashboard** that focuses on presenting real-time data as well as utilizing the **analytical dashboard** in an effort of finding anomaly or insight of the data by drilling down the data.
- **Strategic dashboards** are commonly used in a wide range of business types while aligning a company's strategic goals. They track performance metrics against enterprise-wide strategic goals. It provide a quick overview for the decision maker.
- **Operational dashboards** manage intra-daily business processes – frequently changing and current performance metrics or key performance indicators (KPIs).
- A **performance dashboard** provides users with an instant visual representation of their company's performance.

6.4 Data Visualization for Mobile Apps

6.4.4 Data Visualization for Mobile Applications

Responsiveness in Mobile Design



1) **Fluid grids:** The grid is the tool that designers use to lay out their designs, regardless of whether those designs will be viewed online or offline. Figure on the left shows a grid design has been transformed for three screen shapes.

1) **Flexible images:** When you have images in a dashboard, you want to ensure that they're not cut off or distorted. Making sure that your images can reformat themselves is important.

1) **Media queries:** The content needs to be viewed on any mobile device a user might have. What makes viewing it on a variety of devices a challenge is that the designer has no way to know what the returned result will be.

QUICK RECAP!

1. What is a Dashboard Software?
2. In your opinion, which dashboard is suitable to monitor sales in a company?
3. List down 3 software for data visualization.