A RECENT STUDY ABOUT ONE PLUS 2 MOBILE COMPUTER AND ITS SPECIFICATION WITH FEATURES

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ABSTRACT

One Plus is a Chinese smartphone company, which found in late 2013. Its company in located in Shenzhen, Guangdong province, China. One Plus provided one of the most interesting phones in the year 2014. As Chinese phone turn out to be well-built and well-spec Android phone with one of the most beloved Android user interface customization feature, and around half the price of the normal smartphone, it gains the reputation in just a short period time. This investigation had to go through mostly about the OnePlus 2 specification and how the different electronic component works together to provide the user the best service ever. This study will also discuss the future and the limitation of mobile computing.

Keywords: Architecture, Cache Memory, Features, Smart Phone

I INTRODUCTION

In this new era of globalisation, technology, and the electronic device had dominated our world. Technology had changed the way we live and the way we look at our surrounding world. Today, most of our friend and people surrounded us had at least one electronic device that can communicate and connect to the internet. This technology is called mobile computing. Mobile computing as become one of the most important and significant technology used by majorities of the population on this planet earth. It is a technology that allows an electronic device to communicate or share information with another device such as data, voice, and video. The term mobile computing is a general term related to all computing activities that allow the user of mobile computers to move freely and eliminate the need to stay in a particular location. This documentation selected a smartphone named "OnePlus 2" as main research of today mobile computing. "OnePlus 2" is designed and produces by the company called "OnePlus" founded in the year 2013 in Shenzhen China. "OnePlus 2" was launched in the year of 2015. This documentation will also go through in details about this phone such as its CPU specification, features, general architecture, instruction set and register, memory architecture, advantage and disadvantage of this smartphone.

1.1 Technologies behind the Success of Mobile Computer

In the year 1972, the American Telephone & Telegraph (AT&T) department submitted a proposal for cellular service to the Federal Communications Commission (FCC). The proposal had been approved in 1982. Motorola

had the started a project to create the first handheld device called the DynaTAC800X in December 1972 and took until 1983. The first generation (1G) mobile phones were introduced in 1983 used 824 - 894 MHz frequency bands, voice channel of 30 KHz wide and each channel had 2 frequencies (for transmission and reception). The second generation (2G) phone added compression and was able to support 3 - 10 times more channel. There are 3 competing technologies for the 2G phones:

- a) Frequency Division Multiple Access this technology is mainly focused on analogue phones where each cell uses a separate frequency.
- b) Time Division Multiple Access where each cell uses a certain portion of time at a given frequency. Hence, providing three times more capacity of analogue systems. The Global System of Mobile Communications also known as GSM uses this technology. The GSM uses 900 MHz to 1800 MHz frequency bands in Europe, Asia, and Africa while in the United States and Canada the frequency bands Are 850 MHz to 1900 MHz GSM also has encryption as a security feature.
- c) Code Division Multiple Access this technology provides each cell with a unique code and spread the cell over available frequencies.

Designed for the smartphones, the third generation technology (3G) increases in bandwidth and transfer rates up to 3 Mbps and are able to accommodate web applications and multimedia files. There are several protocols added to the 3G mobile technologies, which include the CDMA, Universal Mobile Telecommunications System (UMTS), which is the most common form, is wideband CDMA and Time – Division synchronous CDMA.

Lastly, in the fourth generation mobile technology (4G) there are two main competitors:

- i. Worldwide interoperability for Microwave Access (WiMAX)
- ii. Long Term Evolution (LTE)

These technologies help increase data speed for uploads and downloads and also enhances the security protocols too. Thus resulting in better accessibility to the internet, Internet Protocol (IP) packet switching and also to support IP version 6 (IPv6). The advancement in the mobile computing technology has made the modern day mobile computer very mobile and easy to be used. When the mobile computers were introduced in 1990's, not only the devices were bulky making it quite difficult to be brought around, the price of the device was expensive, you will need to sit at a specific place to get connected to the network and it was not seen as a basic necessity by the people at that particular time. Hence, causing communications among people to be less. Entering the 21st century, the world had started to enter the electronic era. The new development in technology made the mobile computer become more compact making it mobile and more affordable. The emergence of electronic and online systems made people involve more in computing thus making the mobile computer a basic requirement. With the help of the compact and affordable mobile devices, communications among people as widened to a broader range.

1.2 Importance and popularity of the mobile computers

Why are these mobile devices important? Mobile devices can help to increase productivity, portable and also help sustain the environment. With the help of mobile devices, people do not need to sit at the specific place at specific time to do their jobs. The portability and compact mobile computer enable them to perform their jobs anywhere they are comfortable at any time. For instance, an office worker generally needs to be at the office on time and work with a desktop that is only available at the office to perform his job. Nevertheless, with a laptop or a tablet PC, he will be able to perform his job anywhere even at home. He does not need to run back and forth from his home to the office just to perform his job. This also enables the worker to increase his productivity because with the comfort and mobility of the laptop, he can perform his job peacefully anywhere he likes. With the help of the mobile devices, commercialisation has gone electronic known as e-commerce. E-commerce not only provides many job opportunities but also enables people to explore and purchase things online with many choices. Mobile computing is also important because it enables people to explore the world further and learn many new things. The availability of many informational and educational resources online enables the people to learn further on things they do not know or even conduct their own research. With the advancement of the mobile computers on sharing information, the use of paper to write notes, store records, or send mails can be reduced. With the help of the mobile computer, people can store as many records they require without occupying physical space. The introduction of electronic mail or e-mail enables the user to send and receive messages at fast speeds.

1.3 Popularity of mobile device

In this era of globalization where science and technology are developing at an advancing rate, the popularity and the demand for mobile devices have raised significantly since 2000. Many people these days own their very own smartphones, tablet PC, and laptops because now they are offered at affordable prices and also play a very significant role in the hearts of the people today. Why? Because of the mobile computers simplicity and mobility, it offers to the people today.

II CPU SPECIFICATION, FEATURES

2.1 CPU Specification

The mobile computer that has been chosen our team designs OnePlus 2, which is a smartphone by OnePlus manufacturer. OnePlus 2 use OxygenOS 2.0 as their operating system, which is based on Android 5.0. OnePlus 2 has a 64-bit Qualcomm Snapdragon 810 processor that enable speed up to 1.8 GHz and having Octa-Core structure as the CPU. The system also includes Adreno 430 graphic processing unit. The Adreno 430 graphic processing unit is a separate graphics processor solely intended for the accelerated creation of images to be outputted to a display [1]. According to Qualcomm, the Snapdragon 810 processor, with 64-bit computing with 8 CPU cores and leading modem capabilities, is the "ultimate connected computing processor" (QualComm, 2015). On the other aspect of OnePlus 2, it comes with a 4GB of RAM size and come with an internal storage up to 64GB but cannot expand. As far as the camera are concerned, the OnePlus 2 packs a 13-megapixel primary camera on the rear and a 5-megapixel front shooter for selfies [2]. The size of OnePlus 2 display is 5.5-

inch with full HD and a screen resolution up to 1080 x 1920 pixels, display with pixel density of 401 ppi. The technology that has been used for this smartphone is IPS LCD, which is also known as In-Plane Switching Liquid Crystal Display. IPS LCD is a screen type that improves on the venerable LCD technology. It uses polarized light which is then run through a color filter, horizontal and vertical filters on either side of the liquid crystals control the brightness and whether or not each pixel is on or off, with the black light included, the devices are usually thicker [3]. Furthermore, the color depth for the main display is 16M, it provides a much sharper color and image than other smartphone. The battery of OnePlus 2 is non-removable Li-Po 3300mAh battery that gives the user about 12 hours of usage.

2.2 Features

OnePlus 2 has several great features include in it. Those features are helpful for user and user-friendly. Here are some specific features in OnePlus 2.

Fingerprint scanner



Figure 2.2.1 Fingerprint scanner in OnePlus 2

As shown in "Fig2.2.1" fingerprint scanner in OnePlus 2 can store up to five fingerprints with a very simple and fast registration process [4]. Unlike other fingerprint-equipped devices needed the user to first wake the phone to scan user fingerprint, OnePlus 2 allows the user to switch on the phone while the screen is off.

Alert Slider



Figure 2.2.2OnePlus 2 Alert Slider

The second feature of OnePlus 2 is Alert Slider. The Alert Slider integrates seamlessly with Android's notification settings (OnePlus, 2015). By switching between the three types of setting in Alert Slider, user

can switch between All Notifications, Priority Interruptions, and No Interruptions without unlocking their phone or even taking out of their pocket shown in above "Fig. 2.2.2".

USB type C cable



Figure. 2.2.3 One Plus 2 USB type C cable

The third feature of OnePlus 2 is USB type C cable. USB type C cable is a small 24-pin reversible plug connector for USB devices shown in above "Fig.2.2.3". OnePlus 2 is the first flagship smartphone to incorporate the industry USB type C cable, the new open standard for data transfer and charging delivering up to 2A of power [5]. USB type C cable has the ability to reversible plug orientation, this cable has different injection method for user, there is no need to worry the injection of the cable is correct or not.

Dark Mode



Figure 2.2.4 One Plus 2 Dark Mode

OnePlus 2 come with a dark mode setting, it allows user to change the entire light element into dark. It makes the phone easier to view in some situation. For example, when a user is in a room with the light turning off, it is very hard for the user to view with the entire light element, and is bad for user's eyes. With dark mode, it made user much easier to view also shown in "Fig.2.2.4".

III IMPLEMENTATION ISSUES

In computing, a pipeline is a set of data processing elements connected in series, where the output of one element is the input of the next one. The elements of a pipeline are often executed in parallel or in time-sliced fashion; in that case, some amount of buffer storage is often inserted between elements [6]. Whereas, pipelines

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can be further divided into instruction pipeline, graphics pipeline, and software pipeline. The instruction pipeline is commonly used in central processing units (CPUs) to allow overlapping execution of multiple instructions with the same circuity. Graphics pipeline are mostly found in the graphics processing units (GPUs) which consist of multiple arithmetic units that implement the various stages of the common rendering operation. Software pipeline is where commands can be written where the output of one operation is automatically fed to the next, following operation. One of the software pipelines that can be found in OnePlus 2 is the used of CyanogenMod as their third-party system. It had already been in OnePlus 2 pipeline system. CyanogenMod is an open-source operating system for smartphones and tablet computer based on the Android mobile platform. It offers a better version than Google can provide. CyanogenMod allows user to customise their android phone easily. In another word, it gives the user more control and access to their phone. There are six stages that occur or take place in the instruction pipeline [7]. Instruction is often executed in the CPU itself. The first stage is called the Fetch Instruction. Various instruction is being fetch to the CPU from the RAM or storage. The second stage is called the decode instruction, an instruction is a decode into machine language so that the CPU can understand the instruction. The third phase is the calculate operation where it makes calculation based on the instruction receive. If the outcome favours the condition, the system will be updated. However, if the outcome does not favour the condition, the CPU will bring this operation to another stage, this called the Fetch Operation. This operation will be executed immediately. Lastly, the CPU will write the operands and end this instruction. Another example of Graphics pipeline found in OnePlus 2 is the Qualcomm Adreno 430. It is an integrated graphics card for most android based smartphone and tablets. This graphics card uses a technology called FlexRender. It can switch intelligently between Tile Based Renderer and the classic direct rendering. Besides, The GPU uses 192 unified shaders clocked at up to 650 MHz. During 2015, it becomes one of the faster GPU that found in smartphone or tablet. The coprocessor is a special set of a circuit that is found in a microprocessor chip which can manipulate numbers or perform some other specialized function more quickly than the basic microprocessor circuits. The operation performed by the coprocessor may be floating-point arithmetic, graphics, signal processing, string processing, encryption or input-output interfacing with peripheral devices. Coprocessors allow a line of computers to be customized (Ron White, 2006). A processer called the Snapdragon 810 processor powers OnePlus 2. This processor can support the 64-bit memory. It also contains 8 CPU core and leading modem capabilities. Snapdragon 810 processor is designed to support the most advanced connected mobile user experiences, including streaming 4K ultra HD video, up to 55MP digital photo sharing, online 3D gaming, virtually seamless communication, and outstanding battery life [8]. Interoperability is a property of a product or system, whose interfaces are completely understood, to work with other products or systems, present or future, without any restricted access or implementation. It also can be define as the ability to exchange or communicate data and information with the software application. The electronic component found in OnePlus 2 are able to communicate within itself and also with the software. This allows OnePlus 2 to provides more feature and function to the user.

IV INPUT OUTPUT SPECIFICATION

Input output can be defining as a type of communication or interaction that occurs between a human being and electronic device. It also can be define as the communication or interaction between two or more electronic device. Therefore, in order to allow input and output to occurs, an electronic must have the abilities to receive, send, accept and display information and data. One of the input device that can be found on OnePlus 2 is a fingerprint scanner. Fingerprint scanner allow the smart phone to identify the identity of the owner before allow he or she to access to the smart phone. Using fingerprint scanner to identity the phone owner is still consider as new technology. Back to 2011, Motorola is the first company that offer this facility in it smartphone. During 2013, Apple followed Motorola by adding a fingerprint scanner in its smartphone and named iPhone 5s. There are also a few sensor such as accelerometer, gyro, proximity and compass that constantly input information to allow the smartphone to master its surrounding. This can provides its user a more complete function and not only limited to making phone call or SMS. According to Techrader, OnePlus 2 use USB-C as their media connection. USB-C is the latest connection type, and is due to hit more and more phones this year and into the future, replacing the micro USB connection which adorns pretty much every Android, Windows Phone and BlackBerry handset currently available. It's a big deal on the OnePlus 2, as this was the first widely available smartphone to sport the new connection, with its key selling point being that it's reversible. [8]OnePlus 2 using touch screen technology for most of its input. User are able to touch on the function or apps that their want on the screen. For examples, typing word, texting, reading article on the web, taking picture and etc. One of the output device that can be found in OnePlus 2 is speaker. There are a few function for speaker, therefore, a smartphone will contain more than one speaker. Such as loud speaker and normal speaker. Beside, one of the most important output device is the screen. The screen handle almost 80% of the output with is needed for the user. The screen have resolution of 1080p Full HD (1920 X 1080 pixels), 401PPI. It also have a 5.5 inch wide screen that can support most of the display, such as video and picture. The screen use the LCD in-cell technology to perform its all the display job. For the communication, OnePlus 2 has various type of technology and can support many type of communication standard, such as GSM, HSPA and LTE for cellular network, 802.11 a/b/g/n/AC, WiFi Direct, DLNA and hotspot for wireless network, v4.1 and A2DP for Bluetooth connection, A-GPS and GLONASS for global positioning system, and a v2.0 Type-C 1.0 reversible USB connector shown in "Fig.4.1"[5].



Figure 4.1 Type-C USB connector

OnePlus 2 does not have card slot, therefore it does not accept increase in memory. Nevertheless, OnePlus 2 have dual sim card slot. This mean that a user can use both service provides simultaneously.

V SIMILARITIES AND DIFFERENCES BETWEEN ARCHITECTURE OF THIS MOBILE COMPUTER AND THE GENERAL (VON NEUMANN) COMPUTER ARCHITECTURE

There are several similarities between Harvard Architecture and Von Neumann Architecture. The first similarity is the Control Unit. Control Unit in both architecture act as a core unit, it receives input from the user in both architectures. Control Unit also send the control signal to let the whole system work. Next, the second similarities between this two architecture are Arithmetic Logic Unit. It performs the action of calculation in both architectures. Lastly, the third similarities between this two architecture are the memory. Both architectures runs the application by using the operating system provide by program memory whereas both architecture store and display the user data by using data memory.

I. Harvard Architecture	II. Von Neumann Architecture
• Two different memories with different	• Content of the memory if organised and all
location can run at the same time	installed memory can be used
• Both memories can have different sizes	• Control Unit is simpler with only one bus
• Needs more time for development of a	• Data and instruction are accessed in the
complicated Control Unit	same way.

Table 5. Differences between Harvard architectures & Von Neumann architecture

VI FUTURE OF MOBILE COMPUTING

• Help us to monitor our health, diet and unhealthy habit

In the future, the use of mobile computing will help us with our health care. The mobile computer will monitor our health, control our diet and manage our habit to prevent unhealthy habit. It will enable professional medical to treat most of the disease through the mobile computer.

• Fast charging

In the future, there will be a technology about fast charging and wireless charging. User only needed to charge their devices for 15 minutes and after 15 minutes, its already full battery.

• Real visualization

Up until now, what we got in mobile computing market is Virtual Reality Gear. It is a wearable device to enables user to enjoy a virtual reality world games or movie. In future, users can enjoy the virtual reality without any other external equipment. Perhaps one day, OnePluscompany can develop technology based on the concept of real visualization.

• Super Mobile Computer

Nowadays, the supercomputer is still in a large size just like when the first generation of computer introduce to the market, ENIAC. In the future, the size of the super computer will become smaller and become portable

VII CONCLUSION

OnePlus 2 is one of the best smartphone in the year 2015, because of it awesome feature and the use of best qualities electronic component. For example, OnePlus 2 use 64-bit Qualcomm Snapdragon 810 processor speed up to 1.8 GHz and Octa-Core as the CPU. It also used Adreno 430 graphic processing unit as its graphic card. It also come with a 4GB of RAM and packs a 13-megapixel primary camera on the rear and a 5-megapixel front shooter. Beside, a 5.5-inch of full HD and a screen resolution up to 1080 x 1920 pixels, display with pixel density of 401 ppi. On the software part, OnePlus 2 used CyanogenMod, latest Android version and easy-to-use user interface. This allow the user to use the smartphone easily. Thus, is also enhance the outcome on that can provides from the phone. In the near future, OnePlus may produce a much better phone and improve the feature for the user.

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