CT049-3-1-OSCA

OPERATING SYSTEMS AND COMPUTER ARCHITECTURE

APU1F1911

HAND OUT DATE: 27 NOVEMBER 2019

HAND IN DATE: 20 MARCH 2020

WEIGHTAGE: 50%

INSTRUCTIONS TO CANDIDATES:

1   **Submit your assignment at the administrative counter.**

2   **Students are advised to underpin their answers with the use of references (cited using the Harvard Name System of Referencing).**

3   **Late submission will be awarded zero (0) unless Extenuating Circumstances (EC) are upheld.**

4   **Cases of plagiarism will be penalized.**

5   **The assignment should be bound in an appropriate style (comb bound or stapled).**

6   **Where the assignment should be submitted in both hardcopy and softcopy, the softcopy of the written assignment and source code (where appropriate) should be on a CD in an envelope / CD cover and attached to the hardcopy.**

7   **You must obtain 50% overall to pass this module**

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1.0 Introduction

1.1 Introduction and History

During 1975 two boyhood friends Bill Gates and Paul Allen from Seattle came up with a company called Microsoft, a firm that creates computer software. The word Microsoft was originally coined from two words Microprocessor and Software combined. By the time the company launched it was located in New Mexico then shifted to Washington in 1979 progressing expeditiously into a high level of tech corporation. (History, 2015)

Fig 1.1.1 Bill Gates

In 1980 Microsoft came across its first operating system called Xenix, which was used for Microsoft's word processor which is now known as Microsoft Word (Bellis, 2020). In 1980 a tech firm, IBM requested Microsoft to make another Operating system for the IBM PC. As a result, Microsoft's first successful operating system was released known as MS-DOS (Microsoft Disk Operating System), written for IBM and deployed to IBM PC. Afterward, various Personal computer manufacturing companies officially recognized and licensed MS-DOS to use it as their operating system. In the early nineties, Microsoft began making a huge sum of money and increased revenue by selling beyond 100 million copies (Encyclopaedia, 2020).

The Surface Go is a newly released Microsoft product with Windows 10 Home in S mode embedded in it. Designed with a dual look of a detachable tablet and a laptop comes up with a lower cost and lighter weight machine. The Go comes with a 10-inch slim screen and a

kickstand attached at the back of it with a 165-degree range of motion. Besides its fixed with a front speaker and a built-inn surface pen underneath (Guardian, 2018).

The Go is smaller to carry, a portable, capable device with all the relevant features built-in. It comes up with a weight of 522g (without keyboard) and its dimension is 245x175x8.3mm and its slim 10-inch LCD (1800x1200) Screen. Inside the Go, an Intel Pentium Gold 4415Y processor with a 4 or 8 GB Ram and a Storage of 128 SSD or 64GB eMMC are embedded with a Windows 10 Home (in S Mode). The Go camera comes with 8MP rear, 5MP front-facing, with HD resolution as well (Guardian, 2018).

In 2015 Windows 10 was delivered by Microsoft with a new feature like Microsoft edge and a digital personal assistant known as Cortana introduced. This is a remarkable improvement made in the series of its windows version. As announced by the company this might be the last version of Windows that Microsoft will no longer make any upgrade on the window, however, users will receive regular updates as usual (Encyclopaedia, 2017).

Windows 10 is more user-friendly for users who are making the shift from older versions of windows to make a smooth transition to the new version of Microsoft. Its desktop-friendly functionality appears to be well organized with smooth mouse and keyboard friendliness defining how the platform is efficient (Microsoft, 2015).

Also, the latest apps are installed in Windows 10 such as the Edge web browser, Groove Music and Photo apps. Here are the specifications and newly added features of Windows 10 Home:

- Windows application like Mail, photos, calendar, Video, and Music
- Microsoft Web Browser
- Cortana Digital Assistant
- Windows Face-Recognition, Iris and Fingerprint
- Continuum tablet Mode for touch-capable Devices
- Playing XBOX
- Tablets, PCs, and 2-in-1s

A new thing about Windows 10 is that it will be available in retail packaging in a form of DVD and USB media formats for the first time with a $ 119 retail price. Hence, users will experience purchasing this version of Microsoft's platform for the first time. (Microsoft, 2015).

1.2 Introduction to the People involved in the creation of the device and OS.

Microsoft "Windows 10" is the latest and major release, this latest version of the Windows operating system by Microsoft and it is also the operating system of Microsoft Surface go. Windows 10 was developed by the Windows development team headed by **Terry Myerson,** the vice president of Microsoft's new operating system engineering division (Microsoft, 2013).

Fig 1.2.1 Terry Myerson, the vice president of Microsoft's new operating system engineering division.

Ralf Groene, the director, and designer for Microsoft surface brand has helped shape the design and user experience of the tablet from its very launch. Groene began his life career as a toolmaker in Volkswagen is his home Wolfsburg, eventually income an industrial design degree from in the Muthesius Academy in Kiel. When he did work with Hartmut Esso Linger, founder of frog design and his design heroes, Groene joined Microsoft, where he starts and founded the Surface brand.
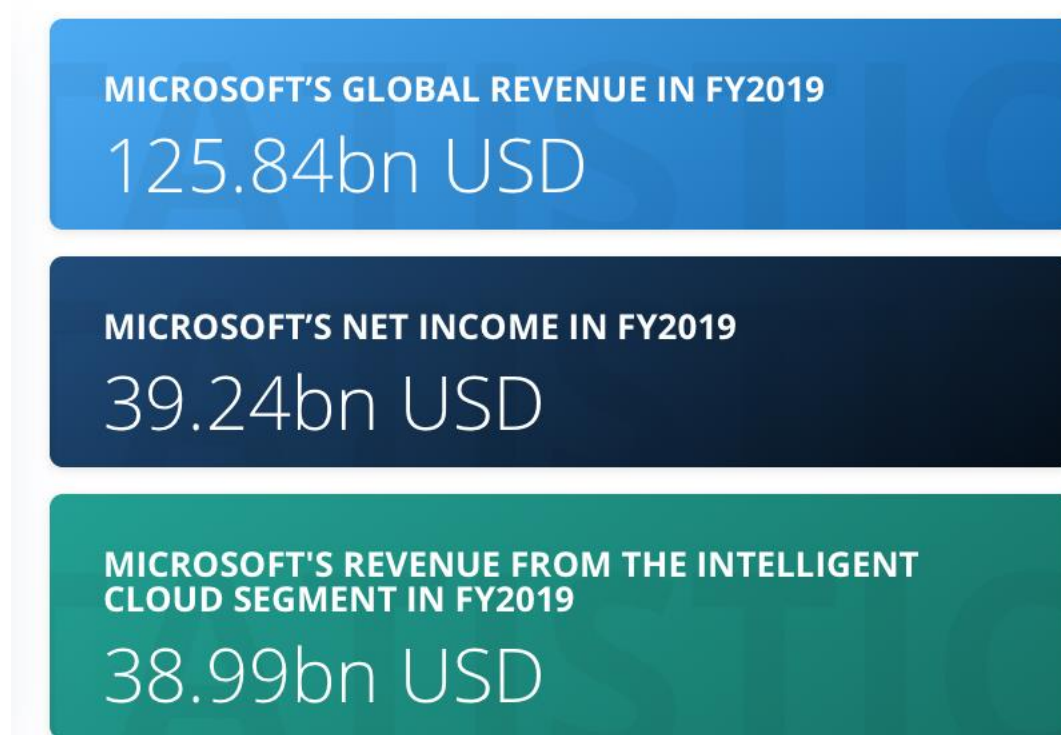

Fig 1.2.2 Ralf Groene.

**1.3 Facts and stats about Company/Organization and Device**

Microsoft Corporation is an American multinational technology company that develops and sells a wide range of consumer and enterprise software, hardware, services, and consumer electronics. Bill Gates and Paul Allen is the founder of this company, in Albuquerque, Mexico, the year 1975, the company has been founded in Redmond, Washington, since 1986.

One of the world's largest and most successful technology companies, Microsoft's global revenue has increased relatively consistently since its conception, with the figure a record high of over 125 billion U.S dollars in the 2019 financial year.

MICROSOFT'S GLOBAL REVENUE IN FY2019
125.84bn USD

MICROSOFT'S NET INCOME IN FY2019
39.24bn USD

MICROSOFT'S REVENUE FROM THE INTELLIGENT
CLOUD SEGMENT IN FY2019
38.99bn USD

Fig 1.3.1

Microsoft obtains LinkedIn for 26 billion U.S dollars in 2016. The deal marked Microsoft's biggest acquisition to date, well surpassing the 8.5 billion U.S dollars paid for Skype in 2011.
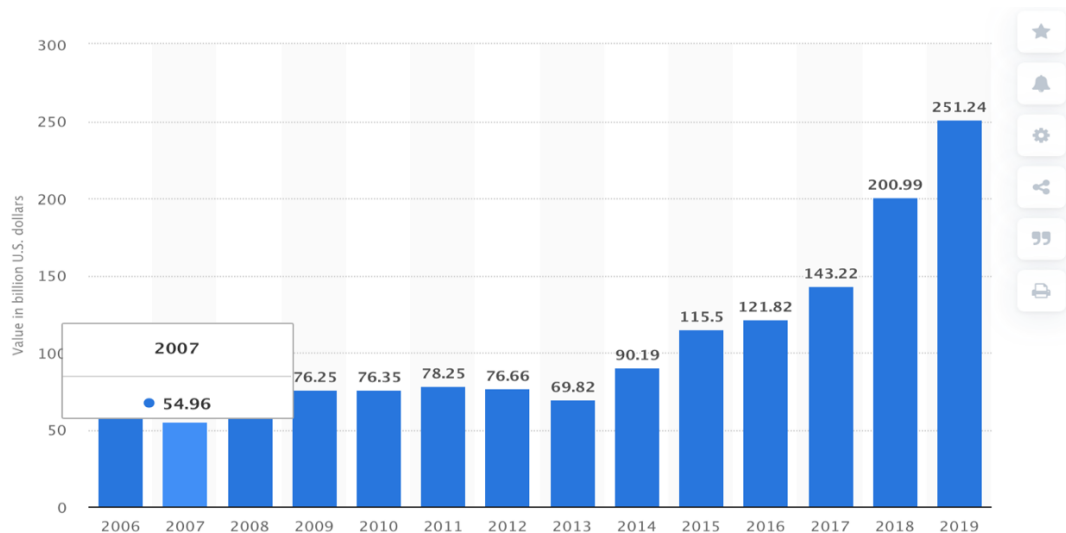
Fig 1.3.2 Global Value of Microsoft 2006-2019

The graph clearly describes the global value of Microsoft's from 2006 to 2019. 62.04 billion U.S. dollars in 2006 is the starting value, Microsoft achieves 251.24 billion U.S. dollars by 2019. (A. Guttman, 2019)
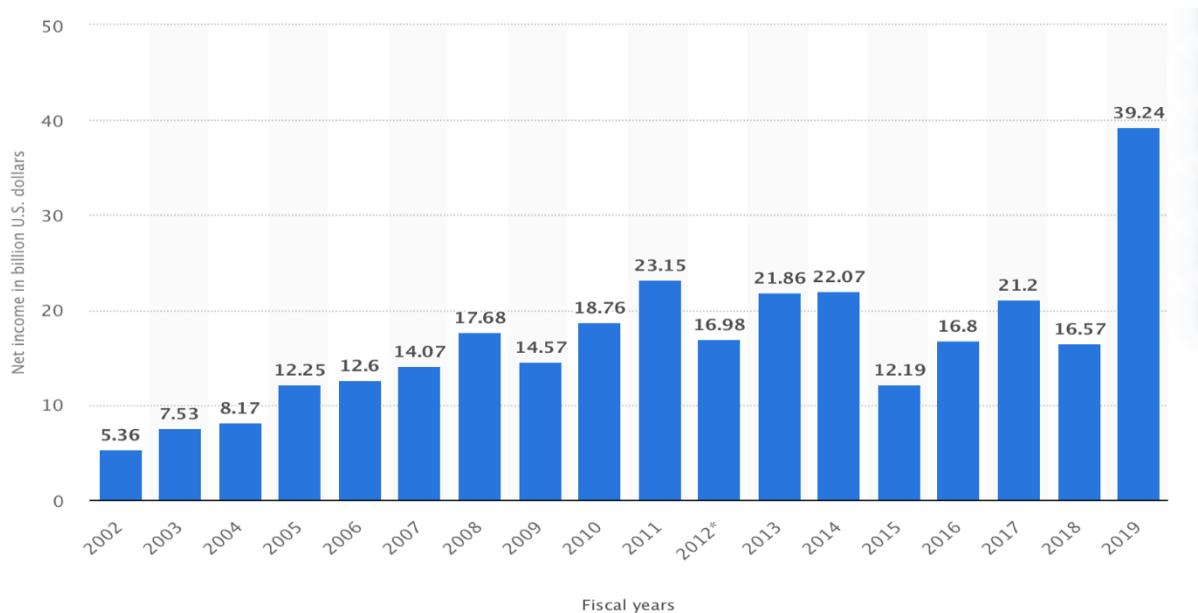
Fig 1.3.3 Net Income of Microsoft 2002-2019

Microsoft Company reported a net income of over 39.24 billion U.S. dollars in 2019, which was a clear increase from its 2018 figure, and a record high. Microsoft's sales revenue also peaked in FY2019 at 125.84 billion U.S. dollars. (Shanhong. L, 2019).

The Microsoft amazing Product Surface GO also has some amazing stats and facts such as this product, share 16% of the overall tablet market more than 1000000 surface apps are available.

Surface Go is excellent for your daily tasks, the portability, and a stunning touchscreen with the power of Windows 10 Home in s MODE. Surface Go

Fig 1.3.4

This little machine is not only for the daily little task, but it can also use to run-heavy game programming, animation, etc. Forza Street (game) is a new way to race on the move. A perfect match for your Surface Go.

2.0 Hardware

2.1 Introduction to the Device

In the box, there is two hardware that includes Microsoft Surface Go tablet and Surface Go Power supply. The document enclosed includes the QuickStart guide, Safety, and Warranty documents.

To use the device like a laptop from a tablet, you need to attach an external detachable keyboard to the tablet, which is not included in the box.

Fig 2.1.1: Hardware that comes out of the box

Fig 2.1.2: Microsoft Surface Go

2.2 Description of Hardware functions and Capabilities

Component	Specification	Rating
Processor	Intel® Pentium® Gold Processor 4415 (1.6 GHz).	2.5/5

Description
The Intel Pentium Gold 4415Y is a low-priced laptop processor. With its two cores, two threads per core, a clock speed of 1.6 GHz, 2MB of cache, 14nm lithography chip and consumes only 6 watts of power.

Opinion and Advantages/Disadvantages
This chip consumes only 6 Watts of power. It is power-efficient and runs cool, comparing Intel Core chips i5-8250U consume 15 Watts. So, it's been suitable to use in thin-and-light laptops, 2-in-1, and tablet PCs; But the benchmark results indicate the Intel Pentium Gold 4415Y is designed for light computing tasks such as web browsing and casual things. It's also slower than other members of the power-efficient Y line-up, such as the Core m3-7Y30.

Table 2.2.1: CPU

Component	Specification	Rating
Display	10-inch PixelSense Display Resolution: 1800 x 1200, Aspect ratio: 3:2, Contrast ratio: 1500:1, Touch: 10-point multi-touch Corning Gorilla Glass 3	3.5/5

Description
10-inch PixelSense Display with the resolution: 1800 x 1200 and 3:2 aspect ratio is good web browsing but gives full-screen 16:9 videos some space is wasted with black bars. It also has a usual 10-point multi-touch Corning and Gorilla Glass 3.

Opinion and Advantages/Disadvantages
Like most tablets, the bezels around the screen are large, but that just allows users to grip the device from any side without accidentally triggering anything on the screen. The Type Cover connects to the bottom bezel via magnet, which changes the tab into a laptop. At 1,800 x 1,200 pixels, this is not the sharpest 10-inch tablet, the latest iPad has 2,048 x 1,536 pixels.

Table 2.2.2: Display

Component	Specification	Rating
Storage memory	eMMC drive: 64GB, or Solid-state drive (SSD): 128GB SSD	3.5/5
Memory	2x SK Hynix H9CCNNNBKTAL 16 Gb LPDDR3 SDRAM 4GB or 8GB	3.0/5
Virtual Memory	Intel® HD Graphics 615	1.0/5

Description

Surface go has installed storage of 64GB eMMC or128GB SSD with Memory of Hynix LPDDR3 SDRAM 4GB or 8GB, but up to 2x 16GB of ram could be installed and has an integrated Intel® HD Graphics 615.

Opinion and Advantages/Disadvantages

Embedded Multimedia Card (eMMC) is affordable, the performance of eMMC storage is somewhere between the speed of HDDs and SSDs, but it's slower than SSD.
Hynix LPDDR3 SDRAM is a slower ram than the latest versions, but it takes less power and compatible with the current processor.
Intel® HD Graphics 615 is a mobile-based graphics card (Mobile Kaby Lake) is considered among the slowest graphics card, but it's installed on the surface to go to fasten the process of data.

Table 2.2.3: Memory

Component	Specification	Rating
Battery	4-cell battery	4.5/5
Charger	Model surface Go charger model 1736	

Description

Battery life is up to 9 hours of video playback on Wi-Fi and up to 8.5 hours on LTE Advanced for local video playback.

The charger has an Input 100-240v @ 0.6A and Output 24W (15V @ 1.6A)

Charger interface is Surface connect.

Opinion and Advantages/Disadvantages

Battery life is 8 to 9 hours of video playback with is can be considered good.

The charger takes less power, 24W only and charges about 80% of the battery within 60 minutes; But have a surface connect interface only.

Table 2.2.4: Battery and Charger

Component	Specification	Rating
Network	Nano SIM Tray 4G LTE Advanced	4.0/5
	GPS/GLONASS: Standalone and assisted GNSS	3.5/5

Description

The LTE modem used a Qualcomm Atheros. The Qualcomm Atheros Chip used is the advanced version of LTE. It has several limited bands to its arsenal. GPS accuracy can be up to 3 meters difference.

Opinion and Advantages/Disadvantages

4G LTE advanced on this device is very astounding. This device with this modem is for people who are on the go and want to have access to the internet for their job or personal use. With 5G coming out slowly, it is not a threat towards this device if there are 4G cell towers around.

Table 2.2.5: Network

Component	Specification	Rating
Camera	5.0MP front-facing camera with 1080p HD video	2.8/5
	8.0MP rear-facing autofocus camera with 1080p HD video	3.0/5
Speaker	2W stereo speakers with Dolby® Audio™	3.0/5

Description

Windows Hello face authentication camera (front-facing). The device has digital image stabilization for the rear-facing camera. The stereo speakers are front-facing which offer complete immersive playback audio. Due to the size of the device, the speakers suffer from overemphasized mid and high and a lack of bass.

Opinion and Advantages/Disadvantages

It has no optical image stabilization; thus, the videos might blur when filming a moving subject. Colors from the cameras are not vivid. The speakers are good (to a certain extent), but preferably you should use Bluetooth speaker or earphones (If watching a movie or playing music). Overall, it is ideal for video calls due to the soundscape being balanced.

Table 2.2.6: Camera and speaker

Component	Specification	Rating
Sensors	Ambient light sensor, Accelerometer, Gyroscope, Magnetometer	4.5/5

Description
An ambient light sensor helps to maximize the battery life of the device used by comparing the amount of light surrounding the device thus controlling the amount of light the screen emits. The accelerometer is used for the detection of the device moving. It works in-sync with the gyroscope which also is another sensor that senses the angular rotation of the device. Magnetometer sensor, a crucial sensor, used for the orientation of the device with the Earth's magnetic north.

Opinion and Advantages/Disadvantages
Overall, they all are very good sensors. If you're a person on the go and you have this device in hand, it would be very useful if you are curious to know which direction you're heading. When playing games or watching a movie or video, the gyroscope sensor is the one helping you out by detecting the device's orientation and changing it when you want it to.

Table 2.2.7: Sensor

Component	Specification	Rating
Wireless	Wi-Fi: IEEE 802.11 a/b/g/n/ac, compatible Bluetooth Wireless 4.1 technology	4.0/5

Description
The device outperforms the competition with its WI-FI modem made by Qualcomm. It can transmit an average data rate of 476 Mbps and able to receive around 581 Mbps. The Bluetooth module is better than the previous versions. It has improved substantially to provide customers with new features such as Mobile Wireless Service Coexistence Signaling.

Opinion and Advantages/Disadvantages
Overall, the wireless connectivity for this device is decent enough for someone who is looking for a tablet that has a small form factor and that is quite fast enough for their needs. The Bluetooth module might be a few years old, with Bluetooth 5.2 coming out soon, it is believed that it can handle itself out there in this modern era.

Table 2.2.8: Wireless

2.3 Hardware Conclusion

Out of the box, the Surface Go feels light and durable, a tiny bit chunky. Microsoft's hardware specialist the particular minds behind Surface GO they crafted the device out of the same magnesium compound of previous iterations, with Gorilla Glass 3 protecting the 10-inch Pixel-sense display (Joe Osborne, 2019). While the Go doesn't offer the various display colour options as the Surface Pro (2017) or Surface Book, the 1800 x 1200 (3:2) display is consistent with other Surface aspect ratios and displays a bright light surprisingly, 397 nits of light; it's not the sharpest tablet display, the newest iPad features a resolution of 2,048 x 1,536 pixels.

The Surface Go comes with Intel Pentium Gold 4415Y is a budget-class laptop processor; With its two cores, two threads per core, a clock speed of 1.6 GHz, 2MB of cache, 14nm lithography chip and consumes only 6 watts of power (Evan Forrest, 2019). You can thank the low-end Pentium chip for two other features: The total lack of fan vents and the low-power indeed its power-efficient and runs cool. Thus, heat is somehow pushed out of the I/O ports—which, to my finger, it's not—the Surface Go is entirely passively cooled. But It's also slower than other members of the power-efficient Y line-up, as the Core m3-7Y30.

Intel® HD Graphics 615 is a mobile-based graphics card (Mobile Kaby Lake) is considered among the slowest graphics card, but it's installed on the surface Go to fasten the process of data. For storage the Surface Go uses Embedded Multimedia Card (eMMC) which is affordable, the performance of eMMC storage is somewhere between the speed of HDDs and SSDs, but it's slower than SSD. Speaking of memory, LPDDR3 SDRAM is integrated on the motherboard of Surface Go, the Random-Access Memory (RAM) is slower than the latest versions, but it takes less power as eMMC Storage memory thus they're compatible with the current processor.

5.0MP front-facing and 8.0MP rear-facing autofocus camera with 1080p HD video is used for Surface Go, which is not up to the mark for Windows Hello-Face authentication camera (front-facing), but not comparable latest cameras installed in current devices. The device has digital image stabilization for the back camera, but no optical image stabilization thus, the videos, blur, when filming a moving subject, colours from the cameras aren't vivid too.

The stereo speakers are front-facing which offer entire immersive playback audio. Due to the dimensions of the device, the speakers suffer from overemphasized mid and high in the amplitude of sound and a scarcity of bass; Speakers are good (to a certain extent), but preferably you should use Bluetooth speaker or earphones (If watching a movie or playing music). Overall, it's ideal for video calls due to the soundscape being balanced.

Surface Go uses a Qualcomm Atheros, which enables 4G LTE Advanced with Nano-SIM Tray for SIM-card (Subscriber Identity Module Card) to connect the device to cloud internet. Alas, it doesn't support the latest 5G (fifth-generation wireless technology). Wireless technology in Surface Go, it supports the latest Wi-Fi (IEEE 802.11 a/b/g/n/ac) and Bluetooth 4.1 which is good enough for this device, but latest Bluetooth version 5.2 which has twice the speed and four-time range and also takes less power than this version.

Surface Go has four sensors, Ambient light sensor, Accelerometer, Gyroscope, Magnetometer. An ambient light sensor helps to maximize the battery life by comparing the amount of light surrounding the device, thus controlling the amount of light the screen emits. The accelerometer is used for the detection of the device moving; It works in-sync with the gyroscope which is also another sensor that senses the angular rotation of the device. Magnetometer sensor, a crucial sensor, used for the orientation of the device with the Earth's magnetic north.

Under load, the Surface Go is warmed up, but not unpleasantly. The 1.6-amp charger is modestly endowed compared to the 3-amp to 4-amp rapid phone chargers have been seeing lately, so you can probably charge Surface Go using your phone's USB-C charger.

The Go retains many familiar elements: the power and volume button on the top, the MicroSD slot under the kickstand, and the Surface Connector on the right side. There, you'll also find the headphone jack and I/O port—which has migrated from USB-A to USB-C with the Go, the good thing is USB-C connectors are growing in numbers. The Surface Connector is used to charge the Surface Go, but can still work with the Surface Dock.

3.0 Operating System Functions and Capabilities

3.1 User Interface:

Windows 10; compared to its notable predecessors (Windows XP, Windows 7, Windows 8), it has made significant strides to improve upon its past iterations and continues to improve day to day through regular feature updates by Microsoft. It has one of the most intuitive, friendly and easy to learn user interfaces in mainstream operating systems.

When you boot into Windows 10, you are welcomed by the default Windows lock screen. This part of the lock screen contains the time on the bottom left with the day and the month with the date (in 24-hour format by default).
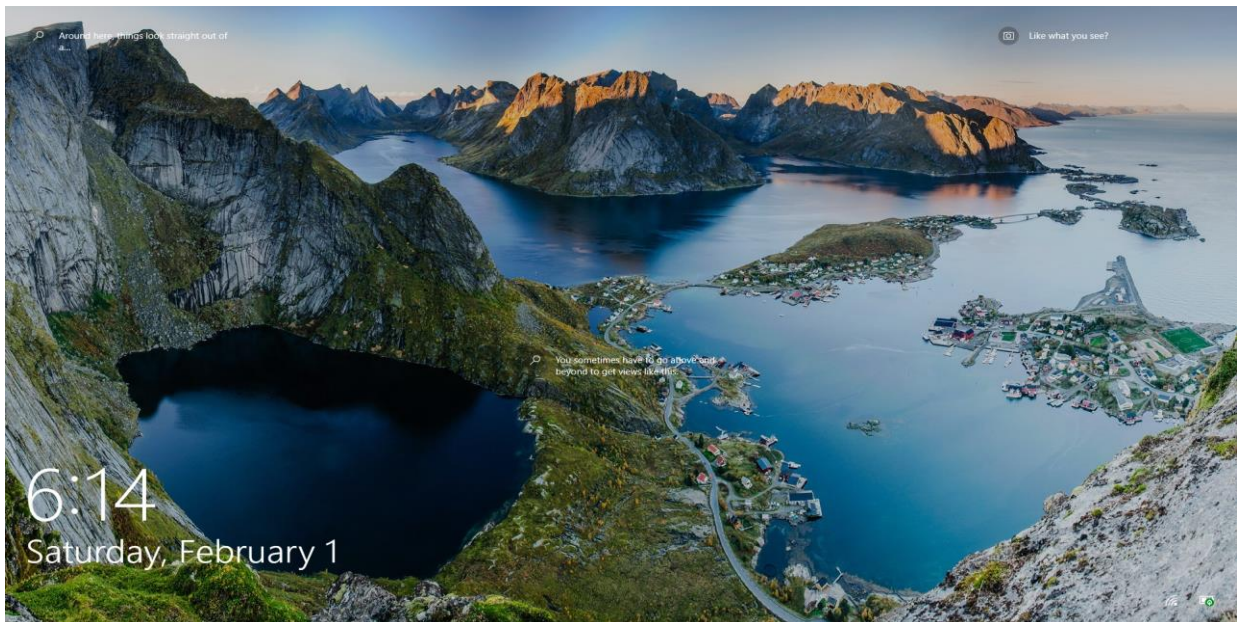
Figure: 3.1.1 Windows 10 Lock screen

This lock screen later slides up on pressing any button on the keyboard to reveal the password/windows hello/fingerprint/pin methods of unlocking the device or simply (if no security options are selected) the sign-in button. If other users are present on the device, they will show up on the bottom left. On the bottom right are the accessibility, Wi-Fi and Shutdown/Restart options.
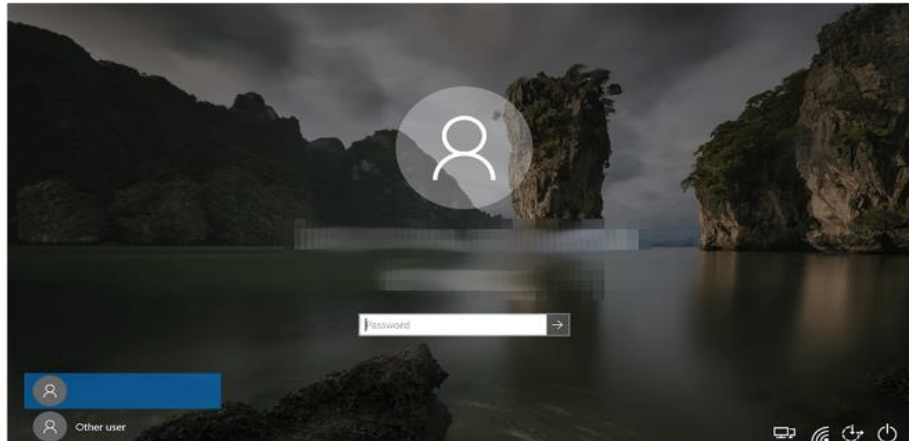
Figure: 3.1.2 Password Entry

After the user has logged into the device, they are given access to the Desktop of Windows 10. The desktop can be customized by the user, therefore giving an emphasis on personalization. At the bottom is the taskbar which contains the Windows Start Button, Search bar, Task Viewer and Cortana at the left and the notification pane, task bar hidden icons, sound and battery at the right.


Figure: 3.1.3 Windows 10 Desktop

In the start menu many basic options are available like the Shutdown Options, Settings, Pictures, Documents and current user Profile on the left. Right beside it is the recently added section on the top with all the applications accessible from the start menu ordered alphabetically set in a scrollable menu. On the right of the start menu is the Content Feed, which can also be configured by the user with inclusions of many different applications. They can be grouped together, moved or even removed; allowing the user full control over the content feed. Some applications can also show the live updates/notifications of them without turning them on.

This redesign of the start menu allows for easier user accessibility. Not only that, in Windows 10 many of the Icons of base programs that come with Windows have been redesigned. They have been given a more modern, simplistic look rather than the complex look used by older versions of Windows. They have changed the icons in such a way that they still look and feel recognizable so that newer users to the platform can easily get used to them. The Icons are very intuitive in nature and are more than enough to identify most of the base programs with just a glimpse. One of the prominent changes to the UI of Windows 10, for example: would be the Settings app that was added in Windows 8. It is still present in Windows 10 with significant changes made to reshuffling, grouping and addition of extra settings.

There is also the presence of the new Touch interface, which allows the user (if the device supports it) to control the entirety of the OS with just touch. The touch keyboard is now more improved compared to the older versions. The Touch interface also allows the user to use many prebuilt gestures to do specific functions in the OS, kind of like keyboard shortcuts. There are quick gestures available for turning on the Task Manager, enabling Cortana, taking Fullscreen screenshots etc. (K, B. & M, P., 2020).

A new feature has been added to the OS, called the Tablet Mode. This allows many portable devices like tablet laptops to be used like a tablet. This changes the regular look of the OS to a more fitting one, like android/iOS tablets. Apps are shown directly and become readily available as the desktop is a full screen version of the start menu.
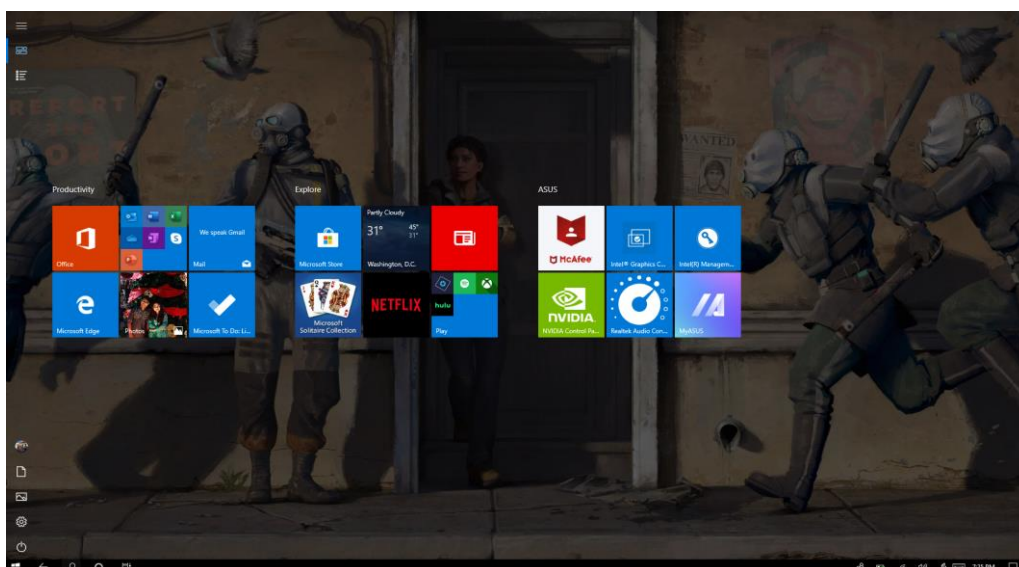

Figure: 3.1.4 Tablet Mode

3.2 File Management:

The file management application in Windows 10 is "File Explorer". File Explorer has been the default program for managing files, drives, disks, etc. anything storage related from before Windows 7. In Windows 10 it completely changed; it now has more functions and has been completely redesigned. The File Explorer is located at the bottom left of the screen beside the windows start menu.

After opening the File explorer, the user is granted with this screen:
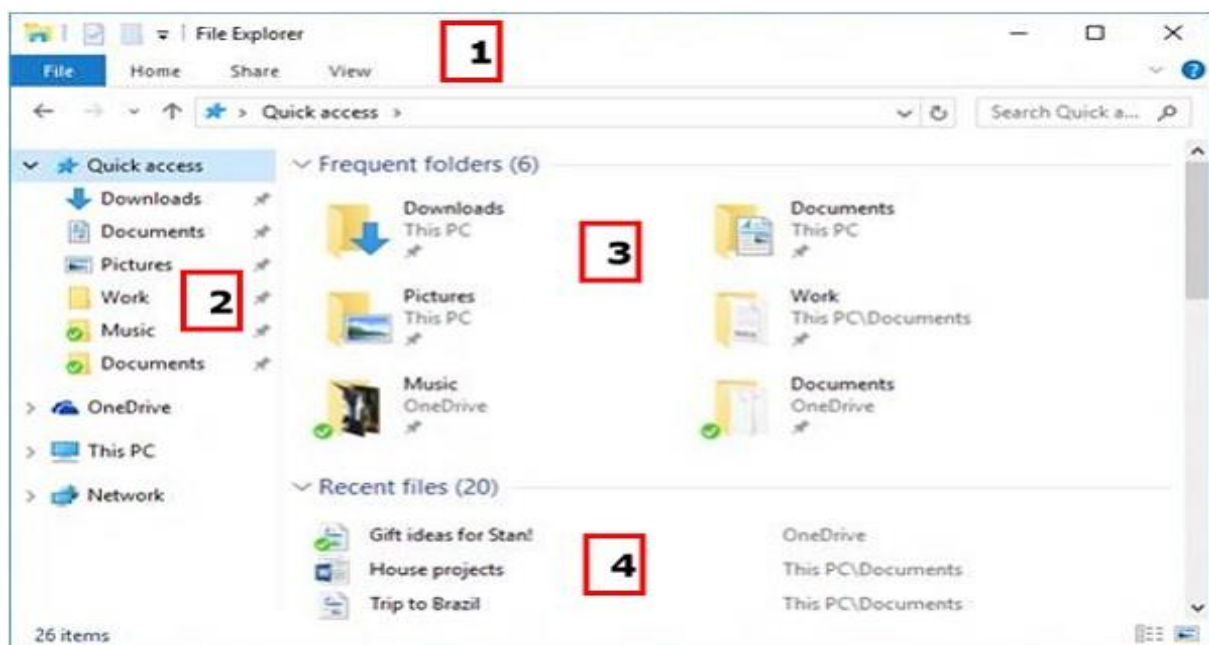
Fig 3.2.1 File Explorer

1) The File Explorer ribbon, which resembles the ribbon featured in Microsoft Office. The ribbon contains buttons for common tasks to perform with your files and folders.
2) The Navigation Pane gives you access to your libraries of documents and pictures, as well as your storage devices. It also features frequently used folders and network devices.
3) The Frequent folders section on the right features the folders you've worked with recently to allow for quick access to them.
4) The Recent files section in the lower part of the window features files and documents that you've opened recently. (Tutorialspoint.com, 2020)

The most frequent page used by users is the "This PC" section on the left. The section contains all the partitions/disks/drives and common access folders of the PC.
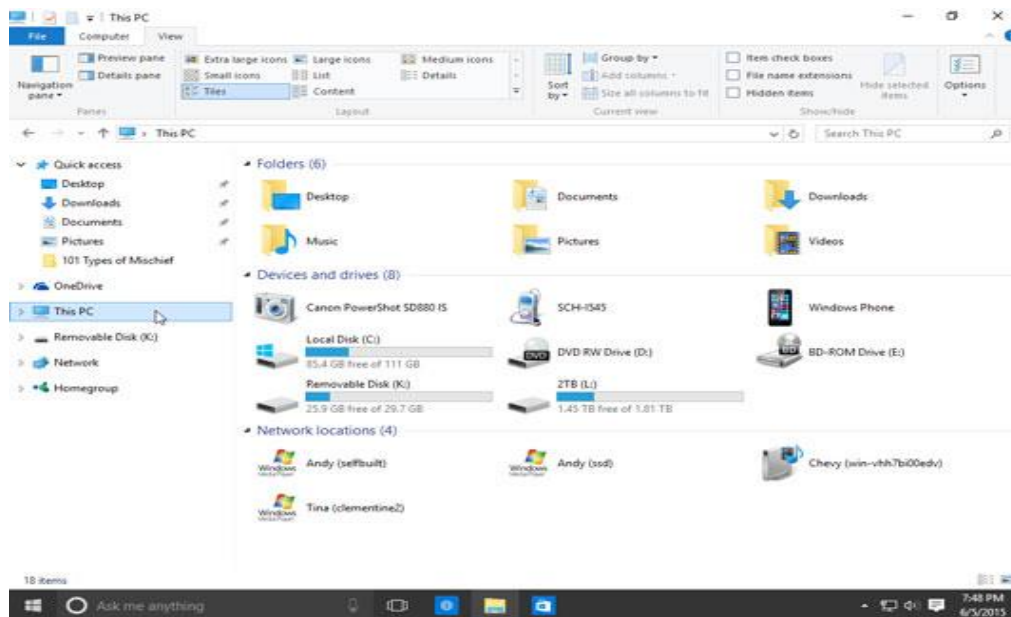
Fig 3.2.2 File Explorer (This PC)

Just like in older versions of the File Explorer, it lists everything on the PC. Here the user can access all the disks and drives currently present in the PC itself. This is very convenient for the user as through this they can access any user accessible file on the HDD or in removeable storage devices (Dummies, 2020).

Other notable features of File Explorer are that a user can create a plethora of different files directly just by right-clicking anywhere in and disk/drive depending on the applications installed on that specific machine.
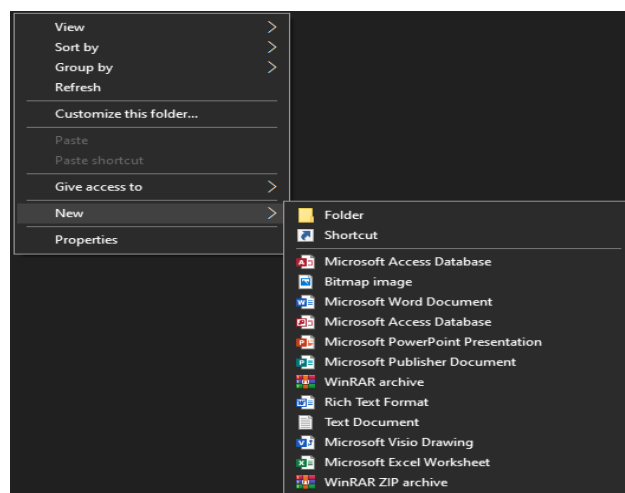

Fig 3.2.3 Right Click Options

3.3 Security

The all-new Microsoft Surface Go comes preinstalled with Windows 10, an operating system that offers security protections from cyberattacks and cyber-threats via multiple means; one of the most important is Windows Security, a preinstalled application.

Windows Security scans the device for malicious software, security threats, and viruses on a regular basis. The application has multiple panels: Home; Virus and threat protection; Account protection; Firewall and network protection; App and browser control; Device security; Device performance and health; and Family options.
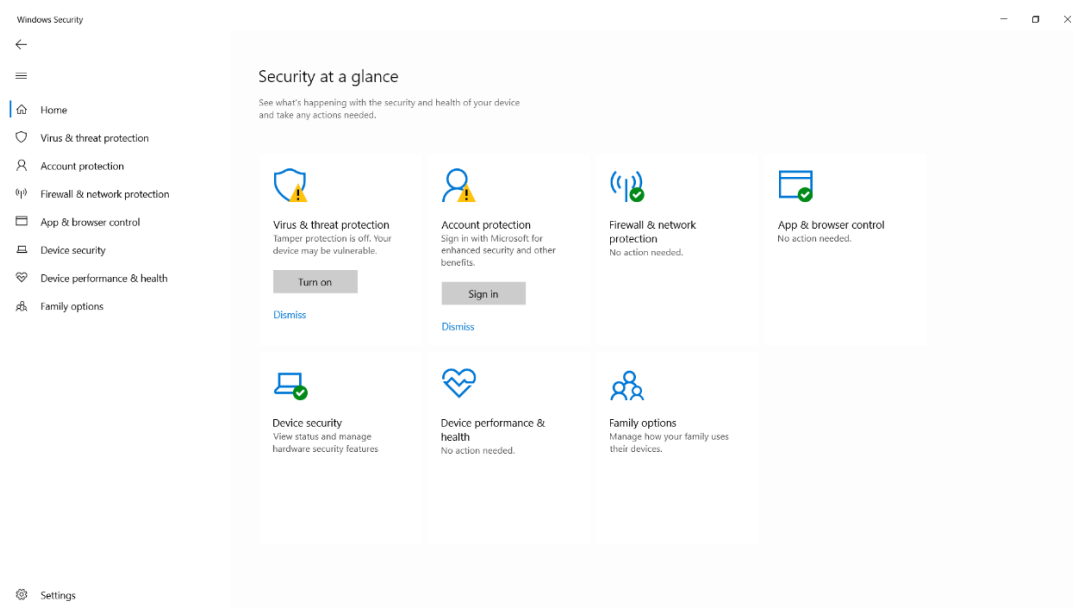
Fig 3.3.1 Windows Security Settings

Virus and threat protection enables users to scan for viruses or security threats on the device through the following scan options: Quick scan which checks folders in the OS where viruses are commonly found; Full scan which checks all files and running programs on the hard disk; Custom scan that allows the user to choose which files and locations to be checked; and Windows Defender Offline scan that tries to find and remove stubborn and advanced malicious software.
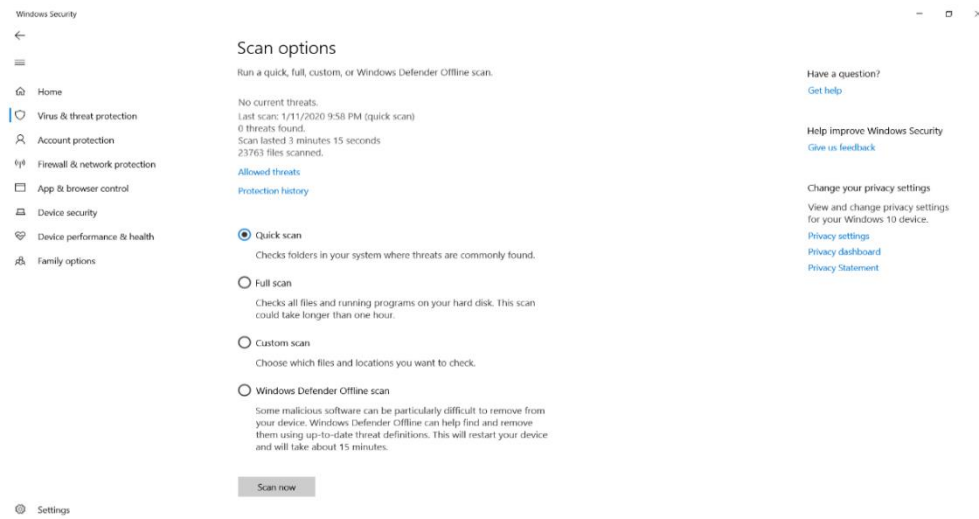
Fig 3.3.2 Scan Optioms

Account protection provides security for the accounts of the OS and the sign-in procedures through signing in to the computer with a Microsoft account by using Windows Hello that enables signing in through facial recognition system; or by using Dynamic lock
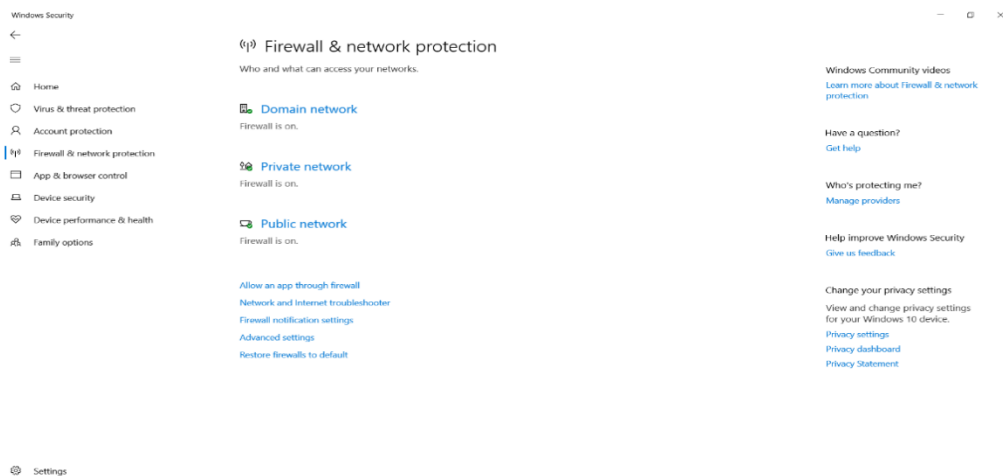
Fig 3.3.3 Firewall & Network Protection

Firewall and network protection enable the user to view the status of Windows Defender Firewall -which helps to prevent unauthorized access or malicious software from gaining entrance/access to the PC via the Internet or any network- and list the network(s) the PC is connected to. In addition, users can turn Windows Defender Firewall on or off and access advanced Windows Defender Firewall options for three types of networks: Domain, Private, and Public (Microsoft Support, 2018a). To ease the process for home users, the Firewall and network protection offer restore firewalls to the default options, which factory resets all the custom configuration made by the user.

App and browser control provide the settings for Windows Defender SmartScreen, which is a security component that secures users' devices by providing protection against phishing or malware websites, and the installation of malicious files. Additionally, App and browser provides exploit protection by automatically applying a number of exploit mitigation and prevention technologies to the OS processes and applications (Microsoft Support, 2018b).
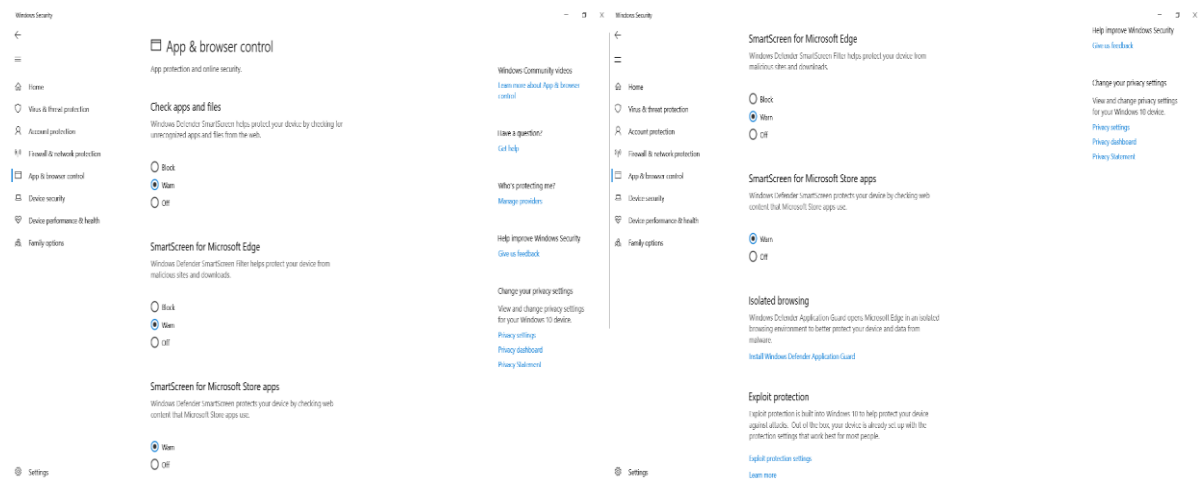
Fig 3.3.4 App & Browser Control

Device security provides details and settings of security utilities that are built into Windows 10, offering core isolation, in which virtualization-based security protects the important parts of the device; security processor which provides additional encryption for the device; and secure booting that prevents malicious software from running when the device starts.
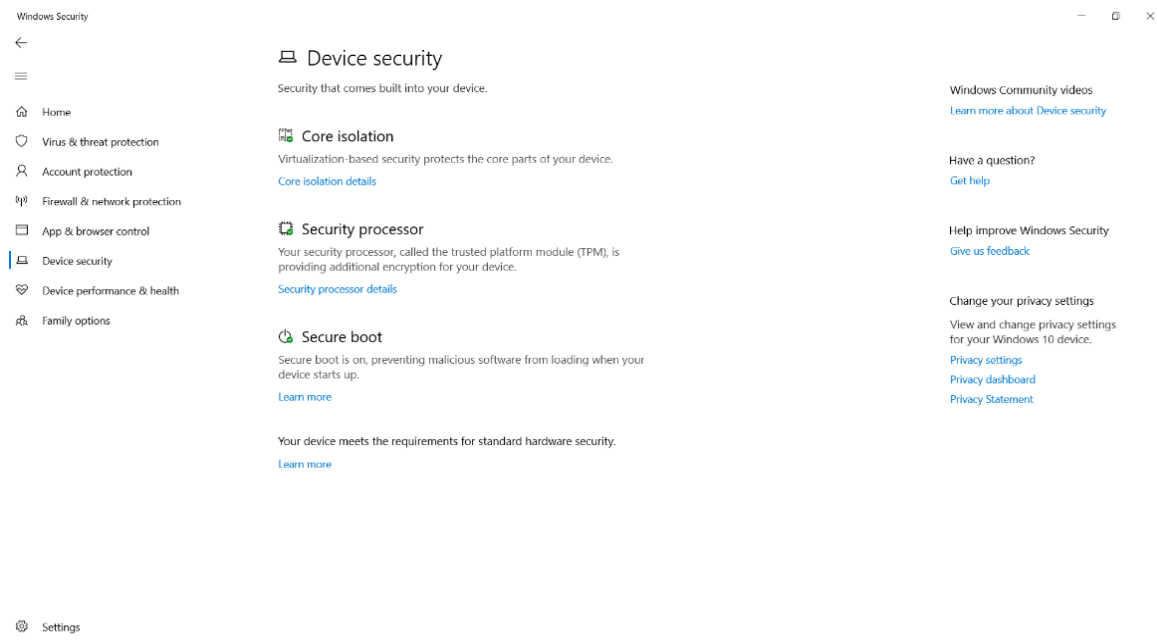
Fig 3.3.5 Device Security

Device performance and health offer reports on the main four key aspects that have an impact on the device's software and hardware which are storage capacity, battery life, apps and software, and Windows Time service. Moreover, Device performance provides users with a fresh start option by reinstalling and updating Windows without deleting personal files.
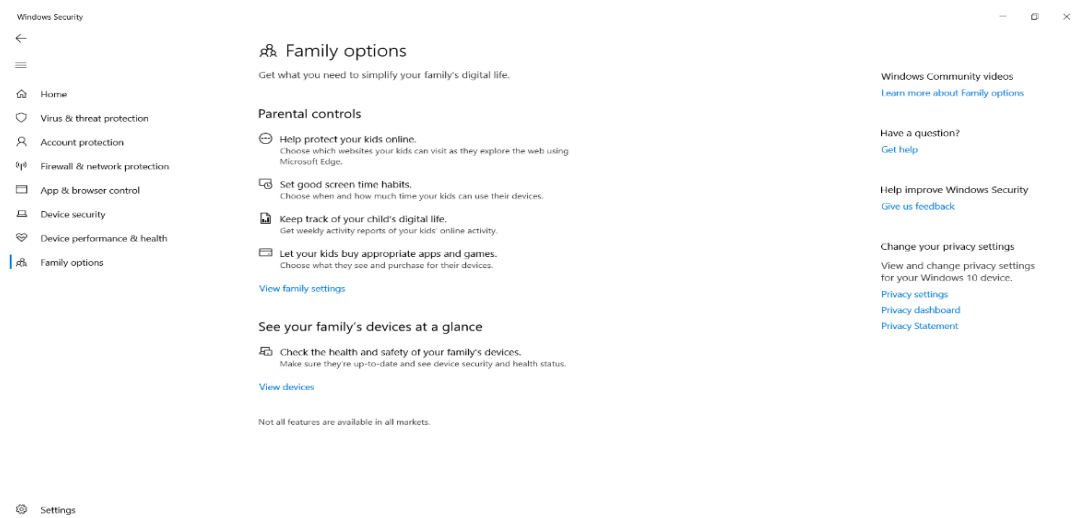
Fig 3.3.6 Family Options

Lastly, Family options offer parents a number of restrictions that they can enforce on their children's devices, such as blocking specific websites and setting a time that the device can only be used.
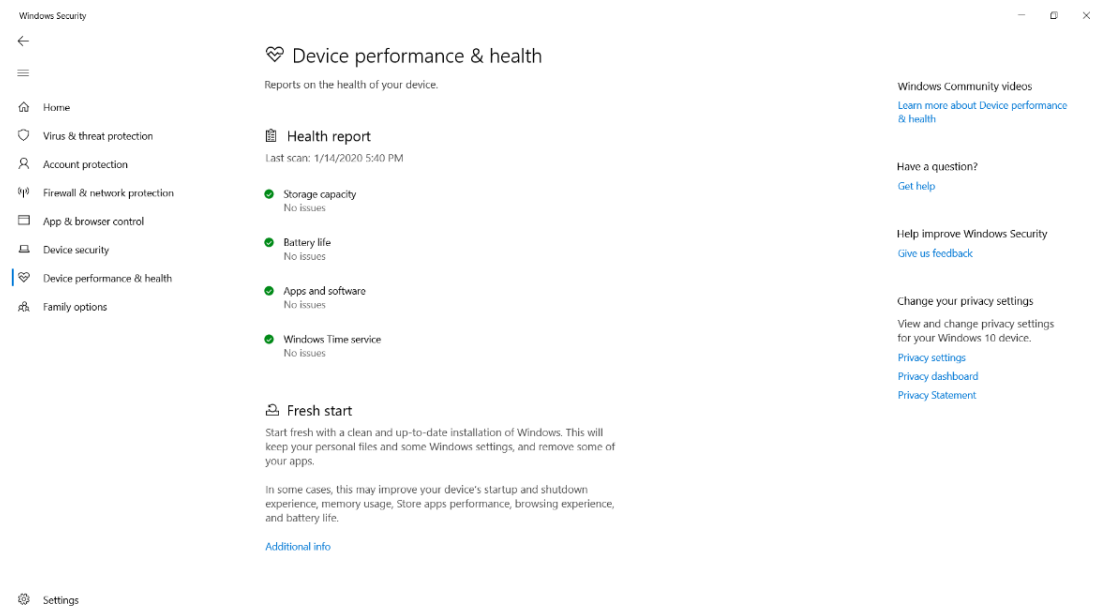
Fig 3.3.7 Device Performance & Health

Windows 10 protects its users through multiple robust cutting-edge security techniques that combine flexibility and easiness of use to nearly every user.

<div align="center">

4.0 Individual Critical Discussion

</div>

4.1 Socio-technical Issues

After the invention of the first mechanical computer back in 1822 by Charles Babbage (Hope, C., 2020), no one thought that one day a greatly modified version of the same technology would become components/devices of daily modern life. Computers from then have evolved a lot and have become very accessible devices comparatively. Whenever we hear the word "computer" nowadays we think of hardware that can fit on one singular desk, foldable technology that can be put into bags or even small devices that can fit in pant pockets. This was not always true. Computers have evolved from once taking up multiple rooms of adjoining modules to now taking up only one desk in a room/office. This was warranted by the research and development in technology sectors. Without the advancement of technology computers as we know it today would not have existed.

One of the most notable advancements in technology is Artificial Intelligence. Artificial intelligence is concerned with building smart machines capable of performing tasks that typically require human intelligence. *The first achievement by AI was in 1951; a machine is known as Ferranti Mark 1 successfully used an algorithm to master checkers. In 1972, WABOT-1; the first 'intelligent' humanoid robot was built in Japan* (Builtin.com, 2020). *The year 1997 marked another great achievement of AI; IBM's Deep Blue (an AI-controlled machine) became the first computer to beat a reigning world chess champion, Garry Kasparov. This great feat was later followed by IBM's Watson (a supercomputer which uses AI and analytical software to answer questions) beat two champions (Ken Jennings and Brad Rutter) of the game show "Jeopardy!", in* 2011 (SearchEnterpriseAI. 2020). Nowadays AI is more widely used; companies like Amazon, Google, etc. use AI to analyse mass amounts of customer data to find patterns in customer behaviour.

Artificial Intelligence is an attempt to replicate or simulate human behaviour/intelligence in machines. The subject itself has become so vast, that a single definition cannot explain the whole field/study. In the book "Artificial Intelligence: A Modern Approach", authors Peter Norvig and Stuart Russel delve into four different approaches in AI (Medium, 2020).

- Thinking Humanly
- Thinking Rationally
- Acting Humanly
- Acting Rationally

These approaches concern thought processes, reasoning, and behaviour. Even though most of these definitions are very abstract to the average person, but they provide a general understanding that ties AI to computer science and allows infusing machine learning with other parts of AI too. The CEO of DataRobot, Jeremy Achin addressed a crowd at Japan AI Experience in 2017 with this definition of how AI is used nowadays: "AI is a computer system able to perform tasks that ordinarily require human intelligence... Many of these artificial intelligence systems are powered by machine learning, some of them are powered by deep learning and some of them are powered by very boring things like rules." (Builtin.com, 2020)

AI has changed a lot of things, procedures and technologies. With the introduction of AI voice assistants like Siri, Cortana, Alexa, Google Assistant, etc. it has become a necessary part of day-to-day life too. Now AI generally has two categories; Narrow AI and Artificial General Intelligence (AGI). Narrow AI is a simulation of human intelligence with limited context. This type of AI is good at performing single tasks very well. AGI, on the other hand, is referred to complex AI (mostly seen in movies), where the AI is capable to replicate human behaviour and can apply intelligence to solve any problem.

Even though AI has had its fair share of advancement and praise, it still hasn't been fully implemented or developed as of the present day. According to many researchers, AI still has a long way to go. It is recently that many companies, researchers and mainstream applications have embraced the idea of AI and started implementing it into their products. It is changing how a lot of tasks done daily are performed and executed. Many tedious jobs like managing an array of parts in a factory or quality assurance of products have been taken over by AI. This creates many more possibilities, but some opposers of AI see this differently. As AI is advancing, it is being used in many companies to do repetitive jobs more effectively and efficiently; employees are usually downsized. The opposers of AI say that in the future, people will be jobless and face mass amounts of poverty. It is even said that AI is possible to achieve sentience if advanced enough, which might end up with sentient robots overthrowing the human race (this has been depicted in popular movies such as "Terminator"). Many

people think otherwise, as they have already embraced the idea. After the implementation of self-driving cars by the tech giant Tesla Inc., it has become evident that people are more welcome to the technology than they let on. For now, AI is the forefront of advancement in technology, and it has made life easier and presented with many opportunities that before, humans might not have even thought of. Though it has its problems, many types of research claim that it can be improved upon with further development and future iterations of the base technology. AI has changed how we as humans think; and has allowed us more time to spend on life. For these reasons, AI is here to stay and will bring many more possibilities/advancements soon.

It is amazing to see how humanity itself has evolved and got used to computer systems over time. AI systems have brought about many welcoming changes but at the rate at which it is advancing, it might overwhelm the general day to day user and bring forth problems that we have not encountered yet. Many opposers of the whole AI hierarchy have thrown ideas where they have speculated that this enormous rise in AI might bring about sentience in computing devices/robots. Considering these opposers, the general public has already embraced the idea of the rapid increase of computing technology itself, therefore paving the way for future endeavours in research and development in this sector. Taking this into consideration, AI itself has brought more benefits than problems as of now. People have become more fascinated and researchers all around the world have shown piqued interest in this technology sector. AI has become a regular product and has interwoven itself in daily life. With such advancements, it is safe to say that AI will bring forth more possibilities than we can even comprehend.

4.2 Environmental Sustainability

Today we live in a drastically evolving world. Despite technology comes up with the latest solutions to solve the problems we face; it also comes with its challenges. One aspect of

those challenges is our environmental sustainability being affected by various technology firms resulting in global climate change. This section discusses the Environmental sustainability of a technology firm Microsoft.

Microsoft Corporation, a giant technology firm stresses that environmental sustainability is a vital concern and is given prior attention to work on it. This company implements a various wide range of activities from introducing the Microsoft Carbon Neutral Fee program, powering its datacentres with renewable energy, leveling the use of water to water stewardship, building environmentally friendly cloud computing, up to the application of Artificial Intelligence (AI) to environmental concern.

In addition to the computing aspect, the company is engaged in various global impacts within different parts of the globe such as Preserving the forests of mount Rainer, Protecting Orangutans in Indonesia, Supporting the new renewable energy market in Taiwan. Besides, the company conducts several types of research targeting environmental impacts with well experienced Microsoft hired specialists concerning the Environmental field of studies, as a result, the organization has a high reputation in promoting environmental sustainability concerns.

We will be discussing the major sustainability initiatives of Microsoft corporation in a briefly mannered way.

1. The Carbon Neutral Fee Program

A senior director of environmental sustainability at Microsoft, T.J Dicaprio stresses that environmental sustainability is a responsibility and an opportunity for Microsoft. Internally in terms of their operations and externally in terms of how they minimize their impact and raise the contribution to the world. (TJ, 2015)

She emphasizes that 3 basic strategic pillars are designed and implemented by Microsoft to deduce environmental foot print & procure full carbon neutrality at Microsoft.

Fig 4.2.1 Three Basic Strategic Pillars

As she explains in 2012, they launched an internal carbon-neutral fee program for all over Data centers, offices, software development labs, and air travel to be carbon neutral. In turn to attain a fully green power equivalent to the electricity utilized.

How does Microsoft's Carbon fee model work?
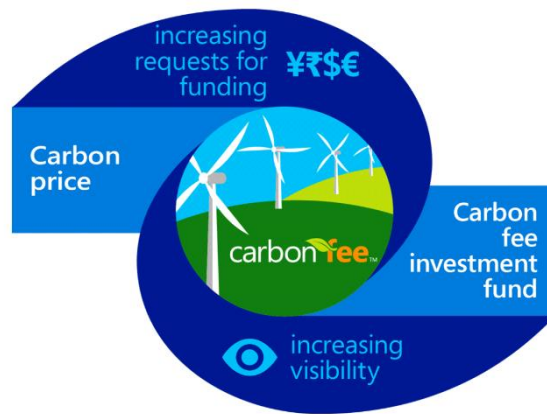
Fig 4.2.2 Microsoft Carbon Fee Model

As illustrated by Tj on the video published by UN Climate Change, it's a financial model in which Microsoft's all departments are financially accountable and sets an incremental fee for their carbon release every quarter then after funds collected are spent on initiatives such as (Tj, 2016)

Fig 4.2.3 Carbon Fee Fund Investments

- Internal Efficiency initiatives
- Green power projects
- Carbon offset projects
- E-waste recycling
- Green Energy & Green Power
- Research & Innovation

Mark LaCroix, Executive vice president of America's natural capital partners told that

they are working jointly with Microsoft to take a portion of that fund and make use of it for high-quality carbon diffusion deduction projects in the least developed countries. (Mark, 2015)
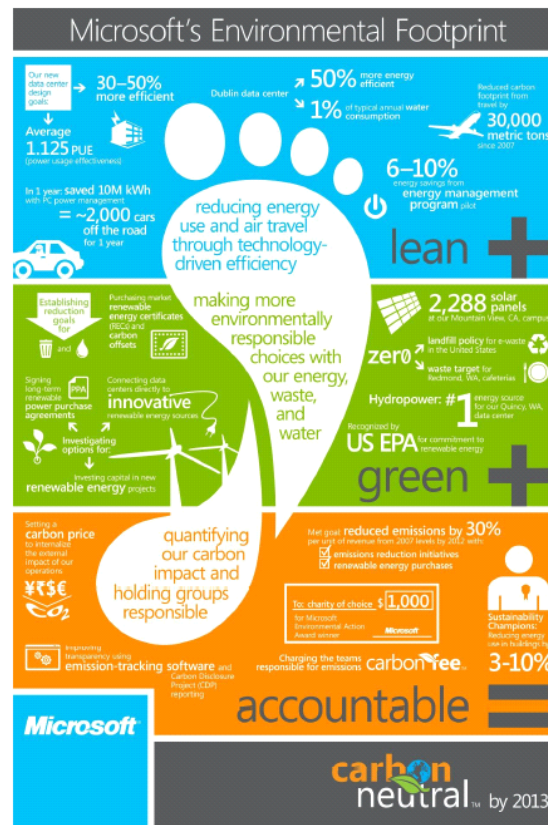
Fig 4.2.4 Microsoft's Environmental Footprint

2. Microsoft's Artificial intelligence for Earth Partners Programme

Lucas Joppa is a chief environmental officer at Microsoft. He mentions that A.I has been introduced to overcome environmental setbacks in agriculture, biodiversity, water, and climate change. As he stated that Microsoft has been investing $50 million within five years, over 450 projects conducted in 70 countries across the globe. (Lucas, 2019)

One of the A.I projects deployed was called Wild Me applied to threatened animals like Cheetah, Elephant, and whales. It involves the application of machine learning to figure out specific individuals in a genus to gather a global database of the precise number of animals that are alive in a genus.
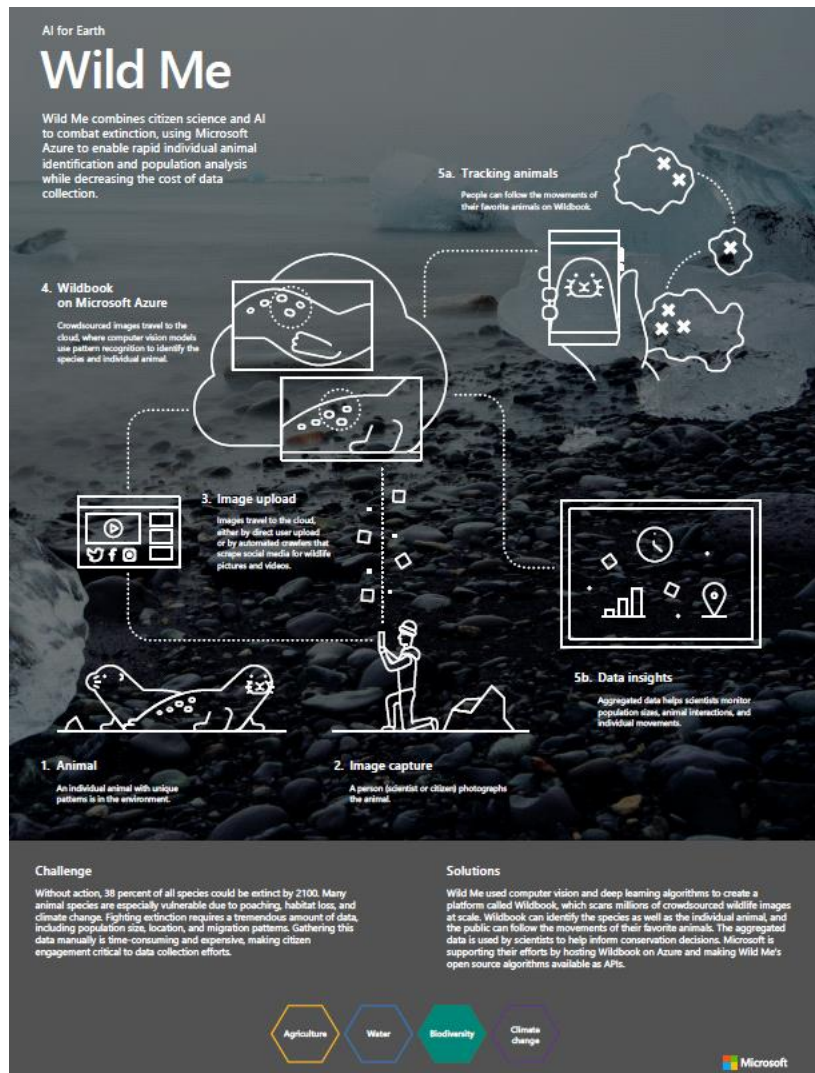
Fig 4.2.5 Wild Me Project

Jason Holmberg, Executive director of Microsoft A.I for Wild Me project, elaborates that an algorithm is used to digitally capture the animal much of like human fingerprint and analyzes it as raw data. (Jason, 2019)

Dr. Tanya Berger a Director of A.I for Earth grantee, briefly explains the video published by Microsoft that it's believed to be there are 90 thousand threatened species in the world. To find out why these animals are in high danger, accurate data is required. She mentioned that Microsoft's A.I provides us all relevant data captured from an instant point which enables us to do further research. (Tanya,2019)

Microsoft A.I for Earth Partners not only ends here but extends further to:

Artificial Intelligence Models	APPLICATIONS
Sun Culture	For farmers and Irrigation purposes
Terrafuse	Foresee Climate Changes
Ag-Analytics	Gather accurate data and provide for farmers
Ocean Mind	Protect lives underneath the ocean
Silva Terra	Preserve forests & enhance Ecosystem
PAWS	Safeguarding endemic and threatened animals

Table 4.2.6 Microsoft's A.I types and their applications.

3. Microsoft's Cloud Computing

Even though standard Data centers are the heart of any actively operating tech company, their energy consumption, and effect on the environment is highly severe if noticed carefully. As a result, today's tech firms who are aware of this are shifting their data centers to Microsoft Cloud.

Rob Bernard, chief environmental strategist and Christian Belady who is a manager at Cloud Infrastructure Strategy and Architecture jointly published a report on how Microsoft Cloud supplies services concerning Carbon release deduction. As a result, they learned that they are 93% energy efficient & 98% Carbon efficient in contrast with the ordinary datacenter service providers. (Rob and Christian, 2018)

Microsoft Cloud services are energy, carbon efficient.

For localized deployments, Microsoft Cloud is between **79 to 93% more energy efficient** than a traditional on-premise datacenter.

When renewable energy is taken into account, carbon emissions (kg/CO_2/user-year) from Azure Compute are **92–98% lower** than a traditional on-premise datacenter.

The four key investments that reduce environmental impact:

Renewable electricity

Operational efficiency

Infrastructure efficiency

Equipment efficiency

$kgCO_2e$/user
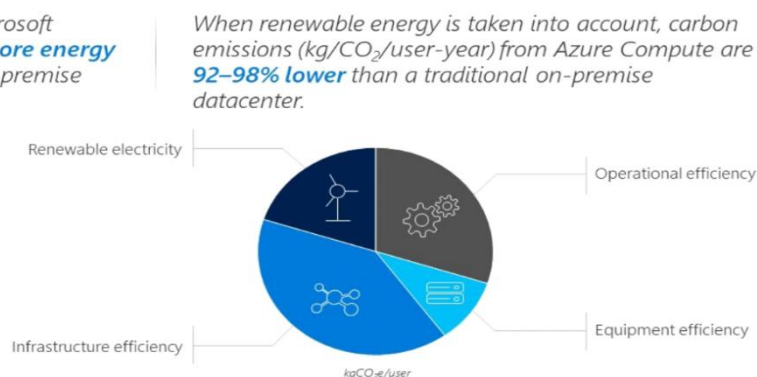
Fig 4.2.7 Microsoft Cloud Services

They further say that from their research conducted, Microsoft Cloud is not only supplying services but also contributing crucial role by procuring Carbon & energy which in turn deducting Carbon diffusion. They also emphasize that the numbers are not overnight success instead of efforts of a long period and intent for their datacenters and cloud services to stand out from the others as the best one by investing in sustainability.

4. Datacentres Power Sustainability

Microsoft designs sustainable renewably power-driven datacenters deployed to work. Recently numbers show that 60% of its source power was generated from renewable energy during 2019. Microsoft plans to hit over 70% of its data centers to function by power produced from renewable sources by 2023 (ZDNet, 2019).

Microsoft has also designed a system where they efficiently conserve and utilize refilling water. Known as a water replenishment strategy deployed in regions where water scarcity occurs by 2030. Their main target is for their data centers to consume zero water for cooling for more than half the year. The design uses external air instead of water for the cooling system when the temperature drops under 85 degrees and if it's beyond the evaporative cooling system is applied (Microsoft, 2019).

4.3 Programming

Based on the research done by (Osetskyi, 2018), while we push farther and wider into a society that is dependent and entrenched on the Internet, the need for developing web apps is rising. Cloud computing is becoming increasingly popular and web-based applications are falling in line with that. Using the internet as your processor, instead of your computer, is one reason why web app development is becoming very popular. A few examples of web-based apps are lightweight photo editors, e-mail clients, word processing and spreadsheet applications. They are also not as powerful as something you would find from Word, Photoshop or a Windows desktop app. Therefore, desktop applications continue to be extremely popular and useful. They also have some web-based aspects too. So far, the most advanced applications such as Auto CAD, Photoshop or Final Cut Pro X for Mac OS, should still run on your local machine. This is because these heavy applications need all the power of your computer. It means that it is difficult to run these apps on your internet browser because these apps need access to the low-level OS and hardware architecture and the interface that demand speed, complexity, and precision. It is believed that this will remain true for at least 5 to 10 years.

If you're developing a Windows desktop app, you would have to use Microsoft Visual Studio. The .NET Framework used by Microsoft Visual Studio helps you to do a lot of different things, but it also opens up a world of tools for you to use like Python, C#, C++ and more. It's a subscription-based service that is highly beneficial to anyone wanting to dig into the creation of Windows 10 software. It has several powerful tools to use to build desktop software and is an excellent choice for its many Windows application framework choices.

Fig 4.3.1 Microsoft Visual Studio work environment

If thinking about the creation of Windows desktop applications - the. NET set of resources is the first to come to mind. The technology further listed in the Desktop App Development Frameworks segment is a part of it designed to help software engineers achieve those specific tasks of designing the backend or frontend of native Windows apps. Windows Presentation Framework software is part of the. NET system. This is a graphical framework that helps users build interfaces while involved in the creation of Windows apps. It has been a part of the framework since 2006 as well as the third edition. NET as an important part of the. NET Windows App Platform. According to (Krishna, 2017), C# is used more commonly on Windows (because it is a .NET native language) The "true" programming language is the one built to build the type of program you are creating. Your best bet at running a program on Windows, Unix, and macOS without making changes to Java. The most critical options from a technological standpoint when developing a new desktop application are which programming language(s) and GUI platform to use. What's fascinating is that the programming language and GUI toolkit options affect one another. For example, if you choose Electron as the GUI toolkit (/platform) then you will need to use JavaScript.

As stated by (Osetskyi, 2018), Electron (developed by GitHub) is an outstanding open-source framework that utilizes Node.js to allow developers to use HTML, CSS, and JavaScript to build cross-platform desktop applications. This platform is used by many different companies for designing desktop applications like Stack, Microsoft, and Twitter. Swing (a graphical user interface toolkit) is also an excellent cross-platform app development language. It is a part of the Java framework which enables you to make outstanding desktop applications that comply with Windows' desktop application frameworks. The entire reason Swing was created was to offer a better selection of components for the graphical user interface. It is one of the strongest cross-platform software systems out there since Swing emulates the look and style of many platforms. Both swing applications and components are built using the Java programming language and are platform-independent. One of the benefits of using Swing for a Windows desktop app is that it has a high degree of flexibility and a deep dependency on runtime mechanisms that help it to respond to changes in its runtime settings. This helps Swing developers to hot-swap their code while it is running. Swing also offers feature accessories to enhance the user experience including stylish borders for components and components tooltips.

If you would want to learn the languages above the best sites on the Internet are GitHub, Stack Overflow, Simplilearn, MIT OpenCourseWare, edX, Code School (Pluralsight) and if all of those wasn't helpful enough you can go on YouTube. Based on the information from (GitHub,2019), "we help society in which more than 40 million * people are learning, connecting and working together to create apps. Developers from all over the planet are bringing together amazing stuff." According to (Stack Overflow, 2008) the website was created in 2008 and is the biggest, a most trusted online forum for anyone who codes for learning, sharing their expertise and developing careers. Each month, more than 50 million unique visitors come to Stack Overflow to help solve technology challenges, develop new skills and find employment opportunities. The information gathered by (Boricha, 2019) states that the MIT OpenCourseWare Initiative takes available both MIT undergraduate and graduate classes. It ensures you can get a degree at the MIT standard even if you are not enrolled in MIT. You will not only take courses in computer science, but you will also obtain certain topics. Also, EdX is a Microsoft-supported, open-source software tool. It already has over 5 million students in the network. The platform has many research sections that include Computer Science. You can find here tutorials which teach you languages such as HTML, CSS, jQuery, Java, C++, C#. Python, SQL, and the creation of even mobile apps.

Finally, we have Code School (Pluralsight), which is among the best online coding websites. The contents are very well brought together in the form of images, slideshows, and immersive software lessons. People new to programming can consider Code School simple and easy to learn from. There's also plenty of flexibility you've got in picking Code School courses. There's also a lot of variety that you have in selecting Code School courses. Whether you are involved in growth at the front-end or back-end, there is something for everyone.

4.4 User (Student)

Nowadays, the smartphone has become a necessary tool not only for every student but for any user, but it's limited for portable communication only. For heavy-duty processing power, laptops and desktops are simply required, while speaking of Microsoft Surface GO is just not a usual laptop, it's a 2-in-1 laptop made up of a tablet and a detachable keyboard that makes it's a portable laptop.

Microsoft's Surface Go is an ideal device for students, thanks to a lightweight and portable design. It's small and light, it'll fit easily into a backpack or under an arm when

moving between classes. Microsoft released a budget Surface device. The company/product line is known for $1,000-$3,000 tablets and $100 pens. Surface GO, a $400 device for students, which is meant to be comparable to its Surface Pro line that costs three to five times as much, depending on the model.

A portable laptop for the student must achieve some basic requirements. Firstly, the Microsoft Surface GO has 3411mAh (typical) battery capacity that is enough to provide eight to nine hours of battery life or a bit more but the device lasts longer in Windows 10 Home. As mentioned above The Surface Go has a 10-inch display, it deploys Intel® Pentium® Gold Processor 4415Y, which is the 14 nm lithography chip and consumes only 6 watts of power, which consist of two cores, four threads, 2 MB of cache memory on the processor, and a clock speed of 1.6 GHz.

Though it has a 4 GB RAM integrated onboard, but the system also reserves virtual memory of 1.2 times the storage size of RAM to access the data which temporarily saved hard disk when it is put to sleep, this allows information to be retrieved faster through RAM and avoid delay for the process of multiple tasks by the CPU. The Surface GO supports Windows Hello face authentication camera (front-facing) that unlocks the device almost as soon as possible. It uses 3D anti-spoofing technology to improve security.

Interestingly, the Microsoft Surface GO can learn the user's daily routine and usage patterns, powering down the unimportant applications. It provides the Power Saving Mode that manages the battery life based on the prediction of the user's usage. The intelligent power saving with large battery capacity allows more time to use and less time to charge. Device staying available for use is very important for a student; so, it cannot cause a loss in their work. Also, Surface GO can be transformed into a desktop PC by plugging in Dock with the Surface Connect cable.

Finally, the Microsoft Surface GO has useful features, as the LTE modem uses Qualcomm Atheros, the chip has an advanced version of LTE that allows users to access the internet through SIM cards globally almost anywhere but has several limited bands at its arsenal. In Surface GO a Micro SD card (up to 128 GB) can also be installed to upgrade storage. If the LTE internet is on all the time in a laptop, Then, data can sync on the cloud,

which makes it difficult to lose data even if the device is lost that makes the student's data more secure.

The price is a little varying, as it does not include the Surface Pen ($100) or type cover ($130), both of which are heavily marketed with the device itself and essential to use it as a normal laptop. Windows do a variety of tasks; this makes it convenient for college students who will most likely be using it for both school and leisure. The Surface Go comes in at a lower price than the Apple MacBook Air and can do the same tasks just as well. Overall, the different combinations of clicks of the Surface Pen's button launch apps like OneNote and others. Students can write on Office documents, Edge web pages, emails in Microsoft's Mail app and more. Microsoft introduced the Microsoft Classroom Pen, which is designed for students who use surface GO. Microsoft's hardware team worked with students to develop this pen which has a more durable tip, fewer moving parts and connects the device within range. Surface GO is good for many environments, especially at its decently low price point.

Why Surface GO is the way to go?

Microsoft's software solutions are used in schools (and businesses) around the world. According to the consult firm Future sources, Microsoft hardware had 44 percent of the global education market in May 2018.

Microsoft's hardware and software infrastructure-building forte is an important asset for education. Microsoft brings initiative collaboration, Teams for Education, device management, and Intune for Education to the table with devices like Surface GO. This is accompanied by cloud and enterprise-grade software like Office 365 for Education. Surface GO in education is backed by the weight of what makes Microsoft an enterprise's success. As compared to other companies, Microsoft's Surface GO likely provides the most benefits to students.

4.5 System Architect/Analyst

PRICE:

So, Microsoft Go is costing me around 2251 RM/per device (549$, 509£, AU$839, AED2399). Meanwhile, I could get the surface Pro for as low as 1639RM ($399, £379, AU$599, AED1,699), with 64GB of eMMC storage and 4gb of memory, with the rest of the specs stay the same.

Annoyingly, I don't know why Microsoft keeps selling their tablet but they are selling accessories separately. The Surface pen starts from 406RM (£99, AU$149), somehow the

new Alcantara texture type covers for surface Go ask for 529RM ($129.99) These are available in different colors, cobalt and platinum it cost me extra that is a negative point.

Buying in bulk:

An electronic customer encompasses a good selection of suppliers. I'll be able to do a whole and correct analysis and I can get my Microsoft surface go in a store or online stores like e-bay and amazon. If I will try to shop for laptops for a whole workplace, faculty or different organization, then it should better to buy in bulk. The most risk in bulk buying is running into a scam and losing your cash or money data. Make sure to create your purchase supported each value and dealing security. If I will purchase Microsoft surface in bulk then I will likely get a minimum 10% off on my whole purchase of Microsoft Go but a different place gives me a different discount. Buying in bulk means buying surface Go for my business purpose for that Microsoft provides a program name as **Surface All Access for business**

This program providing me with access to the Microsoft surface merchandise you want to efficaciously run your commercial enterprise at a charge that suits your budget. With adjustable payment duration and 0% APR, Surface All Access for business let me get your business up to strolling in a manner that works for. Plus, I'll be capable to improve your hardware as time progresses.

Surface All Access for business is Microsoft programme which allows any small start-up accepted into the program to pay a monthly fee for a new surface device and accessories. At the end of the chosen term, simply go back to the device shop for the newest gadgets and add-ons at that time. By using surface all access for business, you never have to pay a large amount of fees upfront for computer accessories that are now permanently upgraded. And this program is giving me a bit relive and hope for less payment and full access quickly.

Like for my opinion Surface, All Access for business is ideal for buying in bulk and good for business looking to stay productive, but also need to unfold out the charge over a duration of time and also stay on the reducing-edge. I'll be able to start work right away to do so your way. Choose from several different hardware and software bundle options that are tailored to your needs. Be correct to your budget-and even better to your productivity- by applying for Surface All Access for business today.

Quality in bulk

Buying in bulk may reduce the price per unit but it also increases the risk factor that the company may send you defective or refurbished laptops but if you buy through Microsoft All-access business you don't need to worry about quality because Microsoft never disappoints their customers. So quality remains the same if you buy in bulk through the official store of the company.

Service time of Surface

If my surface Go needs service, first I will go check if my Surface is registered. If it is no register, then first I will register it. Then, request service for my device online.

When I will request service online, they will check if my device is still under warranty. If it is out of warranty, I have to pay for other service charges.

Then I'll need to send surface to Microsoft for servicing. Before I do, take steps to prepare my Surface, like backing my files and data.

When I will get my surface back from service, you'll need to take some steps to set it up again for use.

Before I start planning and requesting service for my Surface, there are some trouble problem or errors tips you can try, that includes running the surface diagnostic Toolkit to check any issues that we can resolve without servicing. Before giving a laptop for service don't forget to back up your data it can save your money and time.

How Much Will Service Cost

If your Surface warranty is valid than the service will be free of cost but if your warranty is not valid or out-of-warranty service and you have to pay for service the estimated service charges for Surface Go is 1019RM

Time for service

It normally takes 3-12 business days to recover your surface back after you ship dispatch it to us, contingent upon where you live and barring any inventory or shipping delays. For Surface Studio, a specialist will support you and it might be transported back to you Faster.

4.6 System Administrator

With 336,6101 MYR being the median pay and up to 536,2782 MYR pay per year according to the U.S Bureau of Labor Statistics (U.S Bureau of Labor Statistics, 2019), system administrators (sysadmins) receive such high pays because they are a vital factor of success to all IT organizations. A sysadmin is an employee in an organization that is responsible for maintaining the computer system or systems (Englander, 2014) by performing the following, but not exclusively, tasks (Englander, 2014):

- Add and delete users within a software platform as needed;
- Configure systems and set up and distribute group configuration policies;
- Control and modify users' privileges to meet the exact needs of the users;
- Monitor and provide appropriate security solutions (to prevent cyberattacks);

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[1] Equivalent to $82,050
[2] Equivalent to $130,720

- Manage, mount, and unmount file systems that control how data is stored and retrieved;
- Manage, maintain, and upgrade the network(s) used and its utilities;
- Provide, secure, and maintain backups;
- Install, provide, control, and upgrade software;
- Patch and upgrade the operating systems;
- Maintain the systems for optimum availability and performance;
- Monitor systems performance, recommend best systems modifications and upgrade the systems when required.

And according to the Red Hat Enterprise Linux, the philosophy of system administration is composed of these themes (Red Hat Enterprise Linux documentation, 2008): Automation of every task that is done repeatedly; Documentation of everything such as policies; Communication with users regarding system changes; Awareness of all available IT resources; Awareness of all the users within the system to provide appropriate privileges; Prioritization of security solutions; and planning the procedures to be taken when changes occur.

With consideration of the stated myriad of critical duties required of sysadmins, arises the need for powerful, efficient, secure, and reliable operating systems that provide administrative tools to allow maximum control of every aspect running in the software and hardware.

Windows 10, with more than 900 million devices running it as an operating system (Microsoft News, 2018), provides a multitude of tools for sysadmins, each tool possessing certain unique features and purposes/outcomes to manage and control the device(s) as needed. As for Windows 10 Pro 64-bit operating system, the followings are the tools provided as administrative tools: Component Services; Computer Management; Defragmentation and Optimization of Drivers; Disk Clean up; Event Viewer; iSCSI Initiator; Local Security Policy; ODBC Data Sources (32-bit and 64-bit versions); Performance Monitor; Print Management; Recover Drive; Registry Editor; Resource Monitor; Services; System Configuration; System Information; Task Scheduler; Windows Defender Firewall with Advanced Security; and Windows Memory Diagnostic.

The Component Services administrative tool configures and administers Component Object Model (COM) components, COM+ applications, and the Distributed Transaction

Coordinator (Microsoft Docs, 2013). Sysadmins use Component Services to manage COM+ distributed applications by deploying the application on a server computer and configuring permissions for the application (Microsoft Docs, 2012). Sysadmins have two primary ways to deploy and control COM+ applications; either by the Component Services snap-in through the Microsoft Management Console or by coding scripts to automate the deployment and administration process (Microsoft Docs, 2012). Component Services administrative tasks that can be performed by sysadmins are contained within four categories: configuring the system for Component Services, making initial services settings, installing and configuring COM+ applications, and monitoring and adjusting component services (Microsoft Docs, 2012a).

Computer Management is a collection of Windows administrative tools that provides sysadmins the control over either a local or remote computer. The tool is composed of three categories, each with subcategories:

- System Tools
- Storage
- Services and Applications

System Tools contains six tools: Task Scheduler, which enables automatic operation of routine tasks on the desired computer (Microsoft Docs, 2019); Event Viewer used to manage and observe events that are recorded in the Application, Security, and System logs (Microsoft Support, 2018); Shared Folders, which is used to view connections and resources the computer is currently making use of (Microsoft Support, 2018); Local Users and Groups, which manages local user accounts and groups (Microsoft Support, 2018); Performance, which is used to view performance data either from a log file or in real-time; and a Device Manager, that lists all installed devices in the computer and provides utilities such as updating device drivers (Microsoft Support, 2018). In contrast to System Tools, Storage has only one tool named Disk Management; it is used to carry disks-related operations such as formatting or creating volumes, besides, Disk Management aids in the management of hard disks the computer is using (Microsoft Support, 2018). Lastly, Services and Applications provides two tools: Services and WMI Control. Services starts, stops, and configures Windows services, while WMI Control configures and controls the Windows Management Instrumentation services.

Defragmentation and Optimization of Drivers tool rearranges fragmented data found in either the hard disk or removable storages thus improving efficiency (Microsoft Support, 2016). While Disk Clean up deletes unwanted, unnecessary, or miscellaneous files in the system.

The iSCSI Initiator enables sysadmins to set up the connection of a host computer to transmit data to an external iSCSI-based storage array through an Ethernet network adapter over TCP/IP network (Search Storage, 2015).

Local Security Policy Properties enables sysadmins to view and modify local security policies such as user rights and audit policies, thus allowing control of multiple devices in regards to security precautions.

The ODBC Data Sources gives sysadmins the ability to manage database drivers and data sources within the system (Microsoft Docs, 2017).

Print Management enables sysadmins to monitor print queues and receive notifications when print queues halt or stop processing print jobs, in addition to migrating print servers and deploy printer connections using the Group Policy (Microsoft Docs, 2009a).

Recovery Drive tool is used by sysadmins to make backups of the entire software to ease the process of regaining access to old data easily if corrupted or deleted.

Windows Registry is a hierarchical database that holds critical data for the operation of Windows and the applications and services that operate on Windows; it is used to store data about users and the current configuration of the system and its components (Microsoft Docs, 2009b); sysadmins use the registry to edit specific values of registries, create new registry values, export registry files, or import registry files.

Sysadmins use the Resource Monitor tool to acknowledge how processes and services are using the system's resources, monitor resource consumption in real-time, analyze operational processes, identify the applications that are using files, and control process and services (Microsoft Docs, 2012b).

Lastly, the Windows Defender Firewall with Advanced Security tool helps to protect computers from malicious network traffic.

With all the tools it provides for sysadmins, Windows 10 is an ideal and powerful operating system choice for many organizations and companies to use, especially the IT ones.

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Assessment Criteria (Marking Grid):

Group Component (70%)			
Fully	**Partially**	**Not**	**Performance Criteria**
			Distinction (55 – 70 marks)
☐		☐	All credit criteria fully met
☐	☐	☐	Work shows aspects of originality and creativity
☐	☐	☐	Discussions and opinions were well informed and help the point being discussed
			Credit (45 – 54 marks)
☐		☐	All pass criteria fully met
☐	☐	☐	Organization's history and achievements were well reviewed
☐	☐	☐	People in the organizations were identified and discussed
☐	☐	☐	Hardware was properly evaluated indicating strongest points
☐	☐	☐	Operating System discussions contains a good amount of details
			Pass (0 – 44 marks)
☐	☐	☐	Table of Contents
☐	☐	☐	Basic Introduction of Organization(s)
☐	☐	☐	Basic Description of Hardware
☐	☐	☐	Basic Description of Operating System
☐	☐	☐	Citation and Referencing

Individual Component (30%)						
Name ⟋ Grade						
Well-articulated discussions with reference to the documentation.						
Critical review discussed technology.						
Class Quiz						
Total.						