

Computer Game Platforms and Technology

Assignment 2

Unit 36

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Hardware Investigation

	Xbox One [1]	iPhone 13 [2]	Samsung Galaxy S21
CPU Name	Custom AMD Jaguar	A15 Bionic	Qualcomm SM8350 Snapdragon 888 5G
Number of Cores	8	6	8
Speed	1.75 GHz	3.23 GHz Max	2.84 GHz Max
Cache	32 MB split into 8 MB blocks	32 MB	5.5 MB
Bus Width	/	/	/
GPU Name	Custom GPU	A15 Bionic	Adreno 660
Speed	853 MHz	1200 MHz	840 GHz
Graphics Memory	/	/	/
Address/data bus width	/	/	/
Memory	Shared	Shared	Shared
System RAM	8 GB DDR3	6 GB	8 GB
Graphics Memory	8 GB DDR3	6 GB	8 GB
Display Type	External	Built-in	Built-in
Display	/	Super Retina XDR OLED	FHD+ Dynamic AMOLED 2X Infinity-O Display
Sound Type	Stereo	Stereo	Stereo
Compatible Interface Devices			
Number of Ports	6	1	1

Wireless or Wired	/	/	/
Analogue or Digital?	/	/	/
Connectivity			
Port Types	USB 3.0, HDMI In & Out, IR Blaster Port	Lighting Charging	USB-C
LAN	Yes	Yes	Yes
Internet Connection	Yes	Yes	Yes
Cellular	No	Yes	Yes
Wi-Fi	Yes	Yes	Yes
Bluetooth	Yes	Yes	Yes
Display Output	HDMI	/	/
PSU Type	External	Battery	Battery
Voltage	/	/	9.3 volts
Power Consumption	220W	20W	/
Storage			
Amount	1 TB Max	512 GB Max	512 GB Max
Proprietary mediums?	No – HDD	Yes	Yes
Flash Memory	8 GB	Via micro-SD	Via micro-SD
Optical Disc	Blu-Ray	/	/
Anti-piracy protection	/	/	/

Game Platform Hardware Report

What are the main components of the devices?

Central Processing Unit

The CPU is the main brains of the device, making it the most important component. It handles the execution of instructions and allows the device to operate. Depending on factors such as the clock speed and core count, the CPU can process instructions much faster. This affects gamers as the higher the spec of the CPU, the quicker it can execute instructions and the performance of the game you are running is enhanced.

Memory

Memory is the device's short term data store – it stores data the device is currently using, for example currently opened programs. This data store is one of the fastest in the device as it needs to be accessed repeatedly, the memory is almost always being actively used [3]. However, memory is considered volatile meaning when power to the device is lost, all the data in memory will be cleared. This affects the gamer as the more memory they have, the better their game will run as the game can load and store more of the game's data for rapid access whilst playing instead of having to access them from a secondary storage device. Having more memory will also allow the gamer to have multiple applications open at the same time whilst running the game, for example a voice chat application like Discord.

Graphics Processing Unit

The GPU is the device used to output graphics to a display. However, as the GPUs became more advanced, it gave programmers the ability to create more realistic scenes and better visual effects. With further improvement, GPUs can now be used for a wider range of tasks such as video rendering, creative production, deep learning, artificial intelligence, high performance computing and much more [4]. This affects the gamer as the more powerful their GPU is, the better it can render the scenes of the game to a high quality and the quicker it can refresh the image leading to a smoother game experience.

Secondary Storage

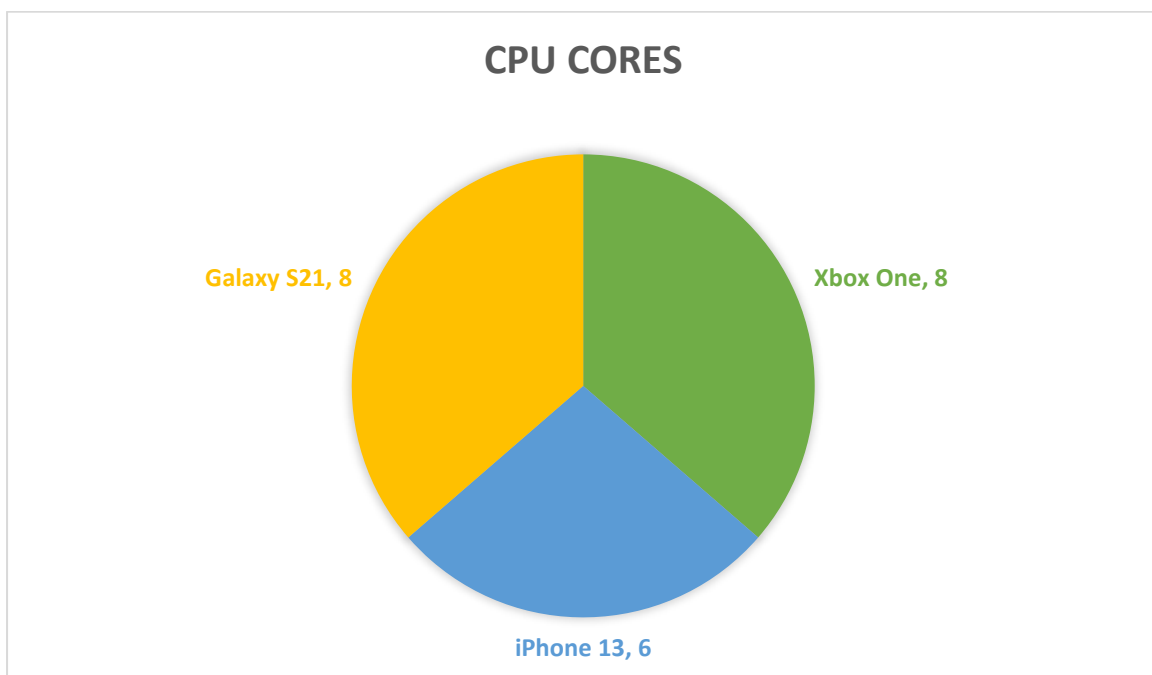
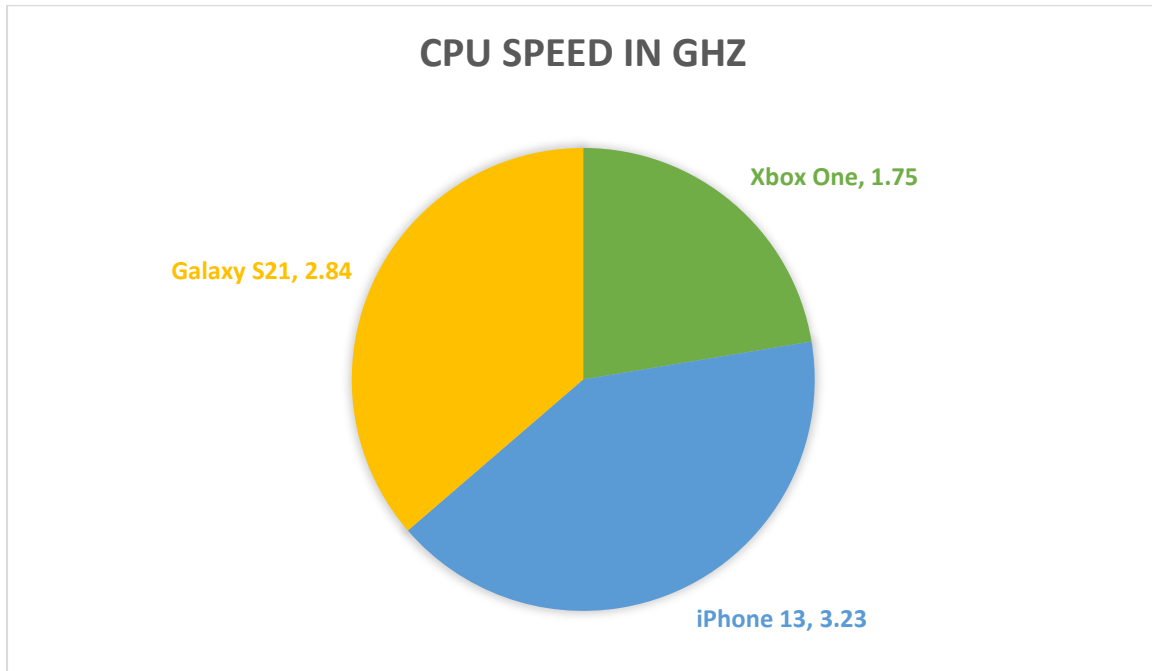
The secondary storage is a device such as an SSD or a HDD. These devices are used to store long term data such as the device's operating system, user's games and files, and more. Unlike memory, secondary storage is non-volatile meaning data persists when power is lost. Secondary storage is much slower than memory, but at the cost of much higher capacities [5]. This affects the gamer as the more storage they have, the more games and applications they can download and use.

Network Interface Card

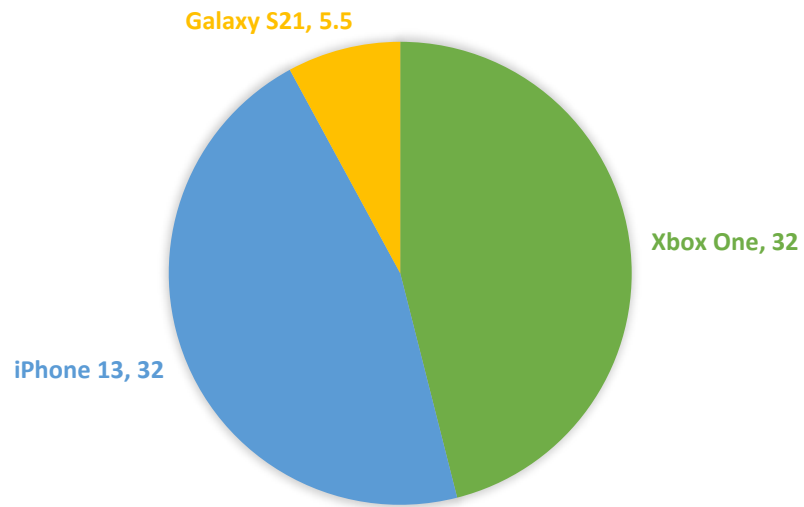
The NIC allows for the device to connect to the internet. This can be done via Wi-Fi or via a wired ethernet connection. Different NICs are rated for different speeds, for example some cards can support a gigabit ethernet connection, whilst others can support up to a ten-gigabit connection. This can affect the gamer as, if they are playing a multiplayer game, a better internet connection will help make the game run smoother. It will also affect their game download speeds as the better their connection the quicker the device can download the game's files.

How do the components differ between platforms?

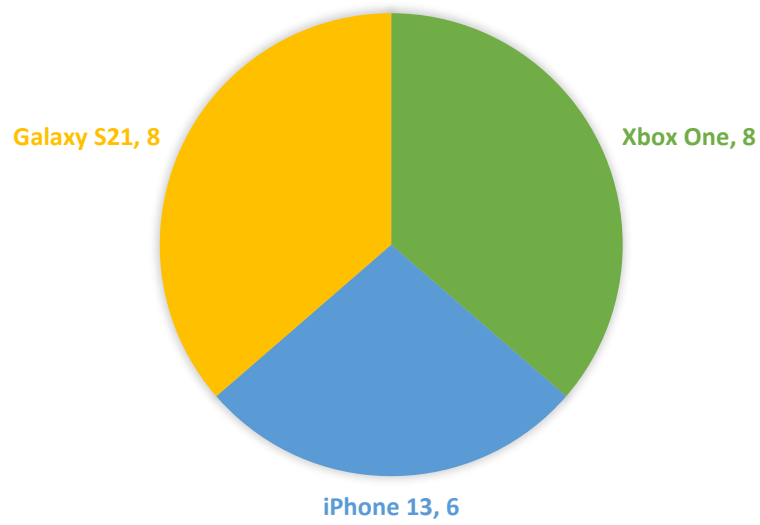
This comparison will be between the **Xbox One**, **iPhone 13**, and the **Galaxy S21**.

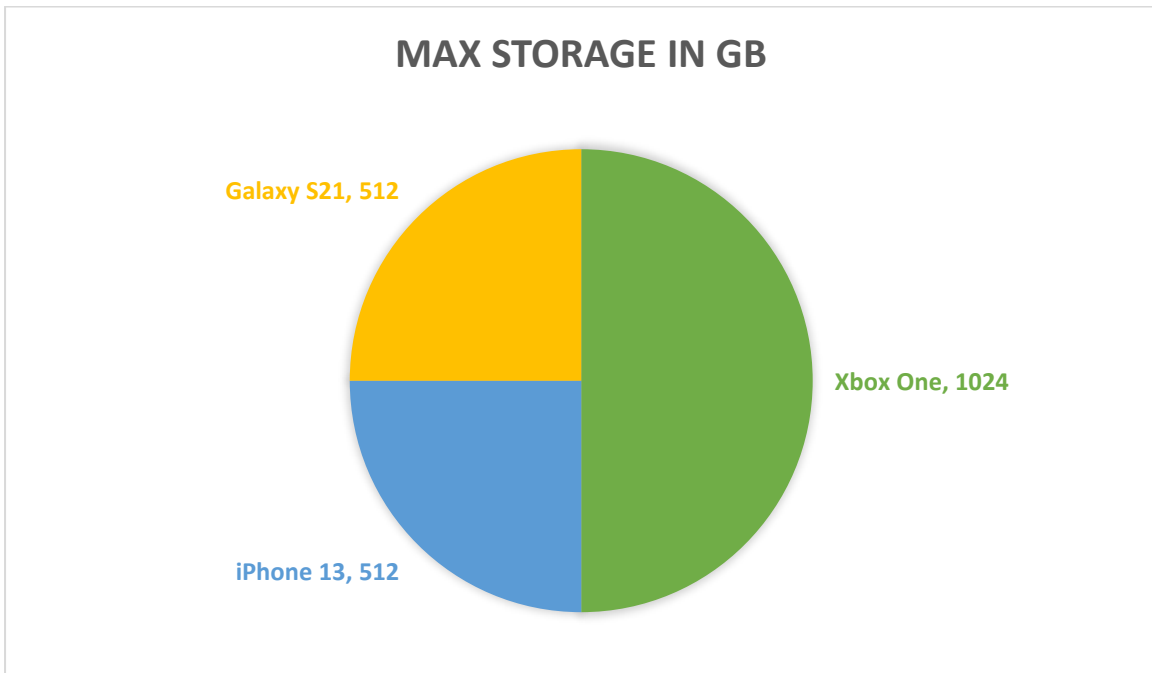
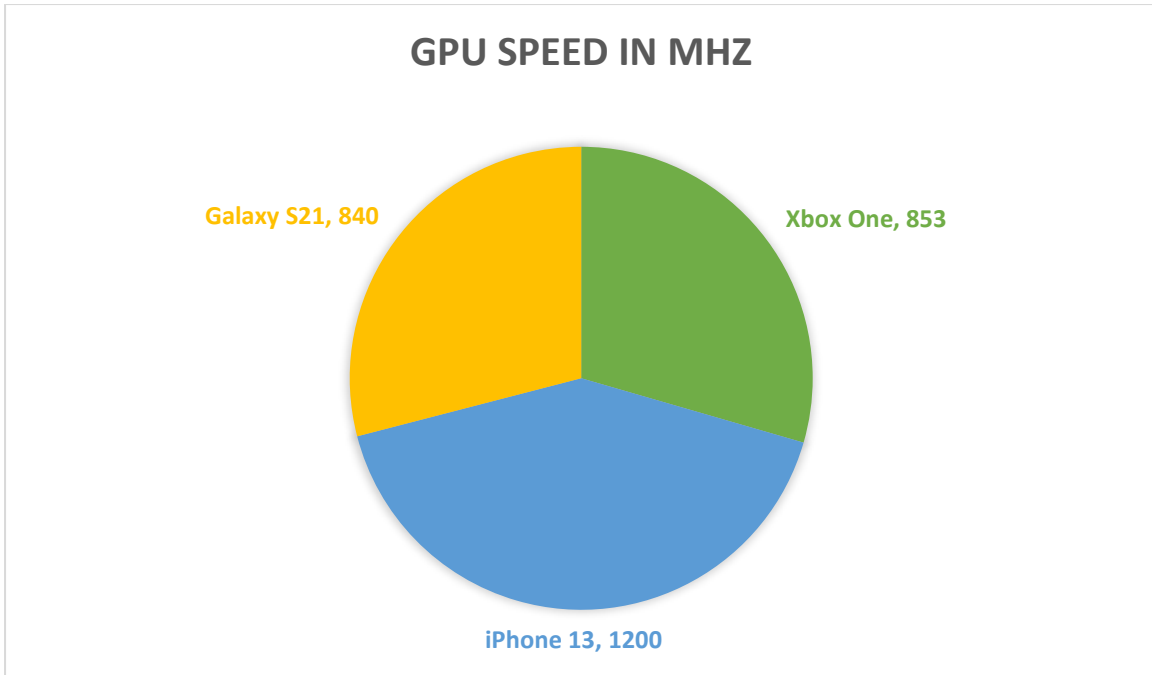


CPU CACHE IN MB



MEMORY IN GB





Overall, the platforms use the same core components just with different specifications. For example, the Xbox One uses an x86 processor, whilst the iPhone 13 and S21 both use arm. However, the raw comparison detailed above cannot decide which is the better platform, as there are many other factors that come into play. For example, having a lower clock speed with more cores would have better performance than a high clock speed with less cores. Or having more cache would increase the speed of the CPU's execution as it can store frequently used instructions on the die itself.

Software Investigation

For this table, I will be examining the different requirements needed to run a game that is compatible on all 3 platforms. For this example, I am going to use The Escapists 2.

	PC Game [6]	Console Game	Mobile Game
OS Version Needed	Windows 7+ OSX 10.10+ Ubuntu 14.04+	FreeBSD 12 Windows Core	iOS 12.1+ [7] Android 5.0+ [8]
Drivers Needed	Typical graphics drivers from AMD or Nvidia	/	/
Extra Software Required	/	/	/
Runtimes Needed	DirectX 11	/	DirectX 11
Connectivity	Supports split screen co-op and online co-op	Supports split screen co-op and online co-op	Supports split screen co-op and online co-op

Game Platform Software Report

There is a lot of software running in the background to power your favourite game. This could be runtimes such as Mono or DirectX, or libraries such as Mirror for networking in Unity. Following the previous example from The Escapists 2, I will explain what software is used and why, along with why they are important for the everyday gamer.

The Main Software

Runtimes

Runtimes are very important as they are the main executors of instructions while the game is running. The games are programmed to use the runtime's API. The runtimes give developers a layer they can use to create their game whilst the runtime does most of the main processing and execution.

Some examples of commonly used runtimes are Mono or IL2cpp (converts the C# code to C++). Another commonly used runtime is DirectX, which was created by Microsoft to allow developers to have a more direct interface between the software the hardware. This allows for more fine tuning to determine how their program works.

A runtime is needed to help developers interface with the hardware of the computer that the game is being run on to help its optimization to ensure it runs as smoothly as possible for the end user. It also allows for an easier experience when creating the game, as most of the low-level requirements are hidden by the runtime making game creation more accessible and easier to learn.

This is important to the gamer as the runtime used can often have an impact on performance. For example, Mono compiles the C# bytecode just-in-time to native code the computer can understand, essentially compiling the code at runtime. [9] However, IL2cpp converts the intermediate language (IL) code (such as C#) down to C++ then into a native binary, which is all done ahead-of-time. [10] They key difference here is that Mono compiles and turns the code while the game is running, whilst IL2cpp creates a native binary which then your computer uses to run the game. As IL2cpp compiles

the code ahead-of-time, this leads to much faster performance at the cost of longer build times for the developer and a large game file for the gamer.

Not all runtimes support all environments. For example, iOS used on iPhones does not support the Mono runtime meaning all Unity games must be built using IL2cpp. WebGL also only supports IL2cpp.

Software Libraries

Software libraries are APIs used by developers to help complete a task within their game. For example, a networking library such as Mirror in Unity could be used to help the developer implement multiplayer into their game. Or A* Pathfinding Project Pro which is Unity libraries for using AI NPCs.

Libraries are needed as they further speed up and assist in the development of games. When these libraries are readily available, the developer can just install them and use them to meet their needs. This also can help hide the complicated workings of some needs (e.g., networking) and make it more accessible for the developer and for learners.

This is important to the gamer as it helps add reliability to their game as functions are more likely to work as expected if a reputable library is used. These libraries are very heavily tested before release to ensure the best stability and performance possible.

Is the software different per platform?

When looking at an engine like Unity, there isn't a major difference between software per platform. Almost all the platforms can use the IL2cpp AOT runtime. This is a good factor as it creates a level of unity between all the platforms and makes developers able to develop for any platform they want whilst keeping the exact same code base.

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