**Objectives**

1. Research information about software for a specific operating system (OS) environment. You will be assigned one of the operating systems form the list of: Windows, Mac OS, Linux. You will also be provided with a list of topics to investigate.
2. Organize your rough research information into a list of topics, sub-topics and facts. This process will involve identifying sub-topics, rearranging your rough research notes, and selecting (or highlighting) interesting facts.
3. Report a summary of your research in the form of a “concept map”. Use the PowerPoint template provided as a starting point. The concept map should only include the best and most interesting information from your organized research notes.

Your assigned operating system is:

* **Windows**
* Mac OS
* Linux
* iOS
* Android

A concept map can be created using the “Smart Ideas” application or PowerPoint or other applications.

**Level 2 – Organized Research**

Organize your rough research information to provide more stricture and meaning.

* Re-read your rough research to identify (highlight) important sub-topics and facts
* Rearrange (cut–and-paste) your rough research so that related sub topics and facts are next to each other.
* Your finished organization should look like the template provided below.
* Upload your rough research notes to your repository when you are done.

Suggested organization template:

* Topic A – Productivity, Entertainment & Other Software Applications
  + Sub-Topic 1
    - Fact 1
    - Fact 2
    - …
  + Sub-Topic 2
    - …
  + …
* Topic B – User Interface (Window Management & Input Devices)
  + …

**Topic A:**

* **Subtopic: Windows Store**
  + The Windows OS brings a unique feature known as the Windows Store which consists of over 669,000 apps within the store. There are apps of entertainment, games, videos, and consists of other many fantastic features.
  + A new version of the Windows Store as arrived on the Windows 10 OS which includes new versions of the Windows Store app. The primary difference between the new and the old version of the Windows Store app the newer version consists of a more simplistic layout and its better suited for browsing on a desktop or notebook with a mouse.
  + The Windows Store also has Progressive Web Apps in which would automatically add selected quality progressive apps through the Bing crawler or allow developers to submit Progressive Web Apps to the Microsoft Store. An example of Progressive Web Apps is google docs.
* **Subtopic: Photos**
  + Windows Photos is a unique aspect within the Windows OS which was introduced with Windows 8. It allows the user to view images stored on your local device or Onedrive account and do simple edits and enhancements.
  + The latest Windows 10 Technical Preview which has the same features but is still a work in progress. One of the unique features within the photos app is the ability to play your photos as a slideshow and delete, copy or share multiple photos in one go. You can go through many fantastic memories with the slideshow option allowing the user to go through the photos like a slideshow just like many types of PowerPoints. Also, you can copy, share and delete many photos in one just quick movement.
  + There are 3 games within the photos app which are actually tools that Microsoft devised to improve their image enhancement, face recognition, and eye detection software in which you must give Microsoft permission to analyze and test your photos for those three purposes.
* **Subtopic: Calculator**
  + The Calculator app on Windows 10 is a resizable window on the desktop in which it comes with three modes: Standard, Scientific, and Converter.
  + The new Calculator on Windows 10 adds a fourth mode which is called Programmer. The program mode features binary numbers, octal numbers, and hexadecimal.
  + The user interface for the Converter has been redone. The measurements can that can be converted with all be listed in a sidebar, not in a drop-down menu.

**Topic B: User Interface (Window Management & Input Devices)**

* **Subtopic: Regular Windows UI**
  + The windows Taskbar sits at the bottom of your screen giving you access to the start menu, several application icons and the notification area.
  + Icons have also been updated as most Windows versions will feature different icons on the background. An icon is a graphic representation of an application or a file. Icons can also be moved around by clicking on them and dragging them to another place in the screen.
  + The main component of your desktop is the background. This is a simple image that appears at the background of your screen. However, Windows computers will come with a pre-selected background but can be changed to any other image that the user wants.

**Topic C: Memory Allocation, Management,& Devices**

* **Subtopic: Management**
  + Each process on 32- bit Microsoft Windows has its own virtual address space that enables addressing up to 4 gigabytes of memory. This means that each process on 64-bit Windows has a virtual address space consists of 8 terabytes. All threads of a process can access its virtual address space. Furthermore, threads cannot access memory that belongs to another process which protects a process from being corrupted by another process.
  + Most interface methods are called by code written by one programming organization and implemented by another code which is written by another individual. Many of these parameters and return values of these functions are the types which can be passed around by any value. This is necessary to pass a data structure. Furthermore, it is also necessary for both caller and called to have a compatible allocation and deallocation policy. COM defines a universal convention for memory allocation and is much reasonable than defining a case by case rule.
  + These methods of a COM interface always provide memory management of pointers to the interface by calling the AddRef and Release functions found in the IUnknown interface, from which all other COM interfaces derive.
* **Subtopic: Virtual Address Space**
  + The virtual address space for a process that is a set of virtual memory that addresses that it can use. The address space for each process is private and cannot be accessed by other processes unless it is shared. This means that any valuable information will be protected unless it is revealed.
  + This does not represent the actual physical location of an object in memory but instead, it maintains a page table for each of the process. This is the internal data structure which is used to translate virtual addresses into their corresponding physical addresses. Each time a thread references an address, the system translates the virtual address to a physical address.
  + The virtual address space for 32-bit Windows is only 4 GB in size and is divided into partitions and one is used by the process and other reserved for use by the system.
* **Subtopic: Memory Pools**
  + The memory manager creates the following memory pools that the system uses to allocate memory and it comes as a nonpaged pool or paged pool. These pools are located in the region of the address space that is reserved for the system and mapped into the virtual addresses of each of the process. The paged pool consists of the virtual memory that can be paged in and out of the system while the nonpaged pool consists of virtual memory addresses that are guaranteed to reside in physical memory as long as the corresponding objects are allocated.
  + In order to improve performance, systems with a single processor have three paged pools and multiprocessor systems have five paged pools.
  + The handles for kernel objects are stored only in the paged pool so the number of handles you can create is based on available memory. Furthermore, the OS system records the limits and current values for its nonpaged pool, paged pool, and its file usage.

**Topic D: Process/Task Scheduling and Management (System Startup)**

* **Subtopic: Task Scheduling**
  + Task Scheduler is a tool which is included with windows which allow the predefined actions to be automatically executed whenever that particular set of conditions is met with. An example could be that an individual could schedule a task to run a backup script every single day or send you an email when the time is set to that event. The picture or background will be an example of Task Scheduling as the image could change at a specific time.
  + The Windows 10 version of Task Scheduler introduces a battery saver and many triggers will be delayed if the battery saver is on.
  + It is not set to start the task only if the computer is idle meaning no one is working on the computer.
* **Subtopic: Updates**
  + Windows update is a free Microsoft service that is always used to provide update towards the OS and Service. This patches out bugs and many other issues and can be used to update drivers for popular hardware devices.
  + The Windows Updates also provides security updates or critical update vulnerabilities against security exploits against Microsoft Windows. These updates could also install more security protection software like Windows Defender and Microsoft Security Essentials.
  + Every second Tuesday of each month, Microsoft routinely releases their updates but every once in a while there will be an urgent update that forces your computer to install.

**Topic E: Software Security, Updates and System Tools**

* **Subtopic: System Tools**
  + System tools are computer programs that can be used for implementing different tasks. People then download them to the system with specific intentions, such as trying to accomplish any sorts of tasks, improve its performance and security, getting a better experience when browsing the web.
  + Most such programs belong to many reputable companies and are very safe and easy to use. You can uninstall a system tool from your computer using its uninstall feature.
  + System tools can be divided into two different categories- legitimate and malicious. These experts warn people about these malicious system tools because they can act on your computer similarly to viruses and malware.
* **Subtopic: Windows Defender**
  + Windows Defender Smart Screen can “block at first sight,”. This helps to protect individuals if they try to visit sites previously reported as containing phishing or any sorts of malware and stop them from downloading the potentially malicious files.
  + Application Guard is another form of Windows Defender which offers protection against advanced, targeted threats launched against Microsoft Edge using Microsoft Hyper-V virtualization technology. If a site is not trusted, Application Guard will open it in a container, completely blocking access to memory, local storage, other installed applications, etc.
  + Exploit guard includes exploit protection within Windows Defender. These features give network protection, reduction rules, and controlled folder access. It also provides legacy app protection including arbitrary code guard, blocking low-integrity images, blocking untrusted fonts, and exporting address filtering.
* **Subtopic: User Account Control**
  + User Account Control protects users by preventing malware from damaging a machine and helps organizations deploy a better-managed desktop.
  + When the feature is enabled, apps and tasks always run in the security context of a non-administrator account, unless an administrator specifically authorizes administrator-level access to the system. Furthermore, it can also block the automatic installation of suspicious apps.
  + These apps require the administrator access token must prompt for consent. The one exception of this control is the relationship that exists between the parent and child processes. Child processes inherit the user’s access token from the parent process.

**Topic F: File System and User Accounts**

* **Subtopic: User Accounts**
  + The system account and the administrator account have both the same file privileges but they both have different functions.
  + The system account is used by the operating system and by services that run under Windows. There are many services and processes within Windows that need the capability to log on internally. The system account was designed for that purpose; which is an internal account and does not show up in the User Manager and cannot be added to groups or have user rights assigned to it
  + The system account does show up on an NTFS volume in File Manager in the Permissions portion of the security menu. The system account has the same functional privileges as the administrator account.
* **Subtopic: New Data Recovery**
  + Windows 10 uses the default file system NTFS like its predecessor Windows 8. However, a complete change to the ReFS file system was rumored by professionals in recent months, the last technical build released by Microsoft resulted in no dramatic changes and Windows 10 will be continuing to use NTFS as its regular file system.
  + ReFS is only used in one place of the operating system with Windows 8. The technique allows multiple physical disks to combine into one logical drive and this concept has been transmitted from server technology to the desktop computer.
  + Data recovery depends on what precisely failed on the Windows 10 computer in which data structures are affected/ If it is a standard installation, the data recovery engineers have to work with, among other things, the NTFS structures.

**Topic G: Special Features of your OS**

* **Subtopic: New Start Menu**
  + Microsoft has brought back the Start Menu in which it has an immense amount of features. One of the features is being the new start menu in which you click the start button at the bottom left of the screen and you get two panels side by side and shows the recently or most used apps.
  + The Power button is located at the top for options such as Hibernate, Standby and shutdown.
  + The Start Menu can expand to full screen whenever you want, which eliminating the need for a modern UI start screen.
* **Subtopic: Virtual Desktops**
  + Windows 10 provides multiple desktops that you can work in and quickly switch between. The virtual desktops features in Windows 10 is called the “Task View” and is located on the Taskbar.
  + To add a new desktop, all you need to do is click the Plus sign and you create multiple desktops. Switching between them is just a matter of clicking the Task View button again and moving your mouse over the thumbnail of the one you want.
  + This feature is very useful as it lets you create multiple separate desktops that each can be switched between in an instant. You can put many specific tasks on one desktop then you can put other tasks on the other desktop.
* **Subtopic: Universal Apps**
  + Microsoft introduced a new category of software called Universal Apps which uses the same code but adapt their interface to the device in your hand.
  + Microsoft is also bundling its own set of Universal apps with the OS like Photos, Videos, Music, Maps, etc. The content is stored and sync via Microsoft’s cloud service.
  + Universal Apps are programs that can be used across all compatible Microsoft Windows devices, including personal computers (PCs), Tablets, smartphones, Xbox One, etc. This can be very effective for any individual who purchases an item from the store and can access it from a variety of different platforms.

**Topic H: Limitations of your OS**

* **Subtopic: Limitation Issues**
  + There are many limitations within the new Windows OS like being unable to upgrade prior versions of it and is very expensive due to many new powerful computers.
  + 64-bit apps will not work like Windows 10 can only run 32-bit desktop applications and not 64-bit applications.
  + No Hyper-V as Windows 10 does not support this fantastic feature.
  + Older games and graphics apps may not work. Windows 10 on ARM supports DirectX 9, DirectX 10, DirectX 11, and DirectX 12, but apps/games that target older versions will not work. Apps that require hardware-accelerated OpenGL will also not work.
  + It cannot use x86 drivers. While Windows 10 on an ARM can run x86 Windows applications, it cannot utilize x86 drivers. Instead, it will require native ARM64 drivers instead. This means that hardware support will be much more limited than is the case with mainstream Windows 10 versions. In other words, it will likely work much like Windows 10 does today.
* **Subtopic: UI limitations**
  + Touch-friendly features have been removed from Windows 10, you can no longer close apps by swiping them down from top to bottom.
  + You cannot resize windows using the handlebars which were present in most of the previous versions of Windows. Windows 10 also removed the functionality to change the volume level using the scroll button present in the taskbar.
  + You cannot revert to the previous OS which an individual was running before. The previous OS will have to be reinstalled from the recovery or installation disk that came with the PC.