**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 (safe marking)
* Mac OS (bonus marking)
* Linux (double bonus marking)
* iOS (double bonus marking)
* Android (double bonus marking)

The concept map template can be downloaded from the “Topic A” folder on the class GitHub repository.

**Step 1 – Rough Research**

Research information about the software for your assigned operating system (OS) environment.

* Guide your research according to the suggested topic list below
* Feel free to copy-and-paste as long as you keep track of your bibliographic references.
* Do not be too picky or concerned about formatting as you will organize this information later in step 2
* Select things that look interesting and don’t forget to include graphics images as well
* Upload your rough research notes to your repository when you are done.

**Topic A – Productivity & Application Software**

~Google apps, such as Google Docs, Slides, Sheets and Sites; compiled together, they are stored in Google Drive

->Google Drive is a file storage and synchronization software; it lets users store and save files, and share them with others

~iOS uses an App Store, where people can publish and purchase applications developed by Apple themselves and other companies

->The App Store lets people purchase different kinds of apps, including productivity software, games, and etc.

**Topic B – Entertainment & Media Software**

~There are lots of applications and software related to entertainment and media, many of them not natively made by Apple themselves

->They include apps such as Netflix, SoundCloud, YouTube (TV, Kids, etc.)

~There’s also iTunes, a media player, library and radio broadcaster published by Apple

**Topic C – Programming Tools & Environment**

~ iOS uses Swift as its programming language. Swift is a general-purpose, compiled programming language developed by Apple for iOS, macOS, watchOS, tvOS, and Linux

~Apple intended Swift to support many core concepts associated with Objective-C, including dynamic dispatch, extensible programming and similar features, but in a “safer” way, which makes it easier to catch software bugs

~Swift 4 (the newest version) was developed in the open at Swift.org, with source code, a bug tracker, mailing lists, and regular development builds available for everyone. Swift already supports all Apple platforms as well as Linux, with community members actively working to port to even more platforms

**Topic D – System Tools**

~There aren't actually many System Tools for iOS (for whatever reason?)

~Some "System Tools" include:

-> There is iOS SDK, the software development kit developed by Apple Inc. It allows the development of mobile apps on iOS' operating system. Combined with XCode, the iOS SDK helps developers write iOS apps using officially supported programming languages, like Swift and Objective-C.

-> Xcode is the Apple’s IDE (Integrated Development Environment for both Mac and iOS apps. It provides you a visual layout editor that shows you the **user interface** (what the user can see when using your app) and a **code editor** (where you will write codes) that deals with the logic and response behind the scene. The idea is when the user interacts with an element e.g. a button on your app (as seen on your visual layout editor), the logic written in the code editor will perform the action i.e. (signing you in/creating a new post) for you. It's free and available to download on the App Store

**Topic E – Software Security & Updates**

~Updates for iOS are released through the iTunes software and over-the-air software updates

~Major new iOS releases are announced yearly during the Apple Worldwide Developers Conference (WWDC), and are usually released in September of the same year, usually coinciding with the release of new iPhone models

~iOS utilizes many security features in both hardware and software

-> Before fully booting into iOS, there is low-level code that runs from the Boot ROM. Its task is to verify that the Low-Level Bootloader is signed by the Apple Root CA public key before running it. This process is to ensure that no malicious or otherwise unauthorized software can be run on an iOS device

-> iOS devices can have a passcode that is used to unlock the device, make changes to system settings, and encrypt the device's contents. They were typically four numerical digits long. However, since unlocking the devices with a fingerprint by using Touch ID has become more widespread, six-digit passcodes are now the default on iOS with the option to switch back to four or use an alphanumeric passcode

-> Touch ID is a fingerprint scanner that is embedded in the home button and can be used to unlock the device, make purchases, and log into applications among other functions

-> Third-party applications such as those distributed through the App Store must be code signed with an Apple-issued certificate. This continues the chain of trust all the way from the Secure Boot process as mentioned above to the actions of the applications installed on the device by users

-> Two-factor authentication is an option in iOS to ensure that even if an unauthorized person knows an Apple ID and password combination, they cannot gain access to the account

**Topic F – File System & User Accounts**

~ A file system handles the persistent storage of data files, apps, and the files associated with the operating system itself. Therefore, the file system is one of the fundamental resources used by all processes. APFS is the default file system in macOS, iOS, watchOS, and tvOS. APFS replaces HFS+ as the default file system for iOS 10.3 and later, and macOS High Sierra and later

~ The iOS file system is geared toward apps running on their own. To keep the system simple, users of iOS devices do not have direct access to the file system and apps are expected to follow this convention

~ For security purposes, an iOS app’s interactions with the file system are limited to the directories inside the app’s sandbox directory. During installation of a new app, the installer creates a number of container directories for the app inside the sandbox directory. Each container directory has a specific role. The bundle container directory holds the app’s bundle, whereas the data container directory holds data for both the app and the user. The data container directory is further divided into a number of subdirectories that the app can use to sort and organize its data. The app may also request access to additional container directories—for example, the iCloud container—at runtime

~ OS X is designed for multiple users; iOS, however, is not

-> iOS does give you restrictions, the ability to limit the type of content accessible from your device

~ Apple offers its own user account creation service, known as an Apple ID

-> Your Apple ID is the account you use to access Apple services like the App Store, Apple Music, iCloud, iMessage, FaceTime, and more

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

~iOS is the simplest of all operating systems; it’s quick and easy to learn and understand, especially for someone new to iOS  
~ Apple gives the iPhone the hardware that it needs, and nothing overboard. Also, iOS is a very light operating system which doesn't consume much processing power  
~You don’t need to fiddle with much of the operating system when you buy it because it comes out ready to use and accessible out of the box  
~It has iMessage, an almost universal message system that every iOS device has out of the box  
~The newer iOS’s feature a fingerprint scanner, TouchID  
~iOS has Apple Pay  
~iOS has Siri, a virtual assistant

**Topic H – Limitations of your OS**

~All you can customize on your iOS is the wallpaper; on Android, you can change the font, theme, the UI, etc.  
~iOS doesn’t have a shared storage space for different applications  
~iOS doesn’t support expandable storage space

**Step 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 & Application Software
  + Sub-Topic 1
    - Fact 1
    - Fact 2
    - …
  + Sub-Topic 2
    - …
  + …
* Topic B – Entertainment & Media Software
  + …

**Topic A: Productivity and Application Software:**

~Sub-Topic 1: Google Drive

iOS does not feature its own file storage application; however, through their App Store, they provide apps produced by Google for that service. The most important one is Google Drive, a file storage and synchronization device. It lets their users store their files, such as photos, documents and etc. on their servers. The service also offers offline capabilities for Windows and macOS, as well as Android and iOS phones and tablets. Users are given 15 TB of free storage; there are paid storage plans that users can purchase to increase their storage space.

Google Drive encompasses Google Docs, Google Sheets and Google Slides, services that let users collaborate and edit documents, slideshows and spreadsheets. Collectively, all of these are part of the Google Drive service.

* https://www.imore.com/google-drive-everything-you-need-know

~Sub-Topic 2: App Store

The App Store is a digital distribution platform developed by Apple Inc. It allows users to browse and download apps developed with Apple’s iOS Software Development Kit. Applications are subject to approval by Apple for reliability testing and other purposes (generally to make them safe for the public to download). Developers have multiple options for monetizing their applications, ranging from free, free with in-app purchases, and paid.

* https://www.imore.com/app-store

**Topic B: Entertainment and Media Software:**

~Sub-Topic 1: YouTube

YouTube (again, not provided or produced by Apple themselves) is a video-sharing website and the second-most popular site in the world. It allows users to view, upload, share videos and subscribe to other content creators. It can be downloaded off of the App Store for free; however, some videos and rental of movies requires a paid subscription. Users can also pay for YouTube Premium, which offers ad-free streaming of all videos on YouTube, and YouTube Music, a paid music streaming service.

-> https://en.wikipedia.org/wiki/YouTube

~Sub-Topic 2: iTunes

iTunes is a media player, media library and internet radio broadcaster developed by Apple Inc. It’s used to play, download and organize multimedia files, like music and videos, on computers and smart devices running iOS, macOS or Windows. The main focus of iTunes is music; you can organize your library, rip songs from CDs, and play content with the use of playlists. It’s since been expanded to add video support, podcasts and e-books.

The iTunes Store, on the other hand, is a software-based media store operated by Apple Inc. It allows users to purchase and download items directly to Apple devices. Apple offers three apps, each of which provides access to certain types of content; the App Store provides apps, the iTunes Store sells music and videos, and iBooks offers e-books.

-> https://www.apple.com/ca/itunes/

**Topic C: Programming Tools & Environment:**

~Sub-Topic 1: Swift

iOS uses Swift as its programming language. Influenced by languages such as Objective-C, C# and Python, Swift is a general-purpose, compiled programming language developed by Apple for iOS, macOS, watchOS, tvOS, and Linux. Apple intended Swift to support many core concepts associated with Objective-C, including dynamic dispatch, extensible programming and similar features, but in a “safer” way, which makes it easier to catch software bugs. Swift 4, the latest version, was developed in the open at Swift.org, with source code, a bug tracker, mailing lists, and regular development builds available for everyone. Swift already supports all Apple platforms as well as Linux, with community members actively working to port to even more platforms.

-> https://developer.apple.com/swift/

**Topic D: System Tools**

~Sub-Topic 1: iOS SDK

iOS, for some reason, doesn't seem to have many System Tools native to it. There is something close to it, known as iOS SDK. It's a software development kit developed by Apple Inc. It allows the development of mobile apps on iOS' operating system. Combined with XCode, the iOS SDK helps developers write iOS apps using officially supported programming languages, like Swift and Objective-C.

-> https://www.techopedia.com/definition/3819/ios-sdk

~Sub-Topic 2: Xcode

Xcode is the Apple’s IDE (Integrated Development Environment for both Mac and iOS apps. It provides you a visual layout editor that shows you the **user interface** (what the user can see when using your app) and a **code editor** (where you will write codes) that deals with the logic and response behind the scene. The idea is when the user interacts with an element e.g. a button on your app (as seen on your visual layout editor), the logic written in the code editor will perform the action i.e. (signing you in/creating a new post) for you. It's free and available to download on the App Store.

-> https://developer.apple.com/xcode/

**Topic E: Software Security & Updates**

~Sub-Topic 1: Updates

Updates for iOS are released through the iTunes software and over-the-air software updates. Major new iOS releases are announced yearly during the Apple Worldwide Developers Conference (WWDC), and are usually released in September of the same year, usually coinciding with the release of new iPhone models. Updates tend to be released to either add new features or build up off of existing ones, or to improve system stability and performance. The latest version is iOS 12.1.

-> https://en.wikipedia.org/wiki/IOS\_version\_history

~Sub-Topic 2: Software Security

Due to how popular Apple’s products are, it’s important that they make their devices and operating systems as safe as possible. iOS utilizes many security features in both hardware and software. Before fully booting into iOS, there is low-level code that runs from the Boot ROM. Its task is to verify that the Low-Level Bootloader is signed by the real Apple Root CA public key before running it. This process is to ensure that no malicious or otherwise unauthorized software can be run on an iOS device.

iOS devices can have a passcode that is used to unlock the device, make changes to system settings, and encrypt the device's contents. They were typically four numerical digits long. However, since unlocking the devices with a fingerprint by using Touch ID has become more widespread, six-digit passcodes are now the default on iOS with the option to switch back to four or use an alphanumeric passcode. Touch ID is a fingerprint scanner that is embedded in the home button and can be used to unlock the device, make purchases, and log into applications among other functions.

Third-party applications such as those distributed through the App Store must be code signed with an Apple-issued certificate. This continues the chain of trust all the way from the Secure Boot process as mentioned above to the actions of the applications installed on the device by users. Two-factor authentication is an option in iOS to ensure that even if an unauthorized person knows an Apple ID and password combination, they cannot gain access to the account.

-> https://en.wikipedia.org/wiki/IOS#Security

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

~Sub-Topic 1: iOS’ File System

A file system handles the persistent storage of data files, apps, and the files associated with the operating system itself. APFS is the default file system in macOS, iOS, watchOS, and tvOS. APFS replaces HFS+ as the default file system for iOS 10.3 and later, and macOS High Sierra and later.

The iOS file system is geared toward apps running on their own. To keep the system simple, users of iOS devices do not have direct access to the file system and apps are expected to follow this convention. For security purposes, an iOS app’s interactions with the file system are limited to the directories inside the app’s sandbox directory. During installation of a new app, the installer creates a number of container directories for the app inside the sandbox directory. Each container directory has a specific role. The bundle container directory holds the app’s bundle, whereas the data container directory holds data for both the app and the user. The data container directory is further divided into a number of subdirectories that the app can use to sort and organize its data. The app may also request access to additional container directories—for example, the iCloud container—at runtime.

~https://developer.apple.com/library/archive/documentation/FileManagement/Conceptual/FileSystemProgrammingGuide/FileSystemOverview/FileSystemOverview.html

~Sub-Topic 2: User Accounts

OS X is designed for multiple users; iOS, however, is not. There can only be one real “user” per iOS device, and everything on that device is associated with that particular device. iOS does give you restrictions, the ability to limit the type of content accessible from your device. Apple offers its own user account creation service, known as an Apple ID. Your Apple ID is the account you use to access Apple services like the App Store, Apple Music, iCloud, iMessage, FaceTime, and more.

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

~Sub-Topic 1: Ease of Access

iOS is the simplest of all operating systems; it’s quick and easy to learn and understand, especially for someone new to iOS. Apple gives the iPhone the hardware that it needs, and nothing overboard. Additionally, iOS is a very light operating system which doesn't consume much processing power. You don’t need to fiddle with much of the operating system when you buy it because it comes out ready to use and accessible out of the box.

~Sub-Topic 2: Special Features

iOS features its own Notification Center, which provides an overview of alerts from applications on your device. iOS offers lots of accessibility features to help users with vision and hearing disabilities. One major feature, VoiceOver, provides a voice reading information on the screen, including contextual buttons, icons, links and other user interface elements, and allows the user to navigate the operating system through gestures. It also has iMessage, an almost universal message system that every iOS device has out of the box. The newer iOS’ feature a fingerprint scanner, TouchID, that is embedded in the home button and can be used to unlock the device, make purchases, and log into applications among other functions. There is Apple Pay, a mobile payment and digital wallet service. Finally, iOS has Siri, a virtual assistant that uses voice queries to answer questions, make recommendations, and perform actions.

-> https://en.wikipedia.org/wiki/IOS#Features

**Topic H: Limitations of your OS**

~Sub-Topic 1: Specific Limitations

All you can customize on your iOS is the wallpaper; on Android, you can change the font, theme, the UI, and etc. iOS doesn’t have a shared storage space for different applications. iOS doesn’t support expandable storage space and communication between applications is heavily restricted.

A separate limitation could also be that devices that run iOS tend to be very expensive compared to their Android counterparts.

**Step 3 – Concept Map**

Create a “concept map” as a final report of your organized research.

Use the PowerPoint template provided as a starting point.

You can use PowerPoint or another concept mapping tool of your choice.

Select the best and most interesting information from your organized research.

Summarize and edit your information to fit on the concept map.

Share your finished concept map with Mr. Nestor at p0079141@pdsb.net

The concept map template can be downloaded from the “Topic A” folder on the class GitHub repository

