**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 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, Entertainment & Other Software Applications

Since Google is the parent company of Android, in other words, Google owns Android. All android applications that are suggested to use and are famous, are Google applications and apps that are compatible with android/google.

|  |  |
| --- | --- |
| Research | Website |
| Productivity   * Evernote * Any.do * Join | <https://www.pcmag.com/article/362295/the-100-best-android-apps> |
| Entertainment   * Netflix * Yelp * Cookpad * Apple Music * Spotify * Google Play |
| Browse App   * Firefox * Chrome * Opera |
| Workplace App   * Dropbox * Google Drive * Microsoft Suite |
| Communication App   * Facebook Messenger * Snapchat * Whatsapp |
| Photo Apps   * Google Photos * Instagram * PicsArt Photo Studio |
| Reading & News App   * ESPN * Flipboard * Kindle |
| Shopping App   * Amazon Shopping * Google Opinion Rewards * Pinterest |
| Security App   * LastPass * NordVPN * Dashlane * Orbot |
| Travel Apps   * Duolingo * Google Maps * Google Translate * Uber |
| Utility Apps   * Swiftkey Keyboard * Tasker |
| App compatibility with Android and Chromebooks. Apps on the Google Play Store may not be compatible with all devices. Note: In most cases, apps from Google Play can't be downloaded to Windows or Mac computers but can be downloaded to supported Android and Chromebook devices. | <https://support.google.com/googleplay/answer/2851648?hl=en> |

Topic B – User Interface (Window Management & Input Devices)

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| --- | --- |
| Research | Website |
| An Android device may be a smartphone, tablet PC, e-book reader or any type of mobile device that requires an OS. | <https://www.techopedia.com/definition/25101/android-device> |
| Some of the well-known Android device manufacturers include Acer, HTC, Samsung, LG, Sony Ericsson and Motorola. | <https://www.techopedia.com/definition/25101/android-device> |
| Android's default user interface is mainly based on direct manipulation, using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, along with a virtual keyboard.[66] Game controllers and full-size physical keyboards are supported via Bluetooth or USB.[67][68] The response to user input is designed to be immediate and provides a fluid touch interface, often using the vibration capabilities of the device to provide haptic feedback to the user. Internal hardware, such as accelerometers, gyroscopes and proximity sensors are used by some applications to respond to additional user actions, for example adjusting the screen from portrait to landscape depending on how the device is oriented,[69] or allowing the user to steer a vehicle in a racing game by rotating the device, simulating control of a steering wheel.[70] | <https://en.wikipedia.org/wiki/Android_(operating_system)> |

Topic C – Memory Allocation, Management,& Devices

|  |  |
| --- | --- |
| Research | Website |
| Objects allocated in the storage:   * Documents * Images * Audio * Videos * Applications |  |
|  |  |

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

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| --- | --- |
| Research | Website |
| it is very common for our application to perform tasks asynchronously and scope of them are outside the application’s life-cycle like downloading some data or updating network resources. In some situations, we also have to do some work but it is not required to do it right now. To schedule background work, Android introduced several APIs which we can use wisely in our applications. | <https://android.jlelse.eu/schedule-tasks-and-jobs-intelligently-in-android-e0b0d9201777> |
| Services allow you to perform long-running operations in the background. Running services in the background are very expensive for the battery life of the device. |  |
|  |  |

Topic E – Software Security, Updates & System Tools

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| --- | --- |
| Research | Website |
| Updates to the Android system are generally delivered to devices through OTA update packages. These updates may come from the OEM who produced the device or the carrier who provides service to the device. Google Nexus device updates come from the Google Nexus team after going through a carrier technical acceptance (TA) testing procedure. Google also publishes Nexus and Pixel factory images that can be side-loaded to devices. | <https://source.android.com/security> |
| At the operating system level, the Android platform provides the security of the Linux kernel, as well as a secure inter-process communication (IPC) facility to enable secure communication between applications running in different processes. These security features at the OS level ensure that even native code is constrained by the Application Sandbox. Whether that code is the result of included application behaviour or exploitation of application vulnerability, the system is designed to prevent the rogue application from harming other applications, the Android system, or the device itself. See Kernel Configuration for measures you can take to strengthen the kernel on your devices. See the Android Compatibility Definition Document (CDD) for required settings. |  |
| Android versions and their names   1. Android 1.5: Android Cupcake 2. Android 1.6: Android Donut 3. Android 2.0: Android Eclair 4. Android 2.2: Android Froyo 5. Android 2.3: Android Gingerbread 6. Android 3.0: Android Honeycomb 7. Android 4.0: Android Ice Cream Sandwich 8. Android 4.1 to 4.3.1: Android Jelly Bean 9. Android 4.4 to 4.4.4: Android KitKat 10. Android 5.0 to 5.1.1: Android Lollipop 11. Android 6.0 to 6.0.1: Android Marshmallow 12. Android 7.0 to 7.1: Android Nougat 13. Android 8.0 to Android 8.1: Android Oreo 14. Android 9.0: Android Pie | <https://www.timesnownews.com/technology-science/article/android-versions-and-their-names-here-s-how-google-has-named-all-the-versions-of-its-android-versions/289386> |
|  |  |

Topic F – File System & User Accounts

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| Research | Website |
| Even a smartphone running Google's latest mobile operating system now offers multiple user accounts. | <https://www.cnet.com/how-to/getting-started-with-user-accounts-on-android-5-0-lollipop/> |
| In Linux / Android / Unix (for simplicity, referred to a just Linux), the file hierarchy is a single tree, with the top of the tree being "/" - the root of the tree. Under "/" are files and directories. The Linux file hierarchy lacks the concept of drives, as in Windows. Instead, file systems are mounted on a directory to create a single integrated tree. For media based file systems. the file system represents a partition of some media. It makes no difference whether the file system exists on the local device, or on a remote device. Everything is integrated into a single file hierarchy that begins with root. | <https://www.all-things-android.com/content/understanding-android-file-hierarchy> |
| The following gives a brief summary of the top levels of the directory structure for the AOSP release of Jelly Bean:  **acct** - This directory is the mount point for the acct cgroup (control group), which provides for user accounting.  **cache** - The mount point for the /dev/block/mtdblock2 partition (the partition name may vary). The size of the cache is limited to the size of this partition.  d - A symbolic link to /sys/kernel/debug.  **data** - The mount point for the /dev/block/mtdblock1 partition.  **default.prop** - This file defines various default properties.  **dev** - The mount point for a tmpfs file system, which defines the devices available to applications. The /dev/cpuctl directory is the mount point for the cpuctl control group, using the cgroup pseudo file system.  **etc** - A symbolic link to /system/etc.  **init** - A binary program that processes the init.rc file. The init.rc file imports the other init.\*.rc files. When booting Android, the kernel executes the init program at the end of its boot process. It is worth reading the init.rc file, as it tells the story of the configuration for the Android device. Since Android does not support /etc/sysctl.conf, the updates to the /proc/sys/kernel parameters are part of the init.rc file. Unless you have a good understanding of the internal workings of the Linux kernel, you should not modify these parameters. The same is true of the /dev/cpuctl parameters.  **mnt** - Besides the mounts for the internal and external SD cards, these directory serves as a mount point for other file systems. The /mnt/asec directory is a mount point for a tmpfs file system, and is part of Android security. The /mnt/obb directory is a mount point for the tmpfs file system, and stores expansion files for applications whose files exceed 50MB. The /mnt/secure directory is another component of Android security. You may also see mount points for one, or more, USB devices.  **proc** - Mount point for the procfs file system, which provides access to kernel data structures. Programs, such as ps, lsof, and vmstat, use the /proc as the source for their information.  **root** - The home directory for the root account.  **sbin** - While much smaller than the /sbin directory in a standard Linux distribution, it does contain the binaries for several important daemons.  sdcard - A symbolic link to /mt/sdcard.  **sys** - The mount point for the sysfs pseudo file system, which is a reflection of the kernel's device object structure. There is a lot of information in this directory, but it does require an understanding of the kernel device model. In a nutshell, the directories represent kernel objects, and files are attributes of those objects.  system - This directory is the mount point for the /dev/block/mtdblock0. Under this directory are the directories that you normally see under the root directory of a standard Linux distribution. These directories include bin, etc, lib, usr, and xbin.  ueventd.goldfish.rc ueventd.rc - These files define the configuration rules for the /dev directory.  vendor - A symbolic link to /system/vendor. |

Topic G – Special Features of your OS

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| Research | Website |
| 10 Unique Features to Android’s OS:   1. Near Field Communication (NFC) 2. Alternate Keyboards 3. Infrared Transmission 4. No-Touch Control 5. Automation 6. Wireless App Downloads 7. Storage and Battery Swap 8. Custom Home Screens 9. Widgets 10. Custom ROMs | <https://www.gazelle.com/thehorn/2014/02/10/the-android-operating-system-10-unique-features/> |
| Android  •Android Is More Customizable Can change almost anything.  •In Android, any new publication can be done easily and without any review process  •Use a Different Messaging App for SMS  •Android Offers an Open Platform  •Easy access to the Android App Market  •Cost Effective  •Upcoming versions have support to save RAW images  •Built in Beta Testing and staged rollout  •Native integration with Google cloud storage. 15GB free, $2/mo for 100GB, 1TB for $10. Apps available for Amazon Photos, OneDrive and Dropbox.  •Booming Job Prospects | <https://medium.com/@saranyaan2710/advantages-and-disadvantages-of-android-ios-aa76e2b8f41> |

Topic H – Limitations of your OS

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| --- | --- |
| Research | Website |
| Defects in Apps and Play Store  •Not all the apps available in the store are compatible with the different levels or ranges of Android phones.  •While there are several free apps for download, these tend to be replete with marketing material and advertisements, making the user experience jarring and intrusive.  •App-crashing or forced closure is a norm with Android devices and staunch Android phone users have now gotten used to this flaw.  Device Defects  •Overheating is a common issue with Android phones, especially when playing games loaded with heavy graphics or while indulging in hardcore productivity tasks. The overheating tends to be more prevalent during summers than winters. The heating issue not just mars user experience and handling, but it also hurts the phone's battery life.  •Android is a very heavy operating system and most apps tend to run in the background even when closed by the user. This eats up battery power even more. As a result, the phone invariably ends up failing the battery life estimates given by the manufacturers.  •Storage is also an issue, with most phones having minimal internal storage. Consequently, storing large apps, videos and files become an issue.  •Adding a micro SD card can be a way out, but that move can hamper the phone's speed.  •Regardless of the high-end specifications and model, Android phones are prone to lag as the ecosystem is not streamlined and integrated.  •Data safety is another problem and the fear of losing data forever always hovers over users. While there are several apps that help backup data, none are tightly knit into the OS.  •Due to cache buildup, the phone's operational speed and experience can reduce and cause severe lags.  •Some phones tend to drastically lose efficiency if dozens of apps are installed.  •The phone's efficiency is bound to take a hit as multiple programs run simultaneously in the background at any given time.  System Defects  •Although seamless data connection is no longer a far cry on mobile phones, Android devices need uninterrupted Internet supply for its efficient functioning. Google is behind Android and the plethora of Google services on offer almost mandates seamless Internet connection.  •While the many Google apps and services are quite useful, they are also very susceptible to hackers and their notorious plans. As a result, these applications get infected even before they get publicly released. In other words, most of the apps on the Play Store are plagued with malware.  •The Android app store is open to every publisher. It's easier to get apps published in the Play Store as space is not continuously monitored. Therefore, most Android apps are half-baked and also not malware-proof. This nullifies any innovativeness the apps have to offer.  •Android's stability and reliability take a hit due to the fact that there are several dozens of Android phones with varying specifications and hardware components. As a result, there arises a lack of compatibility between the OS and its hardware partners.  •While Android's open-source nature makes it easy to customize any Android device, the same aspect also turns out to be a negative trait as hackers don't have to bang their heads for hours together to get through the system and play spoilsport.  •Fragmentation - Google's Android mobile OS is fragmented, meaning not all Android phones run the same version of the operating system. For instance, Gingerbread, or Android 2.3 took nearly six months for it to be adopted by all Android devices. This was all courtesy Android's fragmented character.  •Android OS is decentralized, or there's no apex governing body since the actual versions running on third-party devices are customized. This results in a lack of support or assistance for users during glitches or grievances.  •Some updates relating to apps and the OS may happen by themselves, without seeking the consent of the user. This can hog up unnecessary memory space.  •Android phones don't give administrator rights to their users. In other words, the device user cannot directly control what happens on the device, making one feel disconnected with the phone. | <https://dzone.com/articles/major-drawbacks-android> |
| * Usually, you need more code on Java than Objective-C. * Complex layouts and animations are harder to code in Android. * Applications contain virus also present in Android Market * A lot of “process” in the background that leads to the battery quickly drains. * Advertise, will always be ads on display, either the top or bottom of the application. * Low security and fake apps can be installed to steal your info from unknown resources * High device fragmentation | <https://medium.com/@saranyaan2710/advantages-and-disadvantages-of-android-ios-aa76e2b8f41> |
| * Overheating is a common issue with Android phones, especially when playing games loaded with heavy graphics or while indulging in hardcore productivity tasks. The overheating tends to be more prevalent during summers than winters. The heating issue not just mars user experience and handling, but it also hurts the phone's battery life. * Android is a very heavy operating system and most apps tend to run in the background even when closed by the user. This eats up battery power even more. As a result, the phone invariably ends up failing the battery life estimates given by the manufacturers. * Storage is also an issue, with most phones having minimal internal storage. Consequently, storing large apps, videos and files becomes an issue. * Adding a micro SD card can be a way out, but that move can hamper the phone's speed. * Regardless of the high-end specifications and model, Android phones are prone to lag as the ecosystem is not streamlined and integrated. * Data safety is another problem and the fear of losing data forever always hovers over users. While there are several apps that help backup data, none are tightly knit into the OS. * Due to [cache buildup](http://www.redmondpie.com/free-up-valuable-space-on-android-with-app-cache-cleaner/) , the phone's operational speed and experience can reduce and cause severe lags. * Some phones tend to drastically lose efficiency if dozens of apps are installed. * The phone's efficiency is bound to take a hit as multiple programs run simultaneously in the background at any given time.  System Defects  * Although seamless data connection is no longer a far cry on mobile phones, Android devices need uninterrupted Internet supply for its efficient functioning. Google is behind Android and the plethora of Google services on offer almost mandates seamless Internet connection. * While the many Google apps and services are quite useful, they are also very susceptible to hackers and their notorious plans. As a result, these applications get infected even before they get publicly released. In other words, most of the apps on the Play Store are plagued with malware. * The Android app store is open to every publisher. It's easier to get apps published in the Play Store as the space is not continuously monitored. Therefore, most Android apps are half-baked and also not malware-proof. This nullifies any innovativeness the apps have to offer. * Android's stability and reliability takes a hit due to the fact that there are several dozens of Android phones with varying specifications and hardware components. As a result, there arises the lack of compatibility between the OS and its hardware partners. * While Android's open-source nature makes it easy to customize any Android device, the same aspect also turns out to be a negative trait as hackers don't have to bang their heads for hours together to get through the system and play spoilsport. * Fragmentation - Google's Android mobile OS is [fragmented](http://www.elegantmedia.com.au/blog/iphone-apps-dont-work-android-phones/), meaning not all Android phones run the same version of the operating system. For instance, Gingerbread, or Android 2.3 took nearly six months for it to be adopted by all Android devices. This was all courtesy Android's fragmented character. * Android OS is decentralized, or there's no apex governing body since the actual versions running on third-party devices are customized. This results in lack of support or assistance for users during glitches or grievances. * Some updates relating to apps and the OS may happen by themselves, without seeking the consent of the user. This can hog up unnecessary memory space. * Android phones don't give administrator rights to its users. In other words, the device user cannot directly control what happens on the device, making one feel disconnected with the phone.   Smashing Android from all corners isn't the intent of this piece, and one has to agree it has its share of positives. Otherwise, it wouldn't have reached the popularity it has attained today. But, the fact that the applications aren't built specifically to run on certain devices makes it a less efficient and seamless system. For instance, iOS is created to run solely on iPhones. The same thing cannot be said about Android or its devices. This results in the various devices not interlocking with the OS, causing a truckload of unsolvable and grave issues. | <https://dzone.com/articles/major-drawbacks-android> |

**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)
  + …

1. **Topic A - Productivity, Entertainment & Other Software Applications**
   1. **Subtopic A.1 - Google Apps**
      1. **Fact 1 - Google is actually the parent company of Android**
      2. **Fact 2 - Even if Google is the parent company of Android, it does not mean that all devices with Android OS will be compatible with all Google apps.**
   2. **Subtopic A.2 - Applications for Android have different layouts when installed on an Android device compared to installed on other operating system device.**
      1. **Fact 1 - Some apps are only made for Android. That means that they cannot be found on other operating systems.**
2. **Topic B - User Interface (Window Management & Input Devices)**
   1. **Subtopic B.1 - Frequent Devices that use Android OS**
      1. **Fact 1 - Smartphone, tablet PC, e-book reader and many other devices that are used as a means of communication, can have Android OS on them**
      2. **Fact 2 - Famous Android device manufacturers are Samsung, LG, Acer, HTC, Sony Ericsson and Huawei**
   2. **Subtopic B.2 - The UI of Android**
      1. **Fact 1 - It can be used through touch. It can be tapping to select or type with the help of the virtual keyboard, swiping to slide to the other screen, pinching to zoom out and reverse pinching to zoom in.**
      2. **Fact 2 - The UI provides different types of sensors that are very useful to Android device user. 1. Changing the screen from portrait to landscape. 2. Turning on the device by simply having a presence next to the device.**
3. **Topic E - Software Security, Updates & System Tools**
   1. **Subtopic E.1 - The security and the system of Android OS enhances very well whenever there is a new updated version of the OS installed on the Android device.**
      1. **Fact 1 - Android uses the security of Linux Kernel (another operating system), and a secure inter-process communication (IPC) facility which ensures secure communications between applications running.**
      2. **Fact 2 - The Android OS prevent harmful or stray applications from harming other applications.**
   2. **Subtopic E.2 - The new Android updates make the OS more enjoyable, curious and pleasing to look at.** 
      1. **Fact 1 - All versions of Android OS are named after tasty and lovable food such as marshmallow, or cupcakes.**
      2. **Fact 2 - The updates notices are usually sent through the OTA update packages**
4. **Topic G - Special Features of the OS**
   1. **Subtopic G.1 - They are advantageous to almost everyone**
      1. **Fact 1 - Android OS devices are able to operate with minimal human assistance due to the special features which is called Automation and No Touch Control.**
      2. **Fact 2 - One of the special features of Android OS allows an Android to communicate or connect with other objects that contain data such as a credit card.**
   2. **Subtopic G.2 - The special features makes the OS look very cool**
      1. **Fact 1 - Android allows the user of the Android device to be customize however desired. For example, the font style, the home screen layout and many other objects can be changed to the user’s preferred choice.**
      2. **Fact 2 - Upcoming versions of Android OS will be able to support to save RAW images rather than only .jpeg or .png. This special feature will allow many people to edit and customise the image as they wish. That is because jpeg and png images are difficult to edit.**
5. **Topic H - Limitations of the OS**
   1. **Subtopic H.1 - Disadvantageous to some users**
      1. **Fact 1 - Some applications are not compatible with the Android device or they are not available to be used on the operating system itself.**
      2. **Fact 2 - Although Google applications are used on Android and are known to be reliable, they are bound to be easily hacked and being plagued with any type of malwares.**
   2. **Subtopic H.2 - The flaws of Android OS are very apparent**
      1. **Fact 1 - Android OS device can easily overheat especially when playing games that are heavy on the memory. To add, the battery life estimates fails and the phone tends to become slow when multiples of apps have been installed.**
      2. **Fact 2 - The applications sometimes run in the background although the user closed them and this causes the battery life estimates to fail as these apps eats up the battery even more.**

**Level 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

A concept map can be created using the “Smart Ideas” application or PowerPoint or other applications. A concept map template can be downloaded from the “Topic A” folder on the class GitHub repository

