**OS Comparison** (Computer vs. Smartphone)

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| OS Platform  Measurement | Program in computer or Laptop | Application in Mobile Devices  Such as smart phone |
| Availability | Only available to use in limited area. Because the computer have low portable features. Even if the computer is laptop, the portable feature is depends on the weight of the devices. | In contrast of Computers, mobile devices such as smart phone or tablets have high portable features. People can check email, surf the internet at anywhere and anytime by mobile devices. |
| Connectivity | In general, **Wi-Fi** and **Ethernet networking** is a network standard to connect with internet.  In the case of laptop connectivity services, the payment is the monthly fixed, while some countries use token which allows limited amounts of internet resources depends on top-up amount. | Not only **Wi-Fi** but also **Mobile data, Hotspot** from other smartphone data allows the devices to connect internet.  In the case of mobile data, they provide as plan, which is limited amount, depends on the mobile data technology. Also, the Using Mobile data increase the mobility of mobile devices, but the computer cannot. |
| Operating System | The Computer OS is based on CPU, disk space, RAM, modern chipsets which is not used in mobile devices. | Mobile OS is mostly Android, IOS and Windows Mobile. Especially Each Hardware is related with each OS. For example, Apple’s iPhone and IOS. |
| Cost | Not only capabilities, storage hardware but also Input, output hardware such as Keyboard and Monitor should be purchased to run the computer. The minimum cost will be at least $500.  After Buying Computer, it will require to consume the electronic power and the PUB cost also is increased. Even if the computer is laptop, still need to not only charge during the few hours but also cooling the Devices by running Internal or External fans. | The minimum price of Mobile phone can be $100 - $300.  Tablet can be at least $300.  It is worked based on the Battery and can manage more efficiently than Computers. And it is available to charge by using Power bank when we move. |

**Selection: Application in Mobile Devices**

Reason 1. Portable Features or Mobility. Our App will either allow viewing the encrypted documents if the user is in the area that user set to access available or the file cannot be open if user is outside of the area. If we use the Computer’s Program, rather than Apps, it will have less mobility. In other words, it will be stayed at the same location.

Reason 2. Cost Issue In the terms of Final Year Project, we have already limited time and cost among the Business matter: Cost, Time, Scopes and Quality because of student occupation. In order to solve this problem, we select the Mobile Devices instead of Computer Programs

**Mobile OS Comparison** (Android vs iOS vs Windows 10 Mobile: Which mobile operating system is best?)

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| --- | --- | --- | --- |
| OS Platform  Measurement | Android | IOS | Windows |
| Downloadable Apps and Apps Market | - **Google Play**  - Nowadays, Google Play have dominated in the application market due to convenience of App approval process  - Google Play is well integrated with Google’s Applications such as Gmail, **Google Maps**, Google Drive and so on. | - **App Store**  - In the Initial Period of App Market, App Store dominated in the application market. | - **Window Store**  - Most of popular Applications are already in the market. But the update speed is slower than Android and IOS.  -It is available to unify the application between Desktop such as Windows 10 and Mobile Devices. |
| OS Platform’s Features | - **Samsung Flow**: version is still Beta version  - Hangout  - Google Fit  - Have Wide Range of available devices (Mobile phone, tablets and wearable devices such as smart watches). Not only Samsung but also google and so on. | - Devices based on IOS can be synchronized between Apple Devices.  - iMessage  - Apple Health  - IOS is only limited into Apple own devices such as MAC.  - Most of the devices based on IOS have **expensive cost** among 3 OS. | **Continuum**: plug mobile device into the Monitor with Keyboard and Mouse then get the interface such as Desktop. Thus use the phone like PC.  - Skype  - Microsoft Health |
| Virtual Assistance | - **Google Now**  - Google Now opens its API to developers who can use it for operating or referencing other apps  - **Picture Recognition**: It is available to offer information by input screenshot or picture | - **Siri**  - Siri has **accurate understanding** compared as Google now  - But the information area by Siri is limited  For example, Playing music, setting timer or alarm and so on. | - **Cortana**  - It is the latest virtual Assistance in Windows at 2015  - Bing Search, Music Recognition  - Still need to be uploaded about features compared as the Android and Siri |
| Security | - Android is based on **Open Source Code**  - Easy to submit the Application into Google Play with cheap submission fee compared as the App Store  - it has reinforced security in Google Play store after stagefright attack in 2015  - Direct booting which allows application to begin with the lower layer in mobile devices  - File Encryption which allows protecting the personal data in devices.  - Because the wide range of devices is available in Android OS, compared as the other OS platforms, it is vulnerable from malicious attack and Not whole Android OS platform is updated at the same time.  - | - requires only use Apple’s own devices.  - App Store requires signature and checking from Apple Before submit Application into App store.  - using secure encrypted channel when upload/update apps  - Like Android, IOS is one of the OS that a lot of users use in nowadays. Thus There are probabilities attacked from malicious third party. | - Like IOS, Window store has strict app submission process  - Device Encryption based on the local contents  - Easy to integrated apps between PC and mobile devices  - **Microsoft passport**: strong authentication process to access to resources.  - **Device Guard**: protect data from malicious programs  - **Microsoft Enterprise Mobility**: focus on Security Session with ATA(Advanced Threat Analytics)  - One of the Problems in Windows store is small market compared as Android and IOS. Thus it has a probability to being attacked in the future. And also lack of features in the markets. |
| Biometric Security | - **Fingerprint sensor technology** after IOS  - lyrics pattern recognition technology from Galaxy Note 7 in Samsung | - IOS is the **FIRST** OS which released **Fingerprint sensor technology** in the devices. | - **Windows Hello**: Authentication to sign in Windows 10 devices securely. (Surface Pro 4, Surface Book, most PCs) with fingerprint readers or Face recognition always work. |

**Selection: Android OS**

Reason 1. Open source based code. Google allows to any developers to use the Google’s features or APIs such as google map, google drive as an Open-source, compared as MS Windows and especially Apple’s IOS. If some error or flaw is occurred in the code, check and modify the code fast and easily because a lot of developers can access and confirm.

Reason 2. Availability in wide range of devices. IOS is only allowed to use in only Apple own devices and Windows also is available in only windows devices such as surface. But In the case of Android it can cover the Varity types of mobile devices not only Samsung but also LG, Xiaomi, SONY and so on.

Reason 3. Wide Application market. The more available variety devices are, the wider application market is. And also it is easy to access and submit the application apps into the Google Play Store with efficient price compared as the other OS. Also we have more chance to get more feedback about our application from the users.

**Database Software Comparison** (System Properties Comparison Microsoft SQL Server vs. Oracle vs. SQLite)

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| DB Platform  Measurement | Oracle SQL | MsSQL | SQLite |
| Developers | Oracle | Microsoft | Dwayne Richard Hipp |
| License | Commercial | Commercial | Open-Source |
| Cost | Total (per Processor):  Around $5,999 - $21,350 | Free (Limited entry level database) - $14,256 ++ | Free |
| Supported Programming Languages in Database | C++, Visual Basic, Python, R, PHP, JavaScript(Node.js), Ruby, Go, Java | C/C++/C#/Objective C, Visual Basic, Python, R, PHP, javaScript (Node.js), Ruby, Java, Perl, Scala, Clojure, Cobol, Delphi, Erlang, Eiffel, Fortran, Haskell, Tcl, OCaml, Lisp, Groovy | C/C++/C#/Objective C, Visual Basic, Python, R, PHP, javaScript (Node.js), Actionscript, Ruby, Java, Perl, Scala, Clojure, Cobol, Delphi, Erlang, Eiffel, Fortran, Haskell, Tcl, OCaml, Lisp, forth, D, Ada, Basic, MatLab, Lua, PL/SQL, Smalltalk, Scheme |
| Server-sides and stored procedures | exchanges SQL and .NET languages | PL/SQL | Nothing. SQLite is not for server sides database software. Usually used to store data into internal devices |
| Supporting XML | Support XML format or data structures | Like MsSql, Support XML format or structures | No XML support, need to import |
| Common Features | Support the features of Foreign keys, Durability, Concurrency, SQL standard, Data Scheme(In the case of SQLite, it also support dynamic data scheme) and so on. | | |

**Selection: SQLite Database**

Reason 1. Open source based code. Thus it is free to use. Especially the above other two Database software requires to buy licenses but too expensive to buy the license price in Oracle is already over 20,000 USD! Even though it is free service in Microsoft, the service availability is quite limited. That’s why we choose SQLite.

Reason 2. Availability about Programming Languages. SQLite can support a wide range of programming languages among the above 3 Database software. Thus it is more flexible to use.

Reason 3. Efficient Data storage consumption. Our application is not based on Server Client architecture but save the encrypted data into the internal devices depends on the user input, we don’t need to waste memory to store data by using heavy software.