<Name-of-Software-Application>

CS 230 Project Software Design Template

Version 1.0

Table of Contents

Document Revision History

Version	Date	Author	Comments
1.0	<07/21/2024>	<Brendan Ganzy>	<Brief description of changes in this revision>

Instructions
Fill in all bracketed information on page one (the cover page), in the Document Revision History table, and below each header. Under each header, remove the bracketed prompt and write your own paragraph response covering the indicated information.

Executive Summary

The design problem for Creative Technology Solutions with their product “The Gaming Room”, is creating multiple platform capability while simultaneously keeping all their functionalities that are present within their current android application of The Gaming Room. The first solution I would suggest would be to configure The Gaming Room application onto the IOS app store. The next would be to ensure that the app will seamlessly function on phones tablets and desktops. This goes into the critical information that Creative Technology Solutions. It is important that the user interface is able to conform to different devices and screen sizes.

Requirements

The company`s business requirements would be to expand the games reach to more customers by making it accessible on different platforms and devices such as the IOS store and desktops and tablets. It is also an important requirement that the company maintains their user experience, especially for their existing customers who have a familiarity with The Gaming Room. Another important requirement is that the company ensures that these new platform avenues are able to handle new customers.

Design Constraints

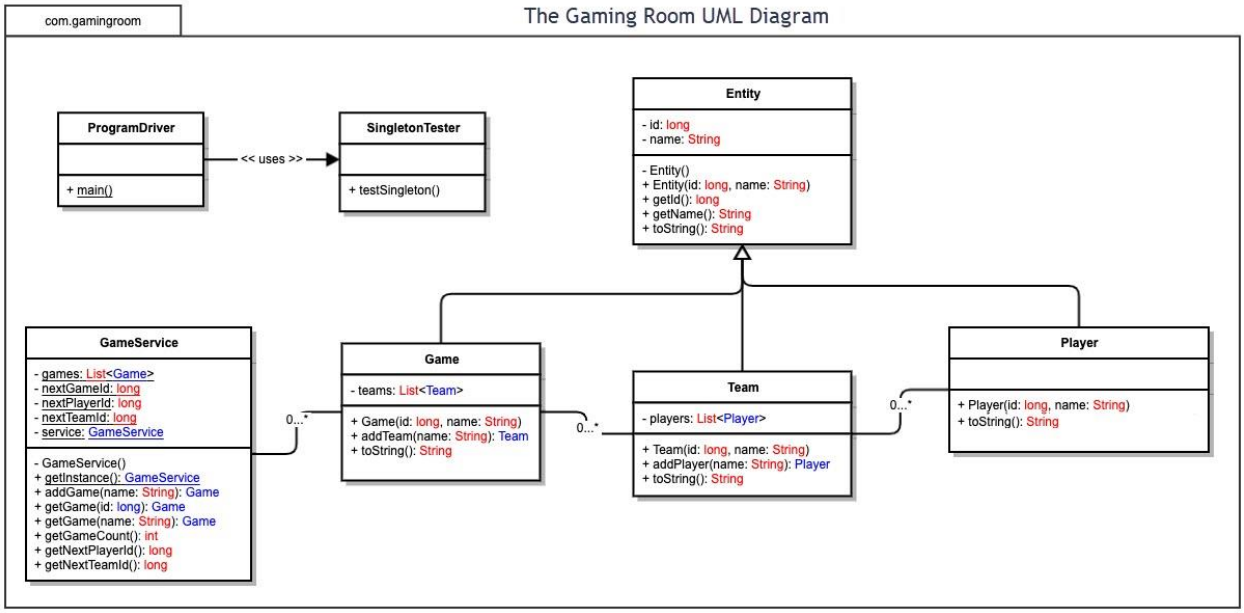
- Cross platform compatibility
- Cross Platform user experience
- Performance optimization

Some of the design constraints for developing the game application consist of cross platform compatibility, cross platform user experience and performance optimization. The implication of the constraint of cross platform compatibility is the game being able to run seamlessly on IOS, Android, tablets and desktops. The implication of cross platform user experience is that the UI must be congruent with IOS and desktop the same way it is on Android to maintain customers familiarity with The Gaming Room product. The implication of performance optimization is to ensure that the application will operate at the same capacity, regardless of the form of OS or device that it is being ran on.

System Architecture View

Please note: There is nothing required here for these projects, but this section serves as a reminder that describing the system and subsystem architecture present in the application, including physical components or tiers, may be required for other projects. A logical topology of the communication and storage aspects is also necessary to understand the overall architecture and should be provided.

Domain Model



The UML diagram represents the program structure for The Gaming Room application.

The program driver class contains the main method which uses the test singleton instance to ensure that there is only one instance. The Singleton tester class has an inheritance to the Program Driver class. The GameService class contains six attributes, a private GameService constructor to ensure that no other data instantiates itself into to this class, and seven methods. The GameService class has an association to use none or more instances within the Game class. Which contains one private attribute of the instance team list, and three public methods. The Game class has an association with none or more of the attributes of the Team class. This Team class contains one private attribute of players list and three methods. The Team class has an association to use none or more attributes of the player class. Which contains no attributes and two public methods of players ids and names, and an instance of string. All three classes of Game, Team, Player have an inheritance to the class Entity. Which contains two private attributes of id and name, one entity constructor, and four methods.

Evaluation

Using your experience to evaluate the characteristics, advantages, and weaknesses of each operating platform (Linux, Mac, and Windows) as well as mobile devices, consider the requirements outlined below and articulate your findings for each. As you complete the table, keep in mind your client's requirements and look at the situation holistically, as it all has to work together.

In each cell, remove the bracketed prompt and write your own paragraph response covering the indicated information.

Development Requirements	Mac	Linux	Windows	Mobile Devices

Server Side	In my experience Mac computers have a tendency for seamless and simple UI. Mac operating systems are also known for its high security and stability for managing programs. One weakness with Mac computers is that the Apple corporation has limited hardware options in its products. There is less customization <Project Two> Mac systems do offer server-based deployment methods where The Gaming Room servers can be hosted. The avenue that the macOS servers would be deployed with would be tools like Xcode. While this resource Is available to host web applications, it is not typically used In large scale operations. A big reason for this is because of the licensing and hardware costs associated with Mac systems.	An advantage Linux has is an opensource OS that is known for flexibility and customization. Another advantage is it has a wide range of available software giving easy access to development tools. <Project Two> Linux operating systems do offer server-based deployment methods where Draw It or Lose It can be hosted. The tools used to deploy the server include Ubuntu and CentOS The potential licensing cost to The Gaming Room would most likely be less than substantial. Because of the open-source nature of these resources which are usually free to use.	One advantage of Windows is its use and familiarity among a wide array of corporations and people. Windows also has a high compatibility for customization both in hardware and software. One weakness about windows is that because of its popularity, it may be a target for cyberattacks. <Project Two> Windows operating platforms do offer server-based deployment methods in which The Gaming Room servers can be hosted. One method in which the product can be hosted is with Windows Server, which is a popular and robust operating system that builds infrastructure for web services and networks. The licensing cost for this server may become highly expensive. With the licensing cost being about $1200 per license.	The advantages of mobile devices are that they are essentially portable computers. Though they are limited compared to their desktop counterparts, mobile devices allow users to complete work on the go. A weakness of mobile devices is this portability, because it reduces the usability and the caliber of work that can be accomplished. Mobile devices are usually not primarily used for hosting web services. Rather they are almost solely used for running the applications that are downloaded to them. In the event that developers choose to work with mobile devices, there are development tools available such as Xcode for IOS and Android Studio, which are free to use.

Client Side	Using Mac in the process of software development we must consider that they are the more high-cost hardware options. With this being said, Mac options may have easier access and usability to software development tools that can expedite the required time to complete these software development projects. <Project Two> For Mac, the requirements of the application development process would be to ensure compatibility with both safari and chrome based browsers. Modern and robust frameworks would be required for the implementation like React or Angular. With cross platform compatibility there is also a relevant importance with security, which MacOS is very much known for. Some of which are their System Integrity Protection, and XProtect, MacOS`s malware scanning tool.	When working with Linux devices and software, there is a wide variety of resources. There is open-source software, which can greatly reduce software development costs. There may be a learning curve for some developers that may be unfamiliar with Linux, delaying the time it takes to complete development projects. <Project Two> For Linux, the requirements of the application development process would be to ensure cross platform capability with MacOS, windows and Android platforms. Linux may be the simplest operating system to complete this task with the most efficiency. The operating system will also have to be compatible with the Firefox and Chrome based browsers.	When working with windows systems, it is important to keep in mind that OS and server licenses have costs that can become significant when being used by a team of developers. The setup and configuration for windows systems may be time efficient, because of its simplicity and popularization. <Project Two> For windows, the requirements of the application development process would be to ensure platform compatibility with the Edge browser and most older versions of internet explorer. It would also be important to conduct tests to measure the usability on the other platforms such as mac, linux, IOS, and Andriod.	When working with mobile devices, most software development recourses are either free or low cost. Due to the simplicity of mobile devices the learning curve may be low which will expedite the time it takes to complete development projects. Due to the vast majority of mobile devices being part of the Android or IOS ecosystem, an expertise may be required in one of those fields. <Project Two> Cross platform capability would be necessarily essential with mobile devices. An app that is launched and IOS and not the Android or play store would isolate half of the mobile users downloading apps, and vice versa. Some frameworks that may help with this includes Bootstrap, tailwind CSS or Flexbox.

Development Tools	The relevant programming languages and tools for software deployment on Mac would consist primarily of Xcode which is native to MacOS systems. Another programing tool for Mac is Visual Studio, which may be simpler to configure on Mac than other options. <Project Two> The relevant programming languages and tools that are used to build software for deploying on Mac systems includes JavaScript, HTML and CSS. Another IDE that are used in with mac systems is Swift, and Xcode which can be seen as the main language for developing MacOS and IOS applications. This would be a the impact on the development team. The team may need to become proficient and Xcode. In the event of strict time constraints, collaboration may be necessary with a team that already has expertise with these IDE`s.	Linux has a wide variety of relevant programming languages that may consist and work well with Python, Javascript, C++. Linux efficiently uses IDEs such as Visual studio. This generally puts Linux in a class that can be beneficial for both front end and back end development. <Project Two> The relevant programming languages that are used to build software for deploying on Linux includes Python, JavaScript, CSS, HTML, and C++. The development environment tools that are used in Linux include Visual Studio Code and Eclipse. Due to the flexibility that is available on Linux systems, the restrictions that developers face may be limited. These development tools are open source and free to use, which means the licensing requirements will have little to no impact on the developers.	When working with windows, there is a wide array of programming tools that are used for deploying software. These include tools like C++, Javascript, python. Windos is also known for tools like SQL server management and Git which helps with things like API development. <Project Two> The relevant programming languages that are used to build software for deploying on Windows includes C#, JavaScript, HTML, and PowerShell. The development environment tools that are used in Windows are Visual Studio and Edge DevTools. The impact that these technical requirements can have on a development team would be the proficiency with Visual Studio and C#. Visual Studio as a free resource to use for developers, while some windows licenses may cause a negative impact on developers because of their	When working with mobile devices some of the relevant programming languages consist of Swift, which is used for IOS app development. And Kotlin, which is a popular programming language for Android app development. <Project Two> The relevant programming languages that are used to build software for deploying on mobile devices would mainly include Swift for IOS and Kotlin for android studio. The impact that these technical requirement's can have on a development team would be the limited aspects the a mobile device can offer. Another impact would be the necessity to be proficient in the resources for moth IOS and Android for cross compatibility. The licensing for Android studio is at no cost, but the Apple developer programming license would be $99 for each developer.

Recommendations

Analyze the characteristics of and techniques specific to various systems architectures and make a recommendation to The Gaming Room. Specifically, address the following:

1. **Operating Platform**:
   The appropriate recommendation platform for The Gaming Room to expand its product would be Linux, because of its versatility and compatibility with different operating systems. Additionally, its low software development cost and flexibility for different programming languages.

   <Project 3>
   The operating server platform I would recommend that would allow The Gaming Room to expand would be the Linux operating system. This is because of the immense flexibility and low server cost of the platform. This resource may offer the most opportunity to expand because of its open-source nature and its compatibility with different development tools.

2. **Operating Systems Architectures**:
   The operating system architecture for Linux consists of a x86_64 bitrate.

   <Project 3>
   The Linux operating systems architectural nature is comprised of a monolithic kernel. The memory management, file management, and networking are all apart of the kernel. Directly apart of the system. This creates an optimal situation for high performance. The Linux kernel can also extend and broaden the capabilities of the system by loading into external kernels called loadable kernel modules.

3. **Storage Management**:
   Logical Volume Management is used for general purpose storage management for managing disk storage and resizing partitions.

   <Project 3>
   An appropriate storage management system to be used in the Linux OS that I would recommend would be Ceph storage. Ceph is a open source distributed storage system that is optimal for use in large scale projects. With a game that needs to be instantiated on multiple devices that can be used by multiple different users. Ceph consists of an object storage system, which allows the user to store data in the format of objects. Another critical point of Cephs storage system is decentralized. This is very advantageous because there is no single point of failure for the system to fail. This increases reliability because different components can fail within the system, without taking down the entire structure of the storage system.

4. **Memory Management**:
   In addition to using ram for its memory management, Linux also uses virtual memory which allows its systems to utilize more memory than the physical ram. Linux also uses a myriad of memory management tools such as swapping, paging and shared memory. This can help the Draw it Or Loose it game by giving the company a scalable resource to deploy the program on.

   <Project 3>
   Linux would use dynamic memory allocation to create new objects and store data. This manages memory by allocating free blocks of memory when needed. This ensures that Draw it or Loose it will always have free memory and also increases efficiency without fragmentation. Linux also implements page caching to access frequently accessed file data within the ram. As well as swap spacing. Which temporarily allocates less used memory to the disks. This also free`s up RAM so more critical tasks can be implemented.

5. **Distributed Systems and Networks**:
   It is important to design a efficient and distributed system for Draw It or Loose It to be able to communicate between various platforms. This will have to include components of a servers that will be compatible with IOS Android and desktops. It Is important the distributed software carries data consistency across all platforms. There also must be regulated dependencies that manage the distributed networks and handle connectivity issues.

   <Project 3>
   The most advantageous approach to communicating between various platforms and devices would likely be implementing a client-server approach that communicates with a central server. It would also be advantageous to use websockets for real time communication, and RESTfulAPI`s for non-real time communication. Rest Api's can be used to send and retrieve data, while web sockets give persistent connection between the client and server. Another important aspect to implement is cross flatform program frameworks like Unity or React. This would allow the same code to run on multiple different platforms, which is important for cross platform eligibility.

6. **Security**:
   In the area of security for the clients, it is particularly important that the proper measures be implemented, considering the distribution of data between different networks. Probably the most effective aspect of this data security would be data encryption. The next best avenue for data security would be firewalls, two factor authentication, and secure APIs

   <Project 3>
   When developing and implementing aspects for a cross-platform compatible game, the security for the system must be robust. It must adequately measure both the client devices and the server. With this being said, the Linux operating system has a broad array of security capabilities. Such as encryption, authentication access control, data integrity, network security and secure software development. Using database encryption can be a massive step in the

robustness in security. One way to implement this can be with SQL encryption. Role based access control is another great aspect of data security. The least privilege principle ensures that users will only have access to the features that is necessary for their role. An example of this would be the players of the Draw it or Lose it game would not have access to administrative functions of the game. Or for instance would not be able to access any development commands within the game.