

<Gaming Room >

# **CS 230 Project Software Design Template**

Version 1.0

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## [Document Revision History](#_grjogdjh5fi8)

| Version | Date | Author | Comments |
| --- | --- | --- | --- |
| 1.2 | 4/7/2024 | Osvaldo Ortiz | A new class was created to handle player identity and game identification, removing these attributes from various classes, creating code that is easier to maintain and modify. |

## [Executive Summary](#_sbfa50wo7nsh)

The Gaming Room presents a game that he wants to develop for his web-based Android application. The game is inspired by a popular game called Win, Lose, or Draw, where players compete to guess the puzzle based on drawn pictures. Gaming Room intends to expand the application so that it is accessible to multiple platforms. To work as requested by the client, the web-based application should be developed while maintaining the main functions of the current application to maintain its current operation. Since the application will accept multiple teams of players, the application must identify each of the team games that are in the game to avoid repetition. For this, we will work with identifiers for each game and team to guarantee that there is only one game in memory, a player instance will be created.

## Requirements

Within the requirements for players to be able to compete with each other, they must close multiple teams, for this the application will have to be compatible with several teams. Within each team there will have to be multiple players. To avoid identification conflicts, the game and the players must have unique names with the function of being able to verify if the requested name already exists so as not to repeat it. The application must have identifiers for each Game, team, and players. The game must be developed on a multiplatform. The application must have a drawing file library to show and guess in the game. In the application, each game will have four rounds with a duration of one minute each.

## [Design Constraints](#_2et92p0)

Security is the link to consider, a design of security protocols must be established to be implemented in the application, ensuring the integrity and protection of data, unauthorized access, and code integrity.

Since the application will be hosting multiple users, it should be designed to support scalability. Working with scalability, the application can be deployed in several servers with the use of containers to allow the distribution of new requests allowing an efficient use of resources.

The connection with the servers through the network could present delays, possible delays must be considered to optimize communication, allowing the impact of the delay not to interrupt the user experience.

## [Domain Model](#_8h2ehzxfam4o)

The diagram consists of seven classes. The SingletonTester class, which is not directly connected to any other class, serves as an example of testing the Singleton pattern. Following this is the ProgramDriver class, which contains the main method where the program executes and interacts with the SingletonTester class.

The Entity class acts as a parent class, encapsulating properties such as id and name as private and providing public methods for accessing these attributes from other classes. The Entity class shares its attributes and methods through inheritance with the Player, Team, and Game classes.

The Player class inherits from the Entity class and includes methods for managing the player's id and name. This class represents the identity of a player.

The Team class inherits from the Entity class and has a list of players associated with the team. It includes a method for adding players, connecting with the Player class.

The Game class inherits from Entity and represents the general identity of a game. It has a list of teams associated with players, a method for adding players, and generating a text string representing the game. This class is connected to the Team class, receiving information of this type.

The GameService class manages games and follows the Singleton pattern, as shown in the method for obtaining the instance, ensuring only one instance of the GameService class is obtained. This class has methods for adding games, retrieving games by ID or name, and managing IDs for players and teams. The relationship between GameService and Game is 0 to several, indicating that the GameService class can manage multiple games.

Evaluation

Server-side Deployment

For server deployment, there are different methods available depending on the chosen operating system. In the case of Windows, the method known as IIS (Internet Information Services) is offered, developed specifically for Windows devices. The costs and licenses associated with this server vary depending on the edition used and the specific needs of the application, such as database usage and integration with cloud services. Windows provides an intuitive user interface and has good support for its products. However, licenses can be expensive, especially for large-scale deployments that require intensive resource usage.

On the other hand, Linux utilizes the Apache server, an open-source option that doesn't incur licensing costs. This server is highly customizable, scalable, and cost-effective due to its open-source nature. However, Linux may be less user-friendly for those less familiar with this operating system.

Lastly, macOS also offers a server-based deployment method, using Apache like Linux. Associated costs may vary depending on the application's scale and the resources needed for its implementation and maintenance. macOS offers a user-friendly interface and convenient management tools, but it may also incur significant costs depending on the project's scalability.

Client-side:

To ensure client-side compatibility and functionality, it's essential to ensure that the application complies with current web standards, such as HTML, CSS, and JavaScript. Additionally, responsive design principles should be implemented to adapt to different devices and screen resolutions. Thorough testing across various browsers and devices is crucial before launching the final product to ensure its compatibility and optimal performance.

Mobile Operating Systems, Android, and iOS:

In developing mobile applications for operating systems like Android and iOS, using cross-platform frameworks like React Native is recommended. It's important to follow specific user interface (UI/UX) design guidelines for each platform to provide a consistent and satisfactory user experience.

Development Tools:

For web development, it's recommended to use languages like HTML, CSS, and JavaScript, along with tools like Visual Studio Code or Sublime Text to ensure efficient and organized development.

In mobile app development, cross-platform frameworks like React Native are ideal for reaching audiences across various platforms. Additionally, it's important to use specific IDEs like Xcode for iOS and Android Studio for Android to cater to the needs of each platform.

Impact on Development Team:

The web development team should have knowledge of both front-end and backend development, as well as experience using relevant tools for this type of development. Similarly, the mobile development team should have experience in developing applications for Android and iOS, as well as using cross-platform frameworks.

Licenses and Costs:

For web development, there are numerous open-source or low-cost tools available, as well as free IDEs that can be used for development.

In mobile development, some IDEs may require licenses, but there are also open-source cross-platform frameworks that can be used without additional costs.

**"The Gaming Room UML diagram. The top of the diagram is labeled as com dot gamingroom. Test boxes are placed in two layers. The first layer has three text boxes and the second layer has four of them. In the first layer, the 'ProgramDriver' textbox points to 'SingletonTester' textbox. The 'ProgramDriver' textbox contains the text 'asterisk main round brackets.' The 'SingletonTester' textbox contains the text 'asterisk testSingleton round brackets.' The arrow between these two text boxes are labeled 'open two angle brackets uses close two angle brackets'. In the second layer, there are 'GameService', 'Game', 'Team', and 'Player' text boxes. The 'GameService' textbox has texts arranged in two layers. The first layer contains games colon List open angle bracket Game close angle bracket, nextGamesId colon long, nextPlayer Id colon long, nextTeamId colon long, and service colon GameService. The second layer contains GameService round brackets, getinstance round brackets colon GameService, addGame open parenthesis name colon String close parenthesis colon Game, getGame open parenthesis id colon long close open parenthesis colon Game, getGame open open parenthesis name colon String close open parenthesis colon Game, getGameCount round brackets colon int, getNextPlayerID round brackets colon long, and getNextTeamId round brackets colon long. The 'GameService' box is connected with the 'Game' textbox with a line labeled 'zero dot dt dot asterisk'.  The 'Game' textbox also contains text in two layers. The first layers contains the text teams colon List open angle bracket Team close angle bracket. The second layer has Game open round bracket id colon long comma name colon String close parenthesis, addTeam open parenthesis name colon String close parenthesis Team, toString round brackets colon String. The 'Game' textbox is connected with the 'Team' textbox with a line labeled 'zero dot dt dot asterisk'. The 'Team' textbox also contains text in two layers. The first layers contains the text players colon List open angle bracket Player close angle bracket. The second layer has Team open parenthesis id colon long comma name colon String close parenthesis, addPlayer open parenthesis name colon String close parenthesis colon Player, and toString round brackets colon String. The 'Team' textbox is connected with the 'Player' textbox with a line labeled 'zero dot dt dot asterisk'. It contains the text Player open parenthesis id colon long comma name colon String close parenthesis and toString round brackets colon String. The 'Game', the 'Team, and the 'Player' boxes point to the 'Entity' textbox in first layer. The 'Entity' textbox contains text in two layers. The first layer has the text id colon long and name colon String. The second layer has Entity round brackets, Entity open parenthesis id colon long comma name colon String close parenthesis, getId round brackets colon long, getName round brackets colon String, toString round brackets colon String.**

| **Development Requirements** | **Mac** | **Linux** | **Windows** | **Mobile Devices** |
| --- | --- | --- | --- | --- |
| **Server Side** | Mac has interfaces which are user friendly allowing easy management and configuration of your web-based applications.  Mac provides a wide variety of development tools which are aimed at web development.  Mac is based on Linux which makes it suitable for the development and management of web applications, it provides a wide variety of commands to manage the structure.  The Mac operating system is usually more expensive so it could affect the budget when hosting a web application.  It could be difficult to expand the hosting infrastructure since Mac hardware is limited compared to PC hardware that there is a wide variety. | Linux is an open-source operating system which allows user modification. This feature allows modifications to the system.  Linux is a very popular system in web hosting due to its stability and efficiency in resource management, making it a highly recommended option for hosting servers.  Linux has a large community that is constantly working on possible vulnerabilities that could be found in this system, making it more secure.  To handle Linux, you must have previous knowledge of its command line, unlike other systems which provide user-friendly interfaces. Linux is more technical. | Windows has its own system of servers which have services to make it easy to manage web-based accounts including access control and permissions that must be configured.  The Windows server system offers graphical interfaces for better account management for users who do not have experience with command lines. Windows has great technical support for users and is the most widely used system in the world.  Although Windows has made improvements to its system in terms of security, it is still one of the systems most susceptible to malware and viruses and targeted attacks, unlike systems like Linux. | The portability of mobile devices is an advantage for users since they can have tools such as applications which could execute a function without the need for hardware that would be difficult to transport for a simple task.  Mobile devices through the network can connect to web applications from wherever they are, allowing the user to interact with the desired application.  Mobile devices have the disadvantage of having limited hardware resources that may be required such as processors, memory, and storage.  When accessing an application, mobile devices only have access to the network through Wireless access; if this is not available, the device would be disconnected from the web service. |
| **Client Side** | For development within Mac, certain tools are required, which could have a cost depending on what you want to work on, some are free depending on the function to be performed. Additionally, depending on the project being worked on, a system license may be required, which may vary in cost.  Within the software view cycle, it will be considered that the process could take more time depending on unforeseen situations that may affect the development and tests that must be carried out to deliver functional software.  Previous knowledge of Mac developers is necessary, such as Apple's frameworks. This is because Mac users expect behavior in their interfaces which they are used to and to comply with this, they must have experience in their frameworks. In addition, users may require assistance at some point, so developers who know the system are the ones who can help solve any situation and maintenance. | In the Linux field, a cost is required in the licenses that may apply. Also, the libraries and frameworks that are specialized software which require a cost depending on what is being worked on.  Development time may vary as Linux has different versions which would need to be tested to fit.  To develop Linux, you must have knowledge of the Linux command line, internal systems. This is to ensure that the staff can make software that is compatible and functional. | Developing Windows requires testing on Windows virtual machines which could incur software and hardware license costs. Working with some specialized development tools such as frameworks, IDEs, and compilers may require licenses for their use.  Windows ditch with different versions which depends on which versions you are working on; you will have to submit tests which could take a period of time.  The development team must have previous experience developing Windows APIs and its development tools. Although knowledge is required to work developing for Windows, unlike other operating systems, Windows is a system that does not require as much due to its easy graphical interaction with the user when developing. | Depending on which mobile device operating system you are working with, such as Android or iPhone, it will depend on what development tools you need to use and whether it carries any cost for its use, and the purchase will depend on this. In the development for mobile devices, you must consider if you are going to use tools such as libraries or third-party APIs, which could lead to more costs.  Depending on the platform that is going to work is the time that can take to complete the development of an application. If an application is required to be multiplatform, it will require working with different programming languages and testing for both operating systems and their different versions.  Developers must know about the prior development of the platforms to be worked on, such as the different libraries for mobile devices, and frameworks that allow the development of cross-platform applications. |
| **Development Tools** | For the development of Mac software, the Swift programming language is used, which is the most recognized for the development of Mac and IOS. Use is also made of IDEs such as Xcode which is the development environment for Mac and IOS which helps in the development of code. | Development on Linux Python is a very popular programming language on this operating system. Also programming languages like C++ and Go are currently used for the development of applications for the Linux system. | Windows conforms more to the C# language which was developed by Microsoft to adapt more to the Windows system. Languages like Java, C, C++, and Python are also used for Windows software development. Windows has its editor such as Visual Studio which works very well with C# and Visual Studio Code which allows development with multiple programming languages in the same environment. | Within mobile devices, Swift is known as the preferred programming language for development in OIS, in this programming language the Xcode development environment is used. In Android, Java is used as a programming language for the development of this system in its Android Studio development environment, which is an emulator which allows working on the functions that the application will perform on a mobile device. |

## Recommendations

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

**Operating Platform**:

Due to its great reach in the population and its easy use, Windows would be the recommended platform to expand the application. Windows operating platform is one of the most used due to its speed and that it is a secure platform.

Because we want the application to work on various operating systems, Microsoft Azure is an excellent choice, based on its cloud-based option, which provides support for multiple operating systems and is scalable, allowing the user base of the application to grow over time.

**Operating Systems Architectures:**

In Windows, the Kernel is responsible for managing system resources and facilitating the connection between software and hardware. The Windows kernel is managed in various versions of Windows including Windows server.

The executive services which are above the kernel of this operating system allow memory management, process and thread management, and device input and output management.

Non-kernel user mode encompasses the applications and processes running on the system including user interfaces and other components that interact with the user.

The Win32 Subsystem is a layer that allows the execution of 32-bit applications on Windows. It provides an API that allows developers to code and run applications using this Win32 model. This system is in charge of managing the threads, the memory, and the essential resources to execute the applications.

The graphics system in Windows allows the management of different parts of the GUI graphical user interface display.

Windows has a File System that handles, among many functions, organizing and managing data in hosting devices such as hard drives and SSDs.

Microsoft Azure operates on a distributed architecture, ensuring service availability and reducing failures. Azure's architecture enables efficient resource utilization and enhances performance across different operating systems.

**Storage Management**:

Due to its wide usage and effective storage management system NTFS is the best storage management system that can be integrated for Windows, running on different modern versions of it.

For the effective management of the Draw It or Lose It application, based on Microsoft Azure, Azure Blob Storage can be utilized, which provides scalable storage. This service ensures proper storage across various operating systems and guarantees data integrity and availability.

Memory Management:

The Azure platform utilizes advanced memory management techniques to optimize resource utilization and performance for the application. It works with dynamic memory allocation, virtual memory management, and garbage collection mechanisms. This ensures that the platform will provide optimal performance for the application across different operating systems.

**Distributed Systems and Networks**:

For users to connect to the application, it must be connected to the Internet. The network infrastructure must provide a secure and stable connection to guarantee the connection to the application. For a connection between the user and the application, HTTP protocols, WebSocket’s and APIs designed for the application will be used.

To ensure compatibility between the platforms in the application for the exchange of data between them, the use of the XML format will be established, which will allow data exchange between the platforms. Given the possibility of outages in the network in connection problems, a mechanism must be implemented for handling and recovery of errors in the system implemented mechanisms of waiting time.

To work on connection security, registration mechanisms must be used in the network, implementing authentication and authorization protocols.

The use of RESTful APIs or Azure Service Bus enables seamless communication between components running on different platforms. This facilitates communication across multiple platforms for the application, ensuring smooth interaction between different systems.

**Security**:

Windows supports protocols for secure communications through the HTTPS and SSH protocols for encrypted data transfer. Upholding the standards of established legal regulations such as the GDPR can help keep customer data secure as well as being required by law to comply with these protection and privacy standards. Windows has guides for implementing these. Keeping systems up to date with your antivirus and antimalware can prevent unauthorized access from external threats. Maintaining system updates allows the detection of new threats. Create an education policy for users giving them tips on how to keep the system safe since users are the weakest link in the network in terms of security. Maintain a periodic network scan with the use of tools to monitor network traffic and investigate security breaches.

As the most critical link for user data protection across various platforms, Azure provides comprehensive security features such as data encryption, access control, and threat detection. The Azure Active Directory feature ensures secure authentication and authorization across the board.