



*Bilkent University
Department of Computer Engineering*

CS 491

Senior Design Project

High-Level Design Report

Project Name:

GrouPub

- A Location-Based Quiz Application -

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Abstract

GrouPub is a location-based quiz application where users compete against each other in quiz events that are hosted in specific pubs or cafes. GrouPub provides a large variety of people to talk with, but in a mobile game form. In this High-level Design Report, after briefly introducing our application in the “Purpose of the System” and “Design Goals” parts, we propose an updated software architecture for our application by creating a subsystem decomposition table and visualizing the hardware/software mapping. In addition, we identify subsystem services necessary to manage our application and give similar applications to GrouPub with similarities and differences. We will discuss how our system behaves when a termination and failure occurs.

1. Introduction

1.1. Summary & Purpose of the System

GrouPub is a location-based quiz application where users can sign up to an event, form or join a group and participate in a quiz event that is hosted in a specific pub or café.

Users need to create an account to be able to use GrouPub. After successfully creating an account and logging in, users will see a list of upcoming events. These events represent the actual quiz event that is taking place in a specific location. After selecting an event, users can see the groups that were already formed by other users that belong to the selected event. Users can either join a group that has an available slot or form a new group (maximum of five). Once the user successfully joins or forms a group, he/she can go the specified location at the specified time to join the quiz.

A quiz event will start at the specified time and users that have successfully signed up to that quiz (and present at the specified location) will start to receive questions every ten minutes. Users will have twenty seconds to answer a question. Once the quiz event is over, the winner group will be rewarded with drinks or food by the host and they will be recorded in GrouPub's public leaderboards. The winner group will also be prompted to take a photo of themselves and upload it GrouPub's leaderboards (this is an optional step for the group).

The purpose of GrouPub is to create an environment where even strangers can form groups, share a few drinks and socialize while trying to win a quiz event. It is an alternative activity that saves users from their daily routine, clear their heads, make some new friends and just have fun.

1.2. Keywords

Event: An event represents a quiz event that is taking place in a specific location (pub, café etc.). It includes information about the quiz event including the start time and the location.

Group: A group (that is formed by a user) represents a group of maximum five users that belongs to a specific event.

Heat Level: Heat level of a user indicates how often that user uses words that are registered in the word blocker's database. Every time a restricted word is used, the heat level will increase by some amount. After reaching a certain threshold, that user will not be able to chat with anyone for a limited amount of time. Note that the heat level of a user will start to cool down if that user does not use a restricted word.

Host: Host is the location where an event will take place. A host can be a pub, a café or anywhere public with tables and chairs where people can sit together and solve quiz questions.

Joker: A joker is a special item that allows users to modify a question such that it is easier to answer it. One example is removing two wrong answers from a question.

Rating: User A can rate user B based on how polite user B was to user A. The average rating of each user will be publicly displayed, giving a rough description of how polite each user is.

Word Blocker: A class (will be written by us) that scans a conversation and censors each word that is registered in its database. The database of the word blocker will be created and maintained by us. The purpose of this class is to censor out insulting and inappropriate words and to help calculate the heat level of a user.

1.3. Definitions Acronyms and Abbreviations

Firestore: An API that provides powerful services such as user authentication, static hosting and more.[2]

HTML: Hypertext Markup Language [3]

ISP: Internet Service Provider

JSON: JavaScript Object Notation [4]

Node.js: An API that provides services for scalable network applications. [5]

Phonegap: A framework that can run mobile applications. We will run/test our application using Phonegap. [6]

Spring: A framework that is used to create JVM-Based applications and systems. [7]

User: A user of GrouPub with a valid account.

XML: Extensible Markup Language [8]

1.4. Design Goals

1.4.1. From the Perspective of Users

Usability: It should be easy to use this program since its main purpose is to provide fun. The users do not want to do so much work in leisure time activities. The application aims to be useful not to be boring.

User-friendly Interface: We will prefer a simple design because of our user target. We will try to apply Material Design features which are developed by Google to our user interface [1]. It will make our work much easier and our interface will be seen neat.

Low Cost: It will be a free application. Only cost is from ISP since it needs an internet connection to be played. The event place's WI-FI can be used to get rid of this cost, too.

Security: To join an event, a QR-code validation is required. Information stored in database (passwords and scores) should not be changed by others.

1.4.2. From the Perspective of Us

Performance: The game will be open for all users at the same time. The application uses web service database, hence the requests and responses should be shorten.

Memory: It must provide efficient queries to the database in order to use consume less RAM.

Updatability: Group information, leaderboards, personal records will be updated frequently.

1.5. Similar Applications

There are bunch of applications that are similar to GrouPub. However, none of them is exactly the same with GrouPub. Let us mention several most similar ones.

- **QuizUp** [9]
 - **Similarities:**
 - Different themes for questions
 - World-wide user scores (leaderboard)
 - Player to player chat engine
 - Multiplayer challenges (1 vs 1)
 - Cannot be played offline (single player)
 - **Differences:**
 - QuizUp is not location-based
 - QuizUp does not provide team vs team challenges
 - No team chat rooms in QuizUp
 - No jokers in QuizUp
 - No rewards in QuizUp

- **MoviePop** [10]
 - **Similarities:**
 - Multiplayer challenges (1 vs 1)
 - World-wide user scores (leaderboard)
 - Jokers
 - Cannot be played offline (single player)
 - **Differences:**
 - MoviePop is not location-based
 - MoviePop does not provide team vs team challenges
 - No chat engine in MoviePop
 - No rewards in MoviePop
 - MoviePop has a fixed question theme

- **Trivia Burst** [11]
 - **Similarities:**
 - Multiplayer challenges (1 vs 1)
 - World-wide user scores (leaderboard)
 - Different themes for questions
 - **Differences:**
 - Trivia Burst can be played offline (single player)
 - Trivia Burst does not provide jokers
 - Trivia Burst is not location-based
 - Trivia Burst does not provide team vs team challenges
 - No chat engine in Trivia Burst
 - No rewards in Trivia Burst

- **Quizoid** [12]
 - **Similarities:**
 - Different themes for questions
 - World-wide user scores (leaderboard)
 - Jokers
 - **Differences:**
 - Multiplayer challenges in Quizoid
 - Quizoid is not location-based
 - No chat engine in Quizoid
 - No rewards in Quizoid
 - Quizoid can be played offline (single player)

- **Urban Quiz** [13]
 - **Similarities:**
 - Location-based
 - Different themes for questions
 - Cannot be played offline (single player)
 - **Differences:**
 - In Urban Quiz users creates the questions
 - No jokers in Urban Quiz
 - No rewards in Urban Quiz
 - No chat engine in Urban Quiz

- **Pub Quiz** [14]
 - **Similarities:**
 - Multiplayer challenges (1 vs 1)
 - World-wide user scores (leaderboard)
 - Jokers
 - Different themes for questions
 - **Differences:**
 - Pub Quiz is not location-based
 - Pub Quiz does not provide team vs team challenges
 - No chat engine in Pub Quiz
 - No rewards in Pub Quiz
 - Pub Quiz can be played offline (single player)

1.6. Overview

Our project is a mobile application both for Android and iOS operating systems which is uniquely designed for socializing and entertainment. It is especially for teenagers who want to compete and socialize. It is a quiz game which users can sign up to an event, form a group with their friends or others and participate in a quiz that is hosted in a pub or a café.

The purpose of GrouPub is to create an environment where even strangers can form groups, share a few drinks and socialize while trying to win a quiz event. GrouPub is a unique application since there is no application that covers the concept of chatting with others in a specified area and creating fun quiz environments in different locations with multiple users to compete with.

3. Proposed Software Architecture

3.1. Overview

In this section GrouPub system is going to be explained in more detail. As a start, subsystems will be covered to see which and what kind of subsystems the GrouPub system is using in order to be efficiently functional. Afterwards, hardware and software mapping of GrouPub is going to be visualized and explained. It is followed by the explanation of persistent data management of the system. In that part, the relation between the persistent data will be visualized and explained. Finally, access control and security, global software control and boundry conditions for GrouPub will be explained in detail.

3.2. Subsystem Decomposition

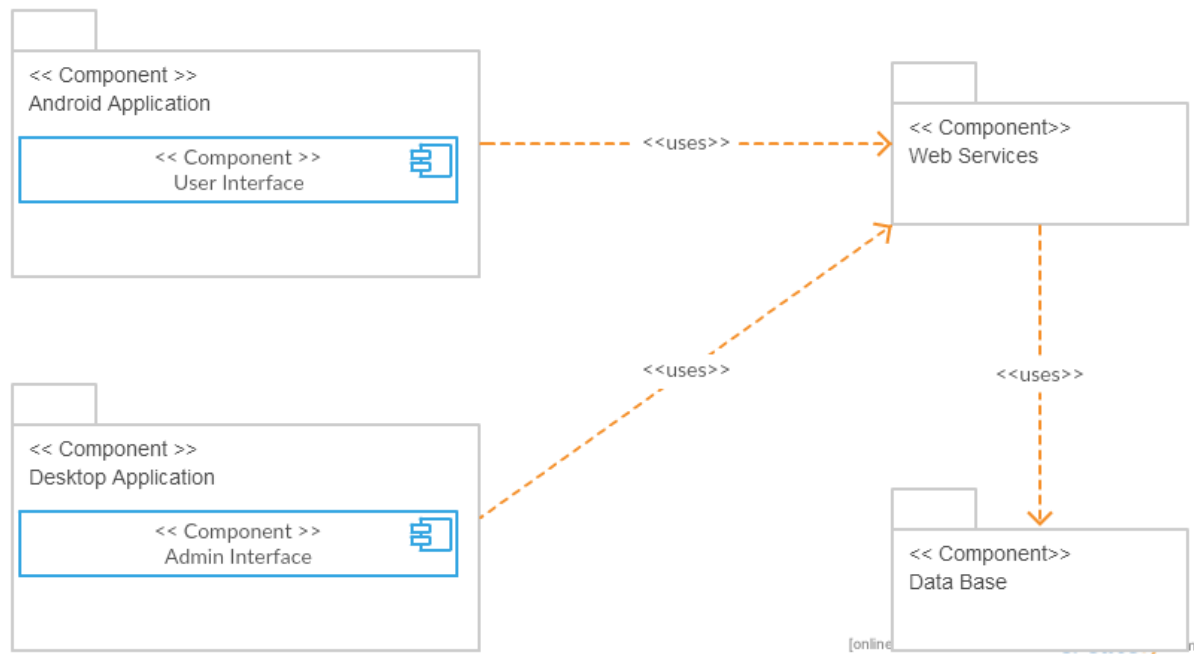


Figure 2: Subsystem Decomposition of GrouPub

Android Application

Android Application has two sub components, user and Admin interface. Components are implemented with JSON because of easy connection with Webservice. Application will be implemented with phonegap.

Database Manager

Database Manager Database Manager is the controller of information that is collected in database. Database stores user information, questions for the quiz and cafe's addresses and information.

Web Service

Webservice provides the connection between application and server, database. When a user creates an account or when there is an event registered, will be done with the help of the web service.

3.3. Hardware/Software Mapping

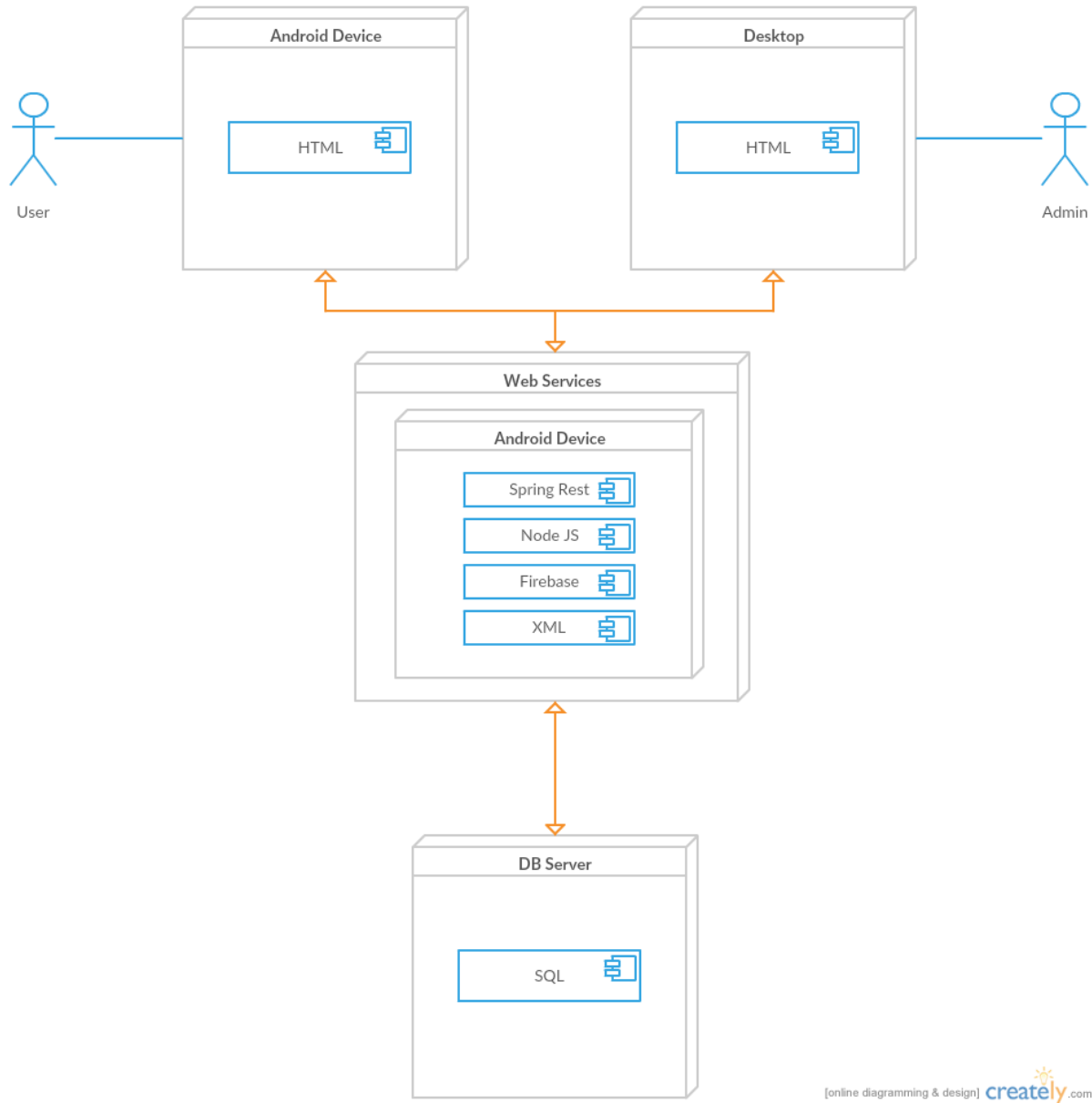


Figure 3: Hardware/Software Mapping of GrouPub

The user will connect to the event by the android device (smart phone). The admin can connect to the events by the desktop computer. Both user and admin use the web service with interacting the android device to add/delete information in database. In web service we use Spring Rest, Node JS, Firebase and XML to reach our database which is using SQL.

3.4. Persistent Data Management

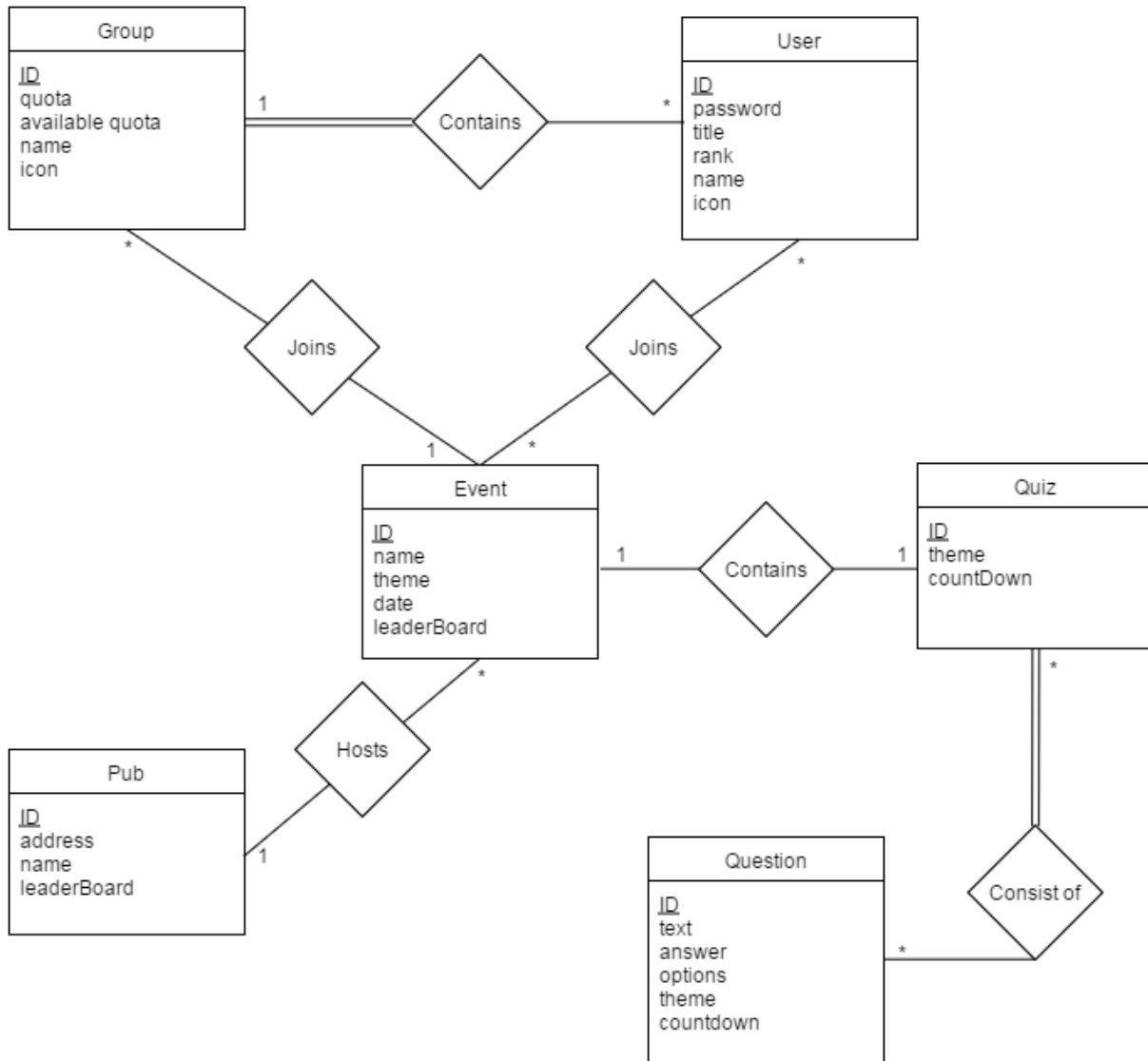


Figure 4: ER Diagram of our persistent data

All the data related to the questions such as the id of the question and its content stored in the database. These question's content will not change very often since there shouldn't be any reason to change the question's content if the question is valid and correct. All user accounts and its information such as user name, points etc. will be stored in the database and can be changed or deleted if needed. All pubs and their data such as their names, addresses and id's will be stored in the database and can be changed if a need occurs. Groups will be created in every event and will be deleted when the event is over which means groups will be constantly added and deleted with each event.

3.5. Access Control & Security

GrouPub has two protection and authentication controls within application. First one is login operation for registered users. When user sends a request, system checks the corresponding data in database system. System allows or denies the user to enter the system according to the information stored in database. If system allows user to attain the related page, otherwise system stays in the login page and asks login information again. Therefore, user accounts are protected by users' login information.

Because GrouPub is location-based chat application, we need to control users' location whether it is valid to attend the quiz or not. Users give the QR code information to the application provided by café/pub. System checks the QR code and if it is valid, gives the user access allowance.

3.6. Global Software Control

There are two different global software control services in GrouPub as web-based phone application and web-based desktop application. These two software systems have similar properties except their usage areas. Web-based phone application uses PhoneGap and used by application users. If the user has suitable software for his/her phone, application runs as mobile application. Web-based desktop application uses web-browser and used by admin to control system backend.

There will be server-client system for web platform. Users send requests to the database and system replies related requests. In addition to this, GrouPub application runs as event-driven. According to the requests, server replies it with corresponding services or continues listening the requests.

3.7. Boundary Conditions

3.7.1. Initialization

GrouPub has two types of users; the regular user of GrouPub and admin.

Users can access GrouPub from their smartphones. In order to login, users need to enter their username and password. If the combination matches an entry in the database, that user will be logged in and the home page of GrouPub will be displayed. If the combination does not match an entry, an error message will be displayed and that user will not be logged in.

Admins will use their PC to access GrouPub's administration page. To login, admins will enter their username and password. If it's a match, they will be logged in and the administration page will be displayed. Otherwise an error message will be displayed.

3.7.2. Termination

After their first successful login, users won't be prompted to log off. They will be kept logged in, in order to prevent the hassle of logging in every time they launch GrouPub. However, if users choose to log off, they can use the log off button to log off anytime they want.

Admin accounts won't be kept logged in once they login. They need to hit the log off button to exit the administration page.

3.7.3. Failure

In the administration page, admins need to save all the changes they made before logging off. If they fail to do so, those changes will not take place and the database will remain unchanged. The failure will occur if there is a connection error during an operation which involves editing the database.

4. Subsystem Services

4.1. Database Manager

Our system will be writing to and reading from its database frequently. Those transactions must be handled efficiently and securely for the sake of the system's stability. For this purpose we are going to use a transaction manager. It is called Spring Transaction Manager a service that Spring Framework provides. This service allows us to create secure and stable connections to our database.

4.2. Event Manager

Events that need to send requests to our application server has to be handled by a manager. On the backend we will handle those requests using RESTful Web Services. It takes JSON and handle the request accordingly.

4.3. Login Manager

Every user is going to have its own credentials which are 'username' and 'password'. When a user launches GrouPub, those credentials are required in order to login. This authentication process will be handled by the login manager. For this purpose we are going to use Spring Security Session Management which allows us to create sessions per user and close those sessions when logout occurs.

5. Conclusion

GrouPub is a location-based quiz application, which provides its users an entertaining way of socializing and improving their knowledge. Quiz events are hosted in different locations and the time of event is declared in advance. Thereby, users can participate as single, form a group or join a group for quiz event. The leader-boards indicate the single events' and overall winners with their points collected. There are rewards depending on the events' concepts such as free drink or food serviced by the event place. Users have choice to participate as a single, form or join a group in specified event after they log into application by their usernames and passwords. To control the location of event participants, we provide QR code at the location that event takes place so that users enter the event thanks to that QR codes. Users may chat with group members or other users to request to join a group. Then, users may meet group members in event place in event day and wait the start the quiz. It is the way of communication and socialization that we aim to provide users. Once the quiz starts, users get the quiz questions by application at a given time interval. At the end of each quiz, according to the points that each group collected, application determines the winners of event to reward them. In addition, there will be another leader-board to indicate overall success of each user. Therefore, user may see the ranks at the leader-board after event finishes. GrouPub aims to provide its users an entertaining way of

socializing and communicating with people by the quiz application. Due to the provided choice of participating single, forming or joining a group, application addresses all types of users and their demands.

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