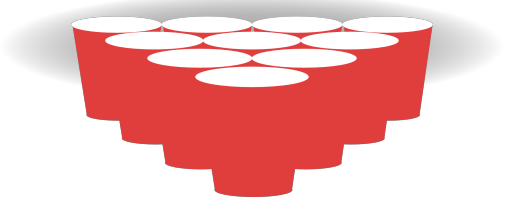
rerack.me



FINAL DESIGN DOC

Overview

Purpose and goals

Brief description of system to be built

We would like to build a system to track the results of people's pong games so that they can see how they stack up against their friends. Every time someone plays a game of pong, they can put their results into rerack.me, and track their in rank compared to their friends. The motivation behind this project is to enhance the already popular game of pong by adding a social and competitive layer to the game. There are currently no solutions available to track scores and results in pong specifically, so we will be the first entrants into this specific market.

Key goals and purpose (what problem does it solve?) [Actionables]

- History
    - Allow people to track their history of pong games
    - Games should be easy to enter in on mobile and desktop so that users have no barrier to enter in games
- Rankings
    - Create a system where people can see their relative skill in pong compared to their friends
    - Establish a confirmation system that fights against people creating fake games

Motivation for development (eg, deficiencies of existing solutions)

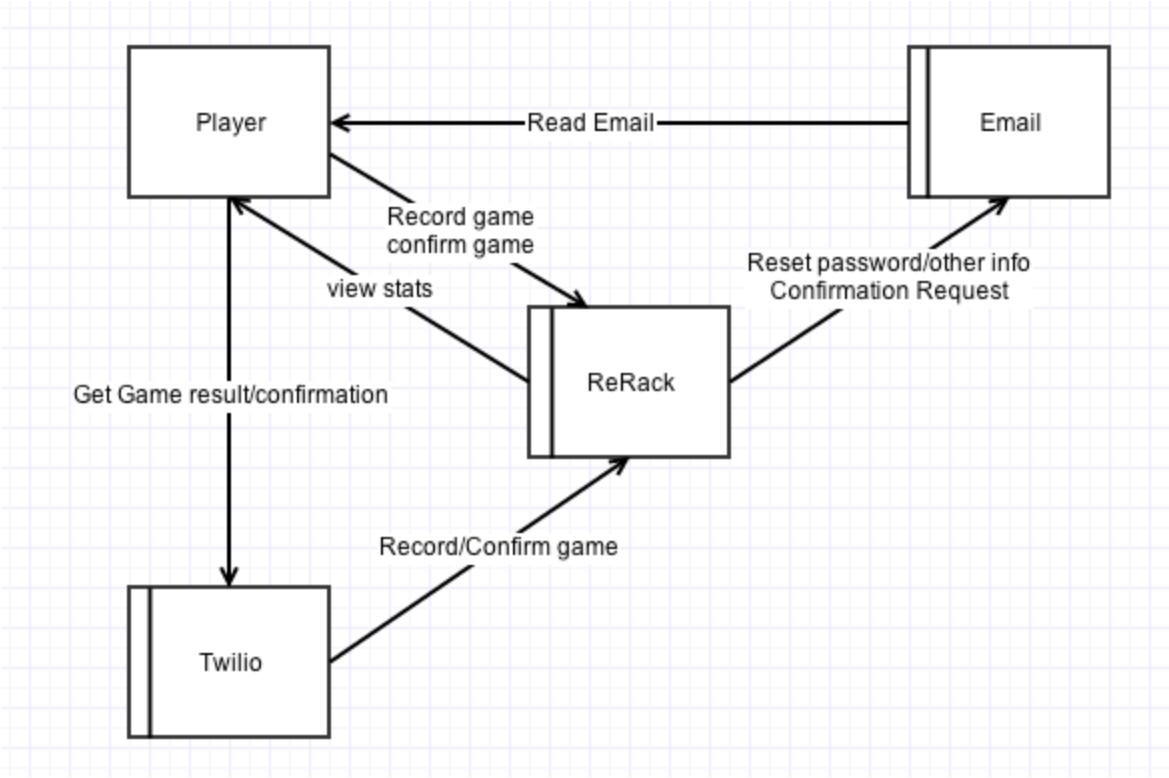
There is not a problem with pong and the way it is now but our team sees potential in adding an element to the game. There is a competitive pong league but it is not very popular and most recreational pong players do not care about pong as a sport. Our application adds a layer of this competitiveness to recreational pong. Recreational players can track their games to make it a little more fun and competitive.

Currently people can track games of any sort using IMLeagues or a variety of other web apps but there is no custom app for pong. We believe that all of these apps have a high activation energy which acts as a barrier and prevents people from recording their pong games. With an application that is tailored to pong players will have a smooth and pleasurable experience.

We are also going to try and add features that make pong a more equitable game. There will be a handicap system where games can be modified to make the games fair. If a very high rated team is playing a team at the bottom of the rankings, the high rated team will be instructed to start with less cups in order to level the playing field.

Context diagram

Establishes boundary of system
Interactions between system and external entities



Concepts

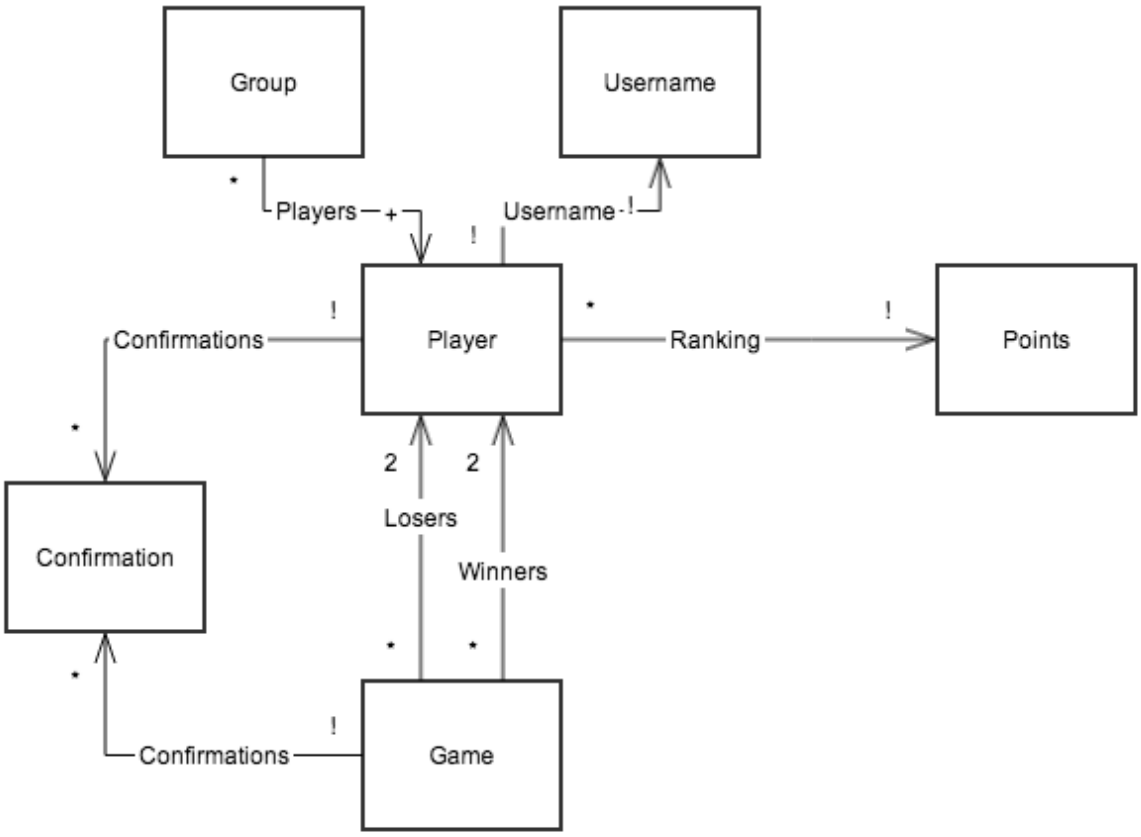
Key concepts

Brief explanation of key enabling concepts

Game: Involves 4 players split into 2 teams; a game of pong is then played with these two teams. At the end of the game one team is designating the winning team and the other the losing team.
Player: Registered or unregistered user who is one of 4 players in a game and becomes a winner or loser.
Ranking: The ranking sorts players according to their history of games. Players are able to move up in the rankings by winning games.
Points: Assigned score to a user that represents how often a player wins at pong.
Group: A collection of people who will have their own rankings. Games played within a group contribute to rankings within the group. A player can belong to multiple groups. An example of a group is a company, fraternity or school.

Data model

Data model of application state
Schema representation details excluded
Syntactically valid diagram with consistent naming & layout
Generalization used appropriately
Names of sets and relations well chosen
Designations in accompanying text of non-obvious elements



In our data model, each player has a username. While this is just a field of the model we decided to include it because the username is important in the app as an identifier of a user. In the final version a user will have an email and a phone number. These two fields and the username will all be a unique. The player will then be identifiable by any of these three fields. For the MVP, each user will have an email and username but the identifier will be the username. Thus we thought username was important enough to include in the data model.

Behavior

Feature descriptions

Succinct but precise descriptions of each feature

Record games

- Players will be able to record games played. One user will be able to record the game for the four participants.

View rankings

- The rankings list will be displayed on a page so the rankings of all players will be displayed.

- On the home page the user will see rankings for the top three places and a cutout of the full rankings chart highlighting their ranking and their neighbor. This will incentivize them to try and beat their neighbors.

Confirm Games

- The admin of a group can establish that games will only be recorded after confirmation. An email/text will be sent to the other team once a game is reported to show a game is confirmed.

Handicap

- Players will be able to enter in a hypothetical game and the app will give a handicap for the game. The higher ranked team may need to start the game with less cups as to make the game even.

Game feed

- A list of recent games will be displayed to highlight action. It will show what is going on and further encourage competition.

View previous results (Game History)

- On their profile page a user will be able to view their past games and results. They will also be able to track their progress and skill over time.

Groups

- Players can set up groups to have rankings only within a group of people
- Groups will be defined by the players
- Any game that is played where all players are a member of that group will contribute to rankings in that group. Thus if all four players are members of two different groups that game between them will count in both groups.

Privacy

- Players have a password protecting their account. Users are able to change their password.

Security concerns

Summary of key security requirements and how addressed

Our app should be secure enough that attackers can't retrieve user data they are not allowed to see, or modify other players' data. It is safe to assume that social game data isn't a high priority target for hackers, so we should only have to guard against common attacks, most of which are prevented by using features of Ruby on Rails.

Here is a list of access restrictions on the site:

- Games can only be confirmed by one of the two losing players.
- Players can only see rankings of people in groups in which they are a member.
- Players can only see points of people in groups in which they are a member.

How standard attacks are mitigated

Here are some standard attacks on websites and our fixes:

- **Cross-Site Scripting (XSS)**
  This is when an attacker tries to inject javascript code into your page by putting it into an input form. Rails automatically prevents this by escaping characters before putting them into the output HTML.
- **SQL Injection**
  In this attack, the attacker executes arbitrary SQL code by putting it into an input field that isn't properly processed. Since we only use Rails' included ActiveRecord to retrieve things from the database, a SQL injection is impossible.
- **Brute Force Password Cracking**
  Brute forcing passwords on our website will be very inefficient because all of the passwords are concatenated with a random string called a "salt" before being hashed and saved. This makes it so that each person's password would have to be computed separately, instead of the attacker being able to brute force everyone's password at the same time.
- **Input Validation**
  Letting people input invalid data might lead to unforeseen security consequences. All of the data put in by users will be validated to make sure it is in the correct format.
- **Cross Site Request Forgery**
  Rails handles this by having a unique token that it keeps track of to make sure that requests are coming from the right place.

Threat model: assumptions about attackers

- Attackers will be able to construct URLs that are otherwise unreachable by clicking links.
- Attackers will also be able to construct arbitrary requests to those URLs that might not be valid inputs, so everything needs to be validated and checked by the server before and data is saved or displayed.
- Attackers can also intercept legitimate requests to the site in an attempt to spoof them.

User interface

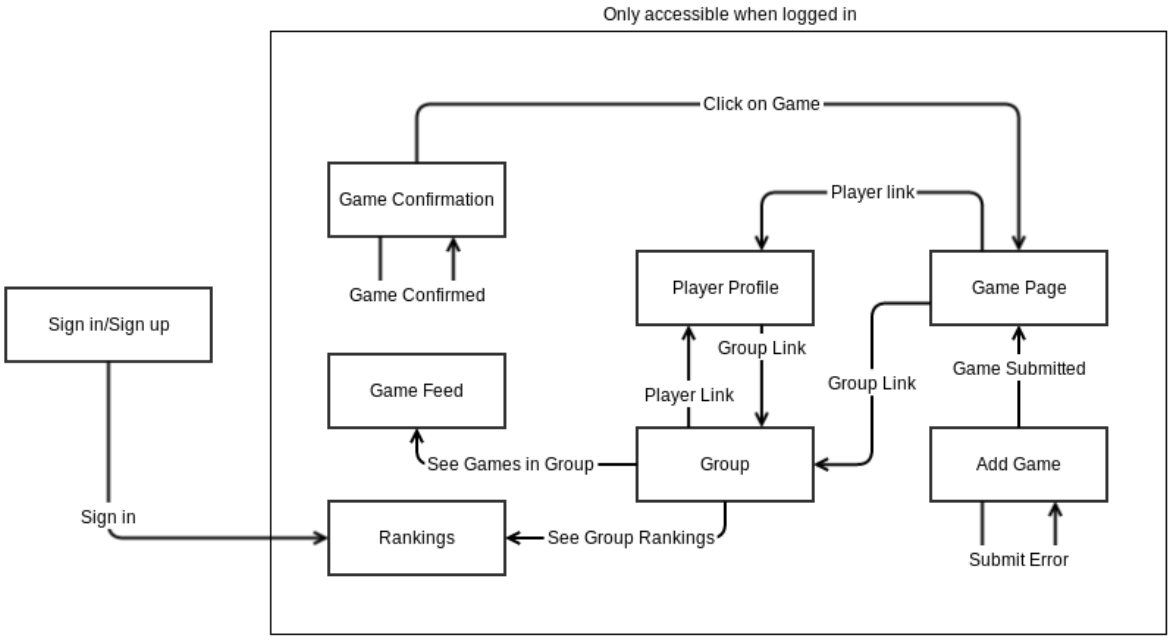
Note about Errors

Errors accounted for

Form errors will be displayed on the page while the user is typing in input. A user will only be able to submit invalid data to the server if they either have javascript off or are intentionally trying to game the system. Of course, the data will be validated on the server as well.

Page Flow

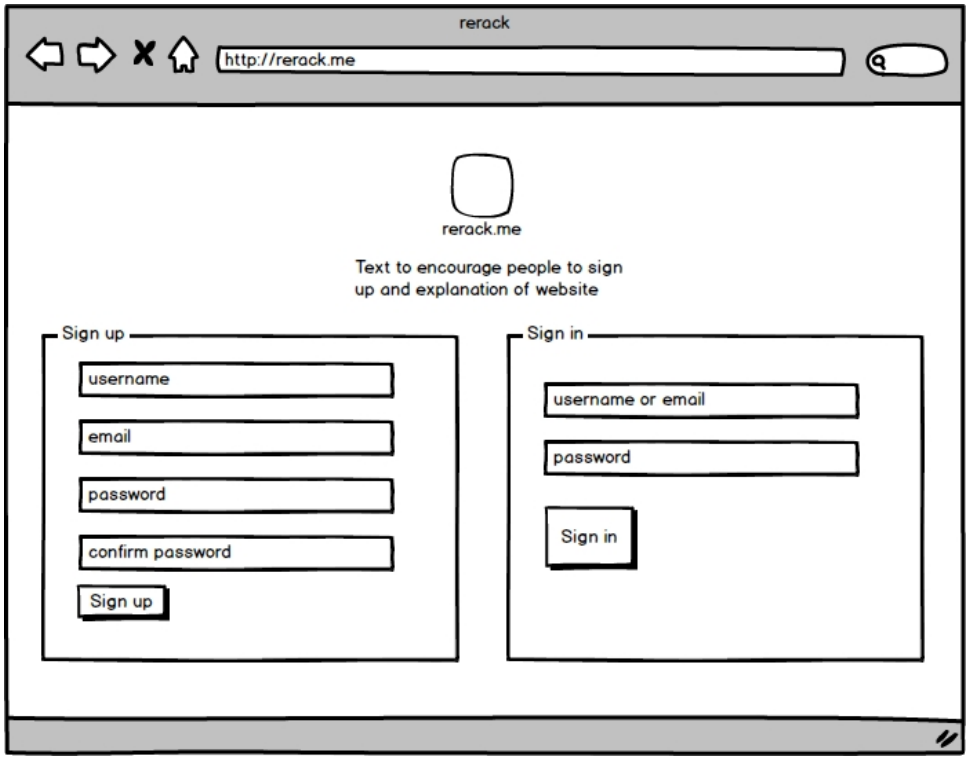
Flow between pages indicated, with named actions



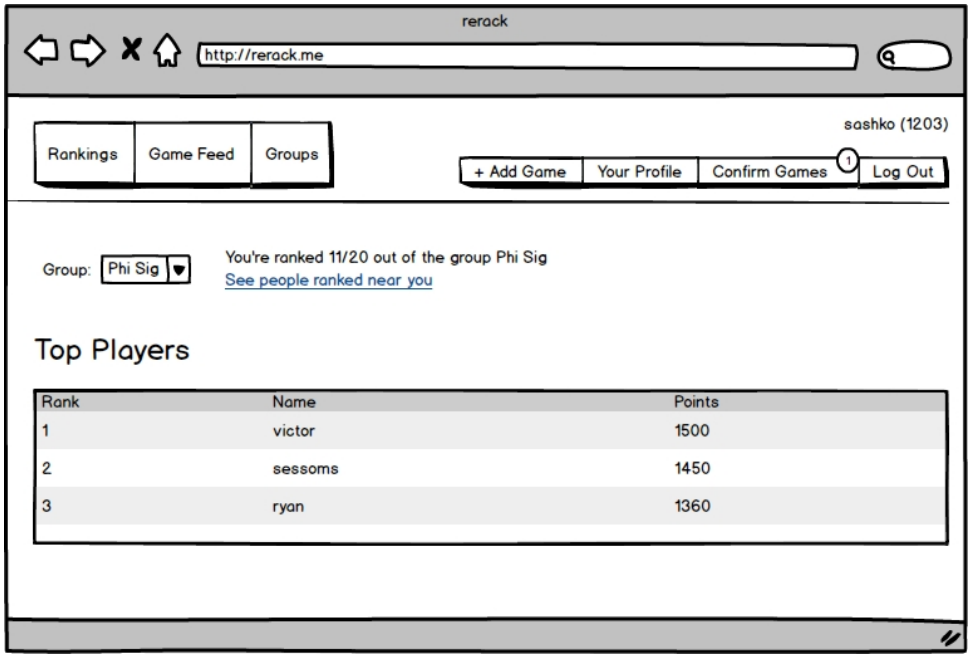
In addition to the flow described here, the Game Feed, Rankings, Game Confirmation, Group, and Add Game pages will be accessible from a global navigation bar shown at the top of every page when logged in.

Wireframes for application

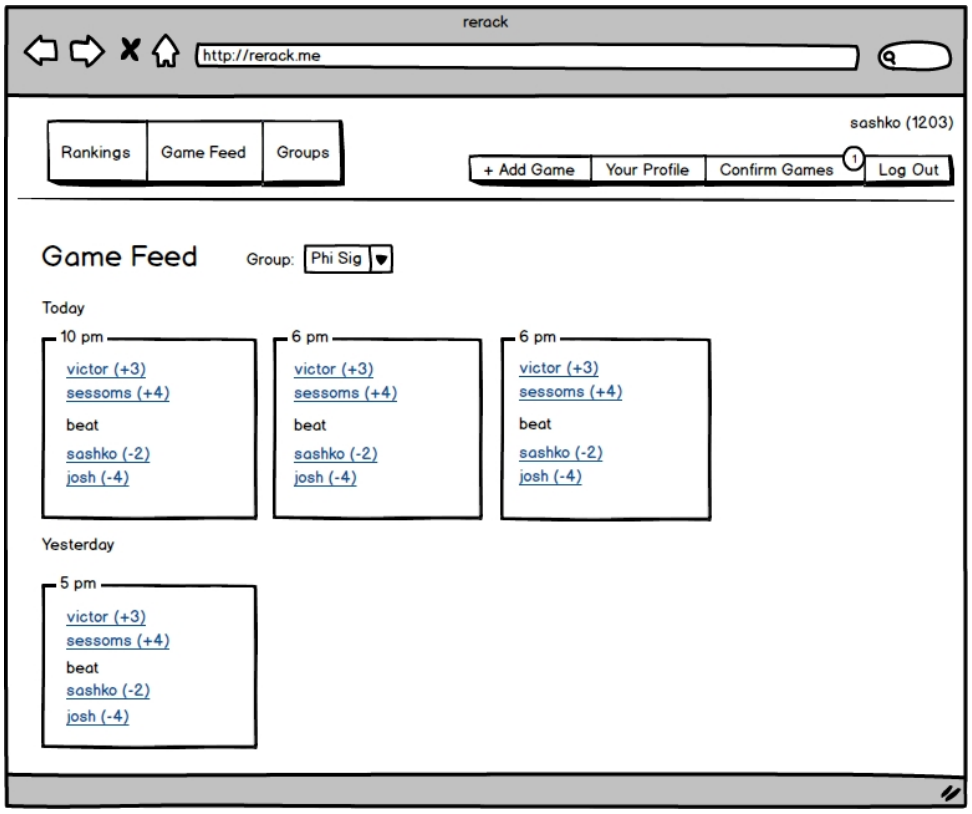
Sign Up Page



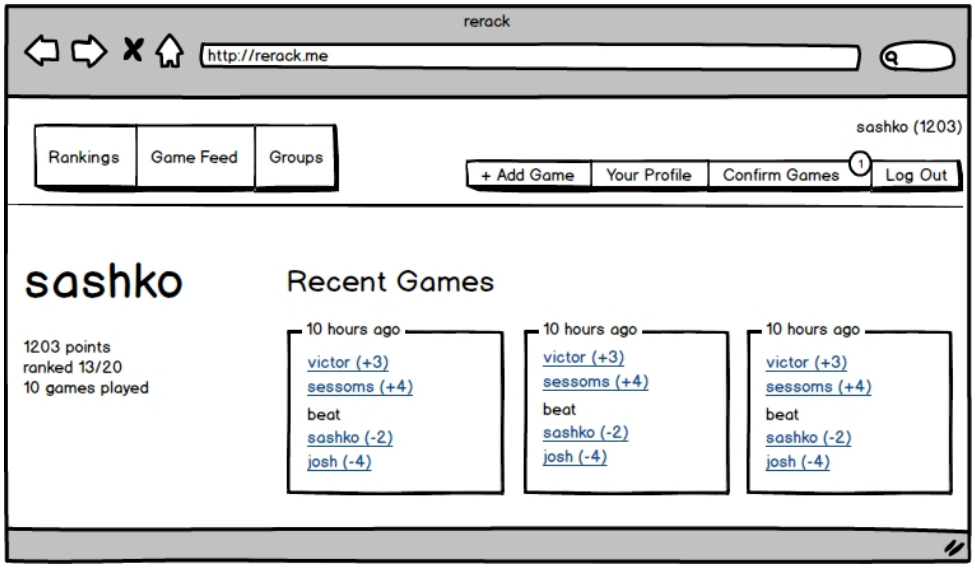
Rankings Page



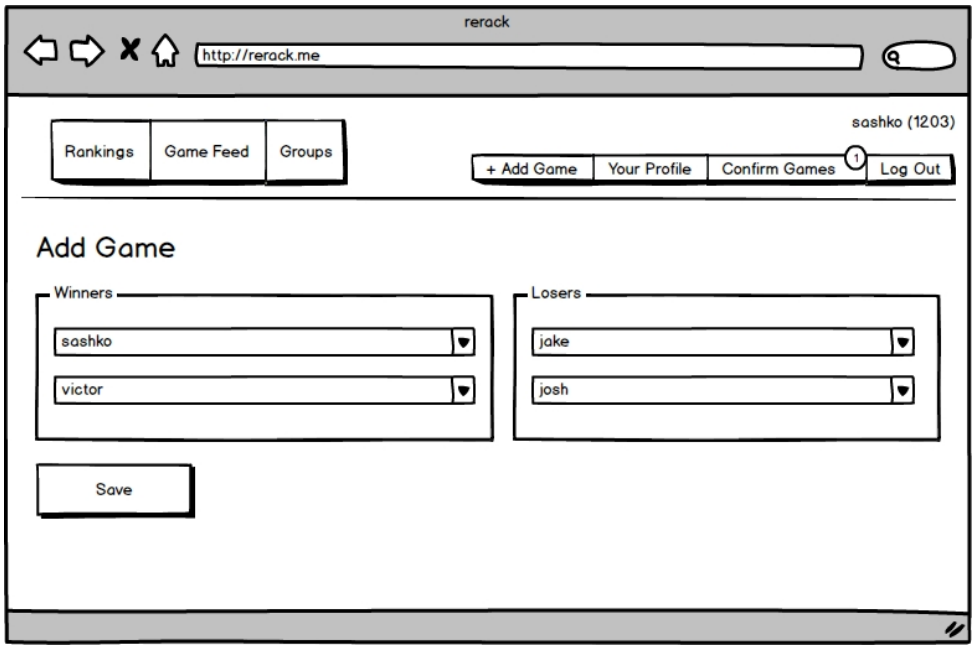
Game Feed Page



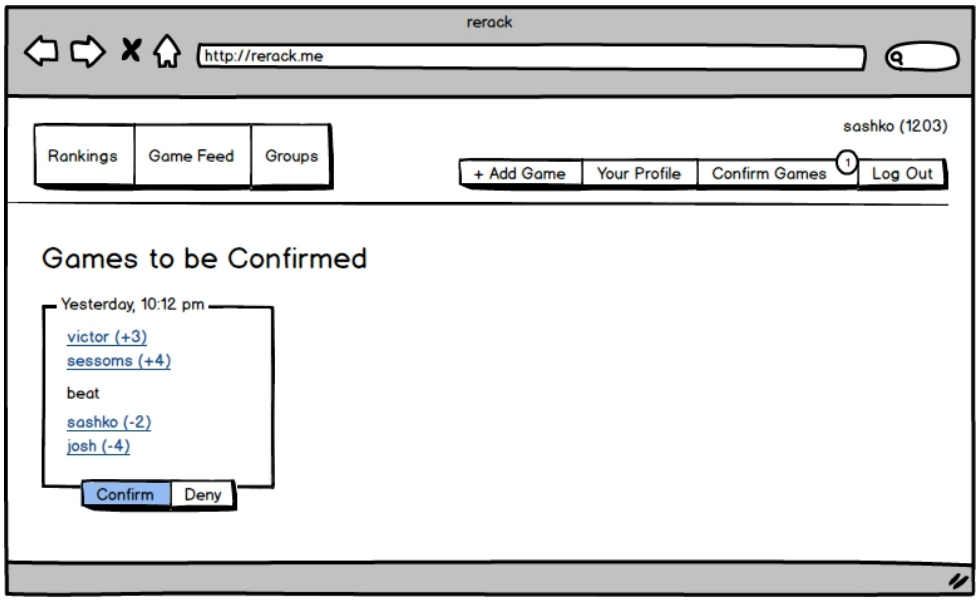
Profile Page



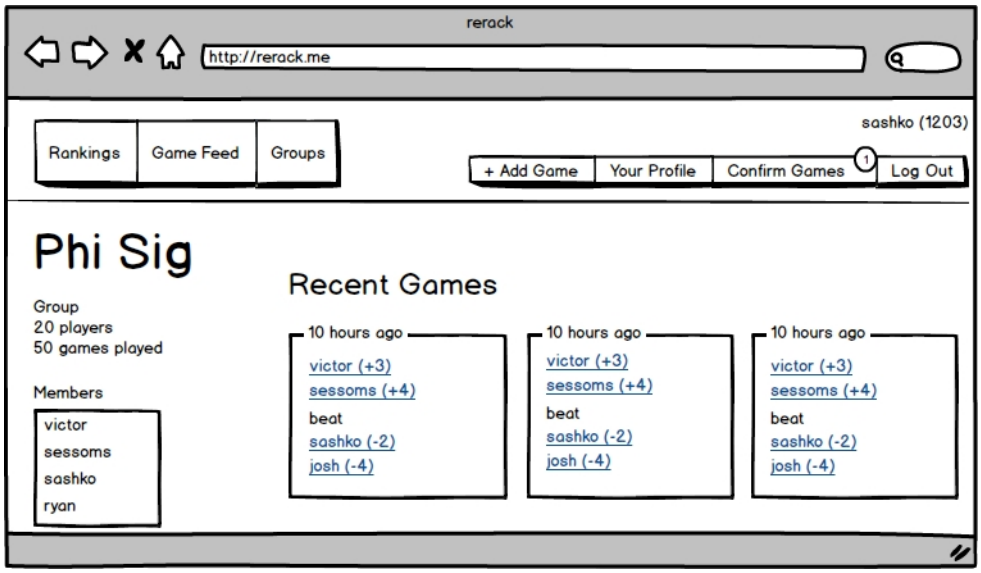
Add Game Page



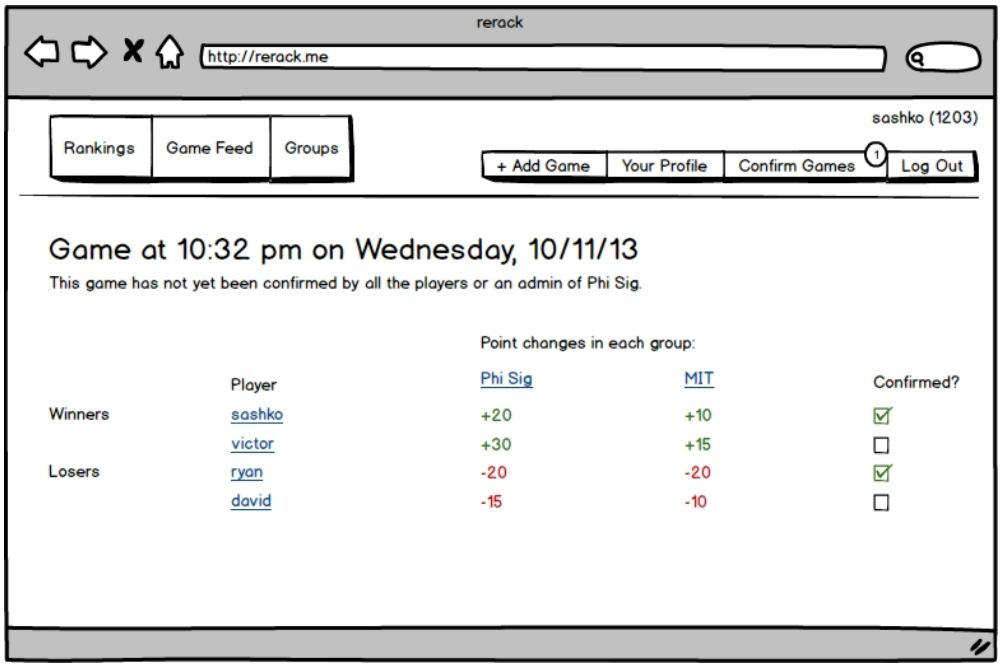
Game Confirmations Page



Group Page



Game Page



Design challenges

List of problems to resolve in concepts, behaviors or implementation
For each problem: options available, evaluation, which chosen
Notes on code design: schema design choices, abstractions

- Should players be tagged with groups?
    - Pros

        - Allows for players to be grouped together easily
        - Prevents everyone that uses the site from seeing your rank
        - Adds its own form of security and validation by making members get accepted into groups
        - Allows for players to easily find rankings relative to their close friends rather than be muddled with rankings of unknown players
    - Cons
        - Makes it difficult for new members to participate if they don't have an immediate group
        - Who controls which groups are made and prevents duplicates?
        - Have to handle players that belong to multiple different groups and how to rank them.
    - Decision
        - Chose to postpone Groups
            - Adding groups would add an extra layer of complication to the website that could deter people that simply want to log their score.
            - Without groups, players could more easily play friends that may not belong to the same living group, workplace, etc.
            - We will add groups to the final version
                - Groups in the final version will be implemented in such a way that allows for players from different groups to play each other easily, but serve as a quick way to view rankings within a subset of players
- Should we have features for teams and tournaments?
    - Pros
        - Would have added another social aspect to the site
    - Cons
        - Without groups its not really a feature
        - With groups its hard to decide how ranking would be done with teams
        - There are a lot of extra complications for implementation
    - Decision
        - No teams or tournaments
            - Allows for better ranking system
            - Less confusing for players
            - Without groups it is not a useful feature
            - Even with groups, players don't often look to make pong tournaments fair, they are more for friends to compete against one another for bragging rights. Games can still be added individually
- Should we have usernames to display or just use names?
    - Pros
        - We can regulate the system so that any username is not used more than once
        - Allows privacy to those who don't want their name affiliated

    - Cons
        - Have to retrieve other players usernames to submit a game, rather than just the names of your friends
    - Decision
        - Games of pong are as often played with/against strangers and acquaintances as with good friends, so you may have to ask for your opponents name anyway. Hence, we will accept the cost of asking for others' username, because unique identifiers will make texting in the game much easier and offers an additional privacy setting.
        - We will use email addresses for players that have yet to sign up.
- Handicap
    - Pros
        - Would allow for people that didn't feel as good about their pong skills to play others with a high ranking
    - Cons
        - Add extra coding aspect
        - Added level of complexity to the site
    - Decision
        - Add handicap feature
            - Will only help increase traffic to website
            - It will increase the fairness of games and rankings
- Do games need to be confirmed?
    - Possible solutions
        - Do not require confirmations
            - Pros
                - Simpler design; less user input required as per goals
            - Cons
                - Users can make up games
        - The team that did not submit the game needs to confirm it
            - Pros
                - Highest validation
            - Cons
                - If the losing team submitted it, then it is likely that the submission is accurate. Might add unecessary steps
        - The losing team needs to confirm if they did not submit the game
            - Pros
                - Seems to be the most efficient solution in terms of need for user input vs accurate results
            - Cons
                - Requiring a member from each team would still be more accurate.
        - Any other participating player needs to confirm the game
            - Pros

                - One more possible player able to confirm the results more quickly
            - Cons
                - Winning team can just confirm every game by themselves; less accurate & more fake results possible
    - Solution: The losing team needs to confirm if they did not submit the game.
        - This solution seems to be most efficient in terms of need for user input vs accurate results.
- How should confirmations be submitted?
    - Possible solutions
        - Email
            - Pros
                - Most people regularly check email after age 17.
            - Cons
                - Many people don't like extra email and would like to keep email for work purposes.
        - Text
            - Pros
                - Almost everyone has a number from which they can text nowadays.
            - Cons
                - Added coding element and cost
        - Notification center on website
            - Pros
                - Easiest implementation
                - keeps everything in one place for the website's users.
                - Avoids "negative publicity" from spam
            - Cons
                - No notification unless user visits the website
    - Solution: We will first add the website confirmations and then add email and text time permitting. Allowing different forms of submission will allow for users to customize their experience.
- How to handle player rankings when they have unconfirmed games
    - Possible Solutions
        - Consider all games
            - Pros
                - Quicker for rankings to become relevant
            - Cons
                - Confirming games becomes useless
                - Users can submit many fake games to jolt rankings
        - Consider only confirmed games
            - Pros
                - Higher accuracy; prevents against users submitting many

fake games to jolt rankings
                - Cons
                    - Added step before games are included in the rankings
        - Decision: Players will have a ranking that is dependent only on the games that are confirmed and when a unconfirmed game is confirmed, the updating of points will be based on the players points at the time of confirmation not the time of game creation. This is much like the system the US Chess Federation uses with official and unofficial ratings; the only difference is that there is no two-month period where games are unofficial because most games occur spur-of-the-moment rather than at official tournaments.
- How to handle unregistered users
    - Possible solutions
        - Real Name
            - Pros
                - Easy to write; no need to ask other player for email address after game
            - Cons
                - Loses privacy aspect
        - Email
            - Pros
                - Easy to invite players to become new users
            - Cons
                - Need to ask for email address after game, added hindrance to submission
    - Decision: Enter email address and send notification to the email address to sign up. The games associated with a particular email address will be automatically added when the corresponding player signs up.