

# Night Knights

# Technical Document

**It always seems impossible until it's done.**

- Nelson Mandela

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## Introduction:

Knight Nights is a project based around the idea of gamifying sleep. It features an alarm clock app to track your sleep; the more you sleep, the more energy you get to play the game. On the website is the main attraction, a video game that rewards good sleep habits with more playtime. In the game, you play as a knight tasked with vanquishing monsters called “Nightmares” using the energy you earned from sleeping. By getting a good night’s sleep in real life, your improved health will increase the performance of your knight in game. The overall purpose of Night Knights is to encourage healthy living by using the proven reward system of a game. While gaming and sleep are often viewed in juxtaposition, Dream Team hopes to reverse this conception; thereby using gaming to encourage and reward good sleeping habits.

## Team Members and Roles:

**Ethan Busbee:** Web Design Lead

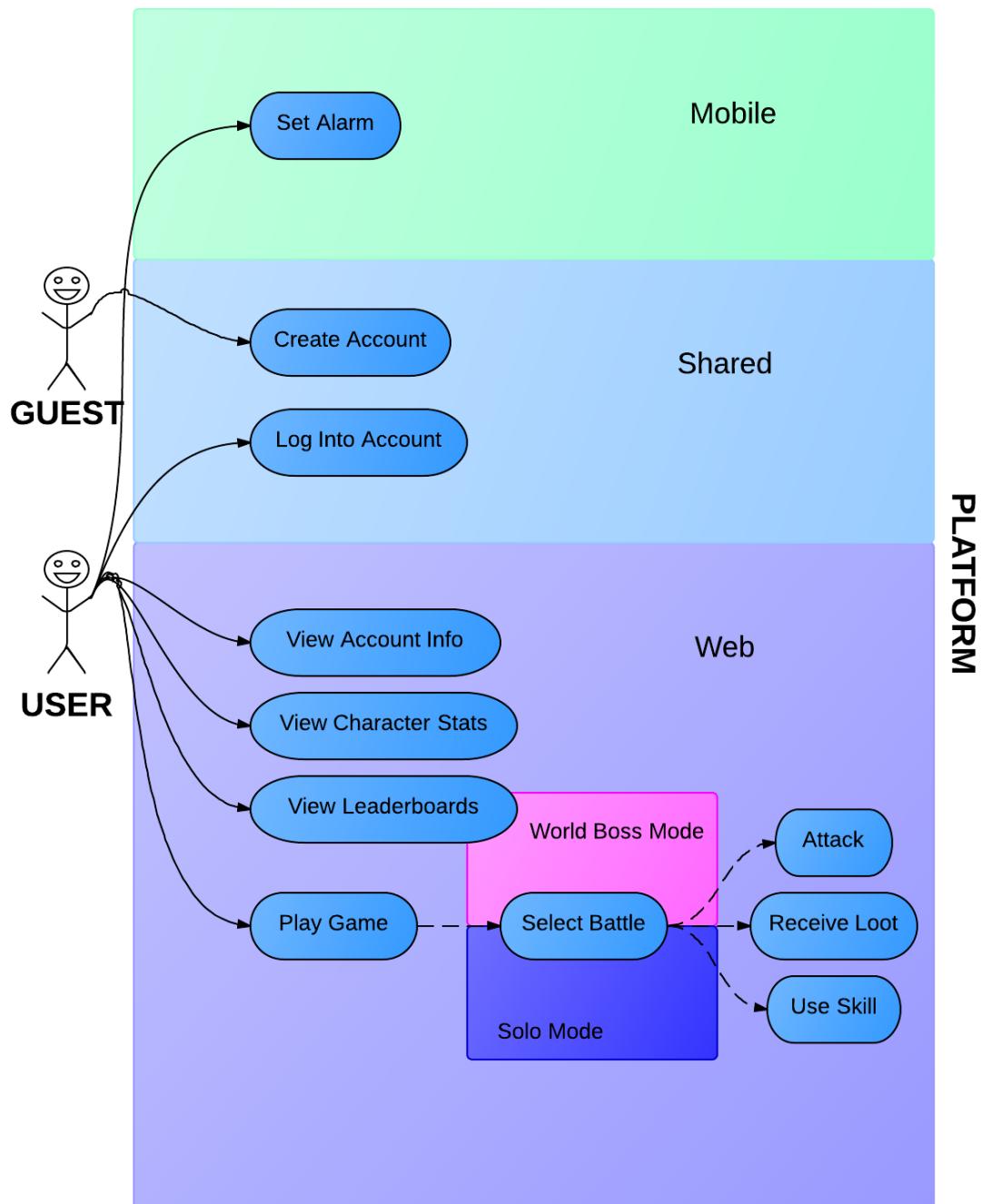
**Anthony Cloudy:** Game Design Lead

**Cameron Keith:** Mobile Development Lead

**Justin Konnersman:** Database Lead

**Will Spurgin:** API Lead

## Use Case Diagram:



# Software Features:

## Website:

- Check your character's current energy, level, and experience
- Compare the stats of items in your inventory
- Switch weapons
- View your account information
- Change your password
- Check World Boss item messages
- View the top ten players and personalized leaderboards

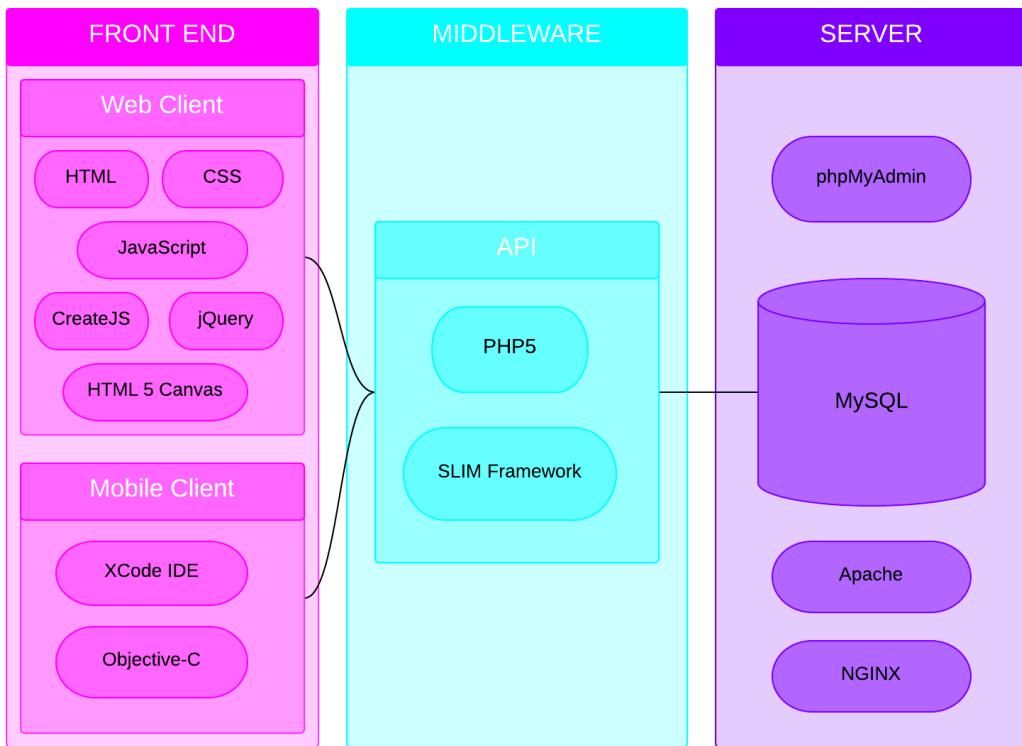
## Game:

- Use energy to fight Nightmares
- Play through 3 different areas with unique monsters to fight
- Earn new weapons by clearing out areas
- Equip weapons from your inventory
- Earn experience to unlock new areas and skills
- Fight World Bosses with the rest of the Night Knights community
  - ◆ Each attack helps the community defeat the boss
  - ◆ Earn treasure after the boss is defeated

## App:

- Login to the Application as a User
  - ◆ Tracks energy gained
  - ◆ Requires Internet connection
- Login to the Application as a Guest.
  - ◆ Does not track energy gained
  - ◆ Doesn't require Internet connection
- Create a New Account
- Set an alarm for up to 24 hours in the future
- Choose a tone to play when the alarm goes off
- Give the User the ability to snooze the alarm
  - ◆ Snooze length is 5 minutes
  - ◆ Gives the player a slight energy penalty for each consecutive use
- Add Energy to a User's account.

# Software Architecture:

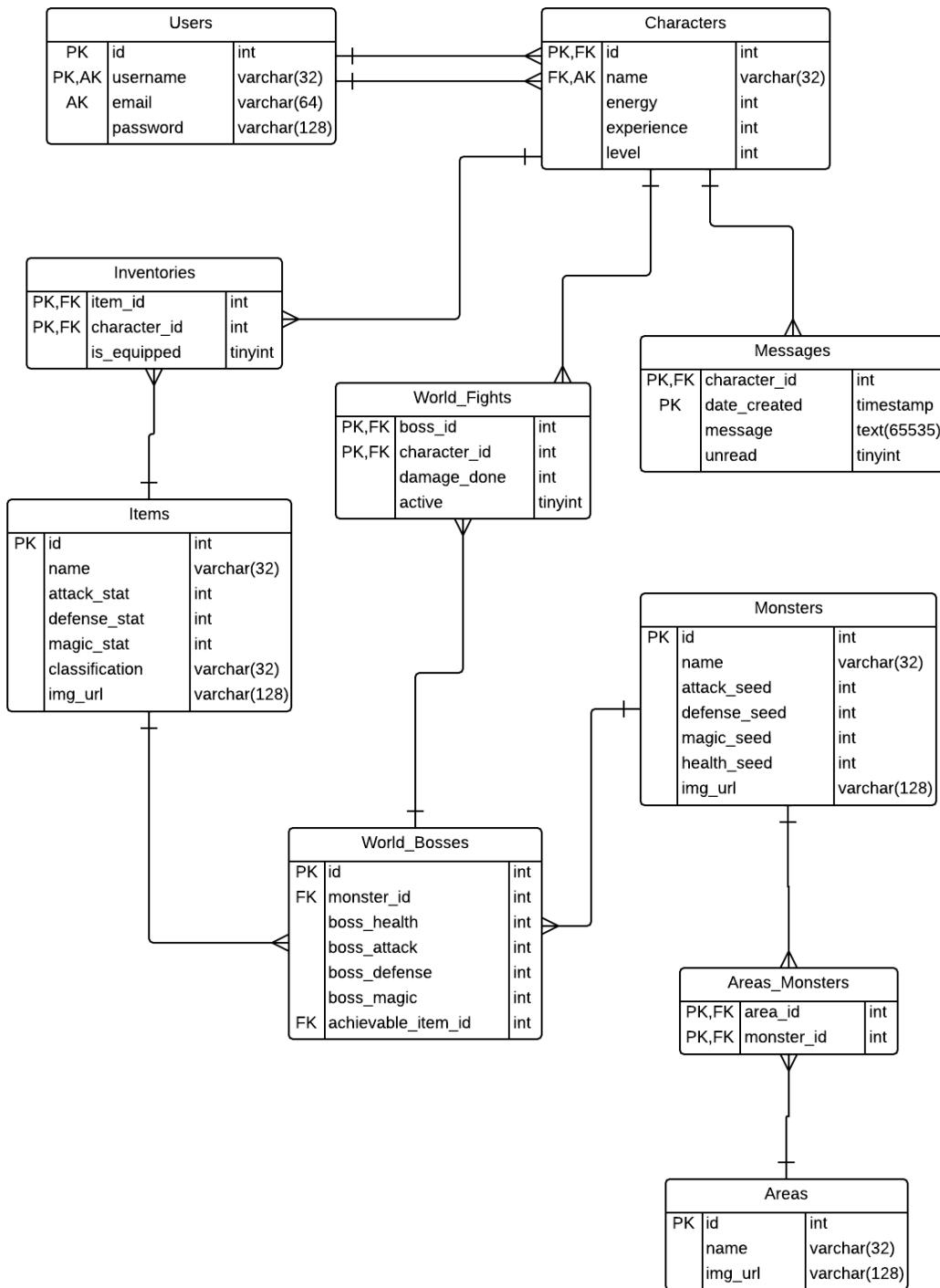


## Technologies Used:

- Front End
  - ◆ HTML5
    - HyperText Markup Language - standard to create web pages.
  - ◆ CSS3
    - Cascading Style Sheets - As opposed to in-line styling, describe look and formatting.
  - ◆ JavaScript
    - Dynamic Programming Language which allows for client-side scripts and user interactions.
  - ◆ CreateJS
    - Suite of modular libraries and tools.
      - EaselJS
        - ◆ For working with HTML 5 Canvas.
        - ◆ API similar to Flash.

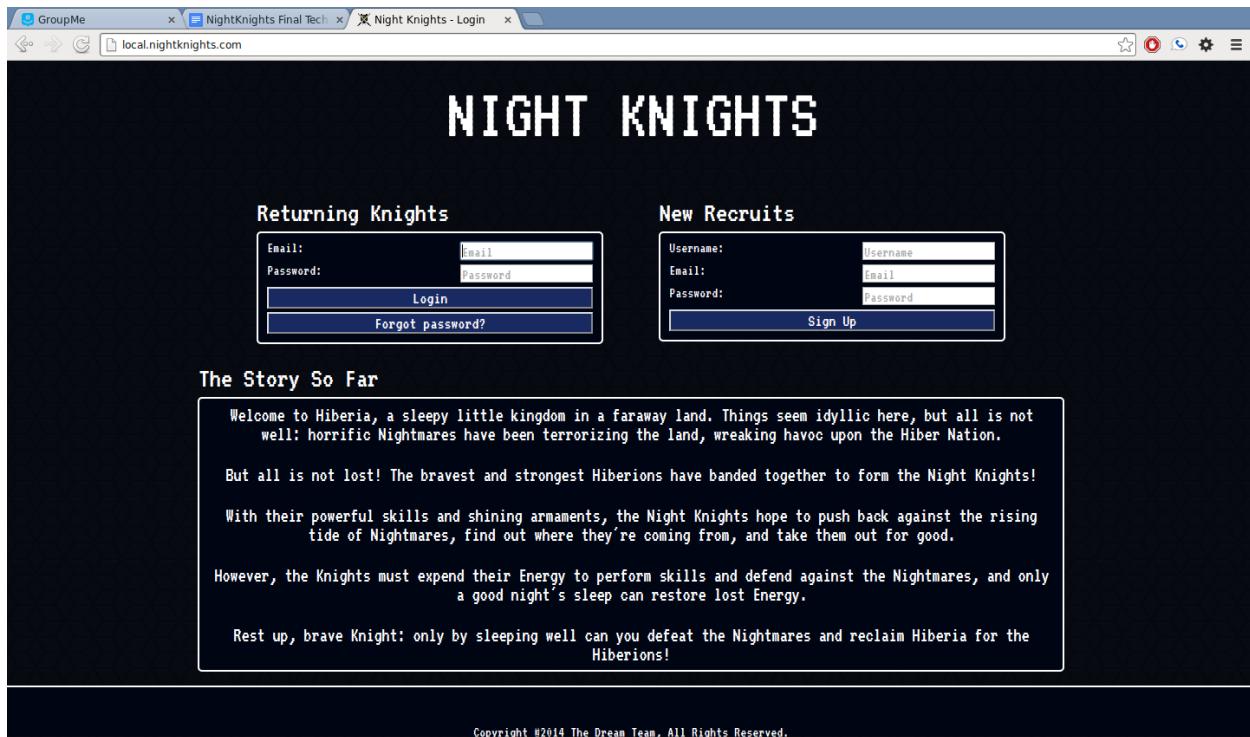
- TweenJS
    - ◆ Generate immediate frames in between two images to give smooth transitions.
  - SoundJS
    - ◆ Audio playback with HTML5, WebAudio, and Flash.
  - PreloadJS
    - ◆ Preloading assets such as images or audio.
  - Zoe
    - ◆ Converts SWF animations to sprite sheets.
  - ◆ jQuery
    - JavaScript library intended to simplify client-side scripting of HTML.
    - Modularity allows for powerful dynamic web pages.
  - ◆ HTML5 Canvas
    - Bitmap manipulation.
  - ◆ Xcode IDE
    - (Apple) for development on OS X and iOS
  - ◆ Objective-C
    - General purpose, OOP language. Main programming language used by Apple.
    - Geared towards runtime decisions.
- Middleware
- ◆ PHP5
    - Server-side scripting language.
  - ◆ SLIM Framework
    - Small PHP framework that allows RESTful routing.
- Server
- ◆ phpMyAdmin (also Sequel Pro)
    - Handle administration of MySQL in a web browser.
  - ◆ MySQL
    - open-source RDBMS. Integral part of LAMP stack.
  - ◆ Apache HTTP Server
    - Web server application.
  - ◆ NGINX
    - open-source reverse proxy server.

# Database:



# User Interface:

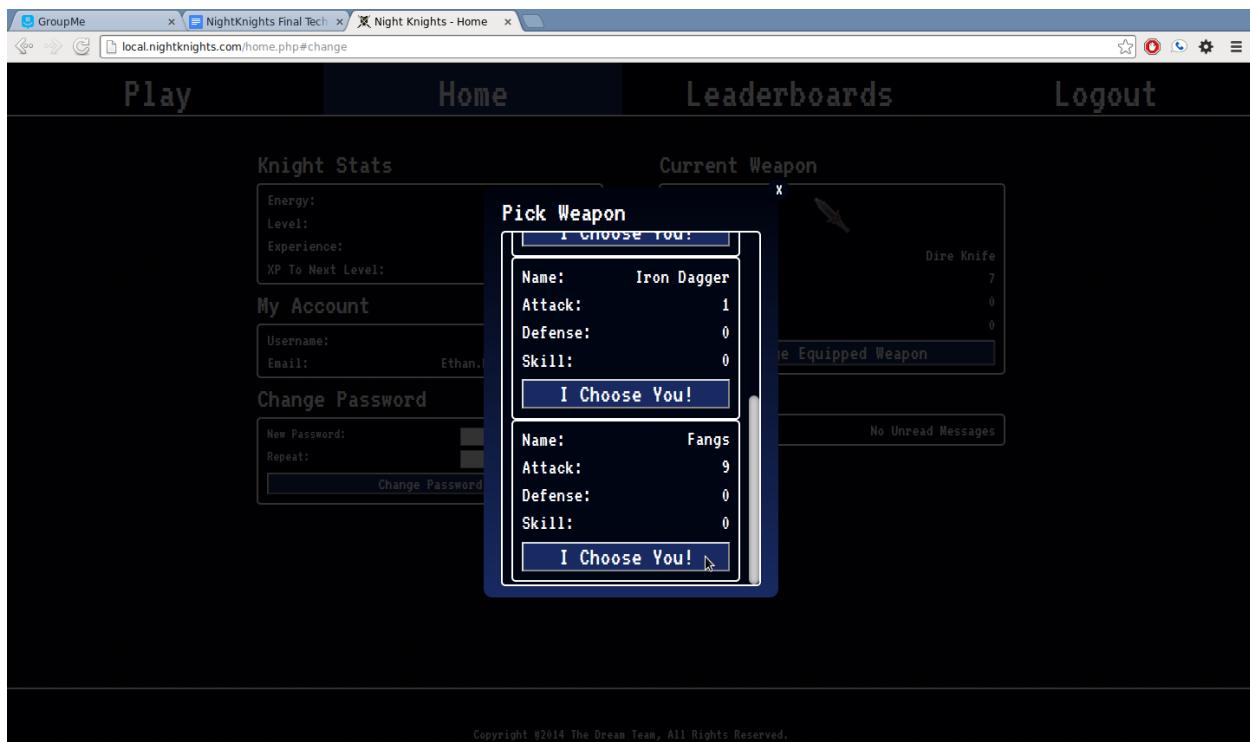
## Web:



*This is the Login page, giving login, account creation, and a short blurb about the game's story. It is the only page accessible without a login session.*

The screenshot shows a web browser window with the URL [local.nightknights.com/home.php](http://local.nightknights.com/home.php). The page has a dark blue header with tabs for "Play", "Home", "Leaderboards", and "Logout". The "Home" tab is active. Below the header, there are several sections: "Knight Stats" showing Energy: 211, Level: 3, Experience: 211, and XP To Next Level: 89; "My Account" showing Username: LelzMarfs and Email: Ethan.busbee@gmail.com; "Change Password" with fields for New Password and Repeat, and a "Change Password" button; "Current Weapon" showing a Dire Knife with Attack: 7, Defense: 0, and Skill: 0, with a "Change Equipped Weapon" button; and "Messages" showing No Unread Messages. At the bottom of the page is a copyright notice: "Copyright #2014 The Dream Team, All Rights Reserved."

Once logged in, users are redirected to the Home page. Here they can view information about their character, equipment, account, and messages. (Currently the only messages the system will send out are alerts that a world boss has been downed.)



When a user clicks the “Change Equipped Weapon” button, a modal dialog box appears allowing them to view the weapons they’ve collected and choose which one they’d like to use.

Night Knights - Leaderboards																																																																																															
Play		Home		Leaderboards		Logout																																																																																									
<b>Top Ten Knights</b>				<b>My Ranking</b>																																																																																											
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*On the Leaderboards page, users can view both the top ten players (ranked by total experience) and a personalized ranking that shows players ranked near to the logged-in users. For convenience of viewing, players see their own ranking in a highlighted color.*

**Top Ten Knights**

Rank	Name	Level	Experience
1	Sarah	27	10424
2	wspurgin	22	12105
3	Sgt. Mom	14	5079
4	LeizMarfs	3	211
5	\$_username	3	200
6	^C	2	139
7	Nergal_the_Cowardly	1	0
8	Porcupine*2	1	0
9	jsmith	1	0
10	ellyonia	1	0

**My Ranking**

Rank	Name	Level	Experience
4	LeizMarfs	3	211
5	\$_username	3	200
6	^C	2	139
7	Nergal_the_Cowardly	1	0
8	Porcupine*2	1	0
9	jsmith	1	0
10	ellyonia	1	0
11	picroiley	1	0
12	thingssssss	1	0
13	TheNewGuy	1	0

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*If a player is not in the top ten themselves--if they're new or don't play often, for instance--the personalized leaderboard allows them to still feel as though they're making progress as they rise through the ranks.*

## Game:



*This is the World View of the game. The world map is displayed in the main canvas (top left), the player's stats in the menu canvas(bottom left), and a help dialogue in the help canvas (bottom right).*



This is the Inventory view for the menu canvas (bottom left). This displays what weapon the player currently has equipped, and allows them to swap equipped weapons.



This is the Area View for the forest level (top left). Three random Nightmares have appeared, and the player can select one to battle.



*This is the Encounter View for the main canvas (top left). The Nightmare to fight is displayed, along with their health bar. The player's energy is displayed in the bottom left. The player can select an option from the battle menu below (bottom left).*



*This is the Melee Menu View (Bottom Left). The player is presented with 3 different attack options to fight the Nightmare with.*



*This is the Skill Menu View in the menu canvas (bottom left). Here the player can use one of their unlocked skills to change their stats for three turns. The player isn't of high enough level to*

*Ethan Busbee, Anthony Cloudy, Cameron Keith, Justin Konersmann, Will Spurgin 17*

use Bezerk or Overload, so those two remain locked. The player has attacked the Nightmare in this screenshot, so the Nightmare's health has dropped as well. The console canvas in the top right corner displays the last few events that occurred in the battle.

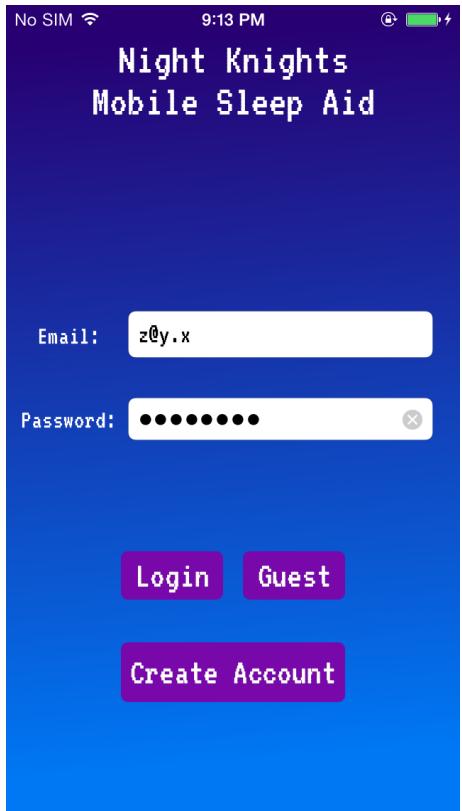


This is the World Boss View (top left). Here, you can see the two current world bosses. In the bottom right corner is the help information for the World Boss on the left (which the cursor is hovering over).

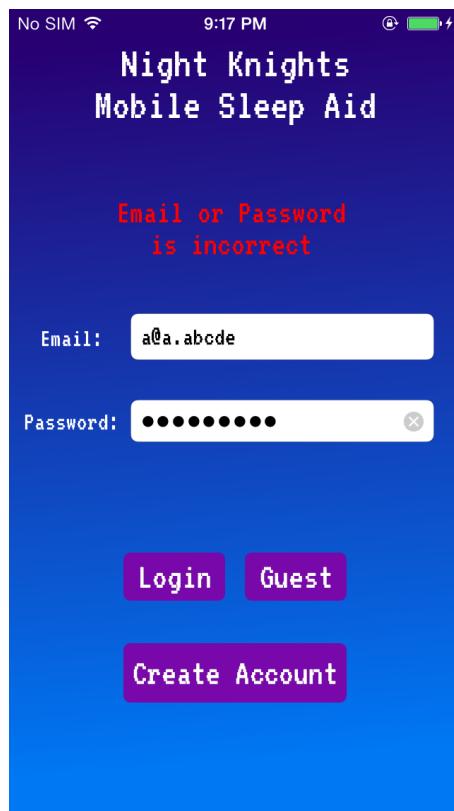


*This is the Encounter View for a world boss fight (top left). Because the world bosses are too difficult for a single user to take down, the player is allowed to run away after they've done the damage they want to. The run away button is in the top left corner, and allows the player to save their results for the battle.*

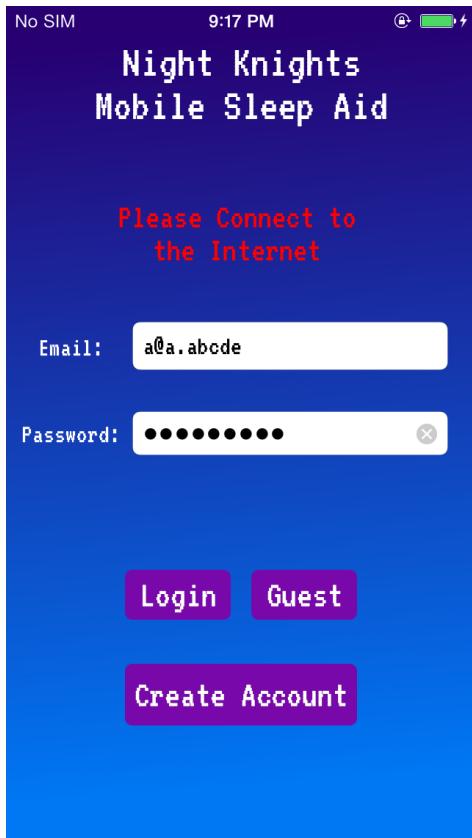
## Mobile:



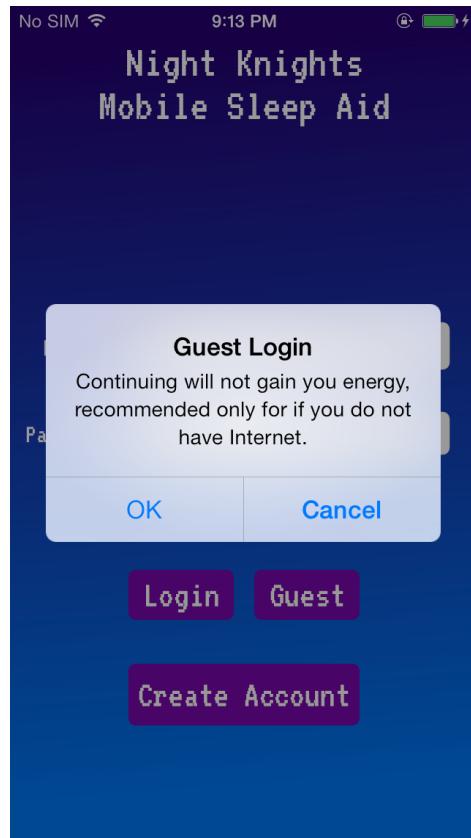
*This is the first View that a User encounters. The text fields may or may not be filled in depending on if this is a users' first time logging in.*



*This is what the User sees if they haven't input valid login credentials.*



*This what the user sees if they are not connected to the Internet when attempting to Login.*



*This is what the User sees when pressing the Guest Button.*

No SIM 9:13 PM

**Cancel** Night Knights  
Mobile Sleep Aid

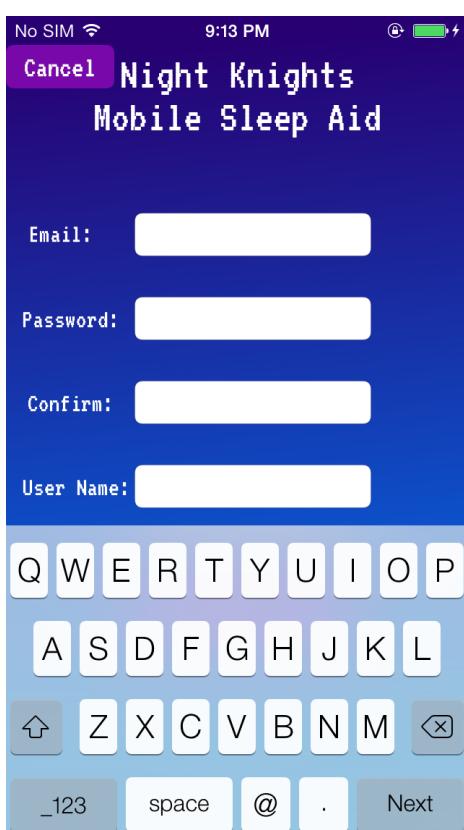
Email:

Password:

Confirm:

User Name:

Q W E R T Y U I O P  
A S D F G H J K L  
↶ Z X C V B N M ↷  
\_123 space @ . Next



*This is the initial view that the user sees when they press the Create Account button in the first View.*

No SIM 9:14 PM

**Cancel** Night Knights  
Mobile Sleep Aid

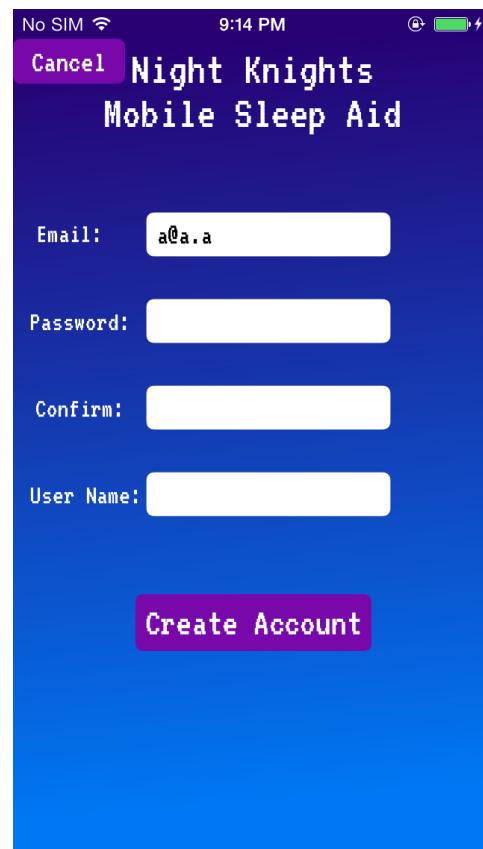
Email:

Password:

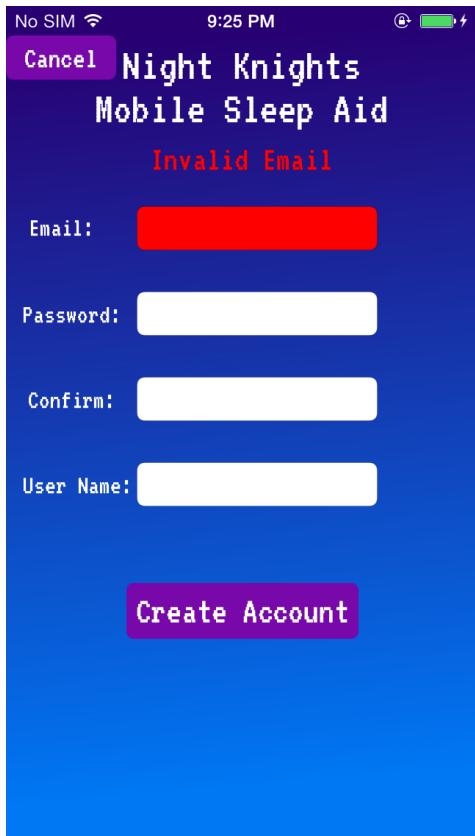
Confirm:

User Name:

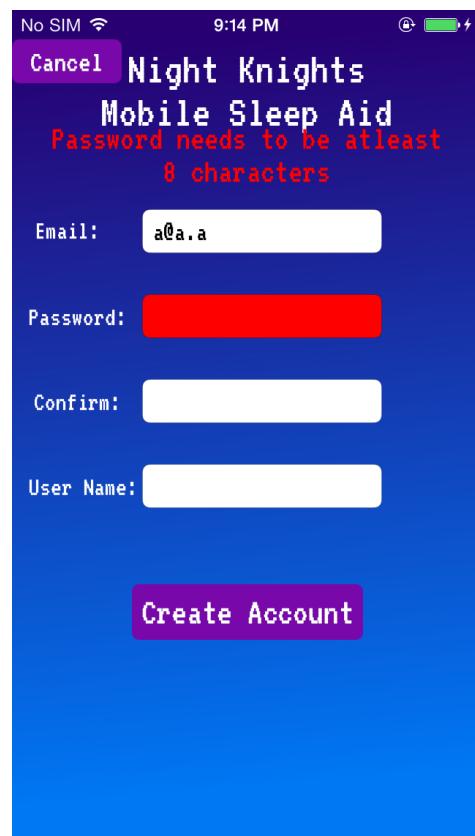
**Create Account**



*This is the rest of the view that was initially hidden by the keypad.*



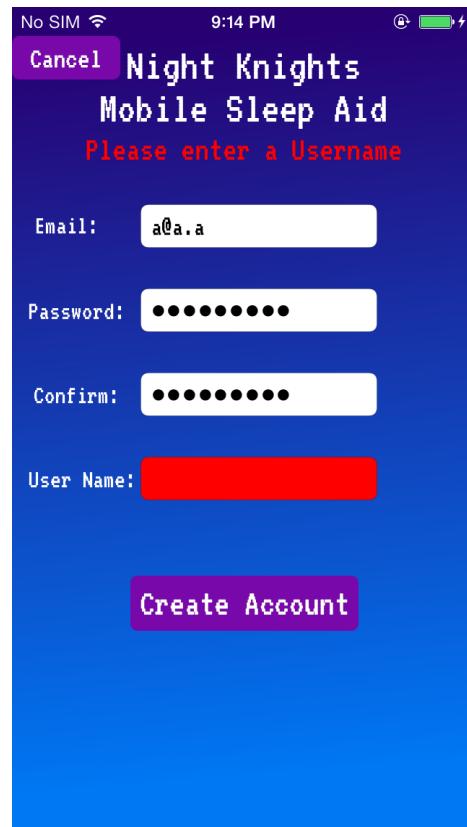
*If the User does not input a properly formatted email address, the text field becomes red and displays a Red Warning message stating what is wrong.*



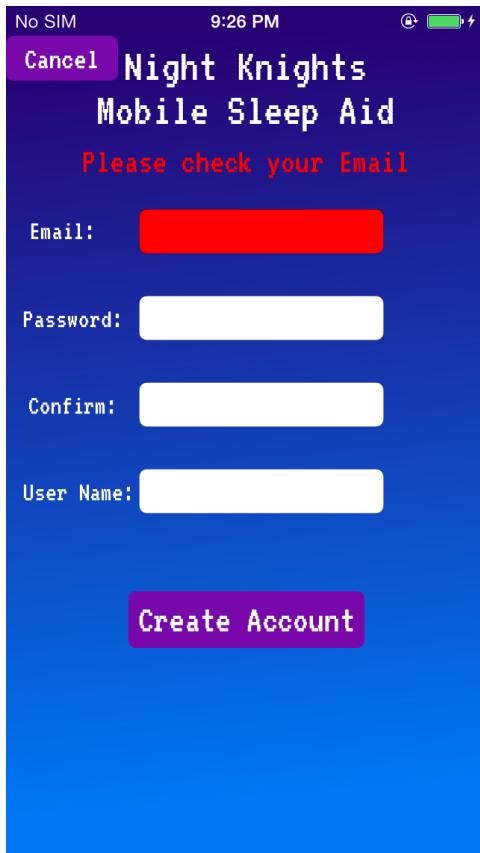
*If the User does not input a proper length password the password field becomes red and the Warning message updates to display what is wrong.*



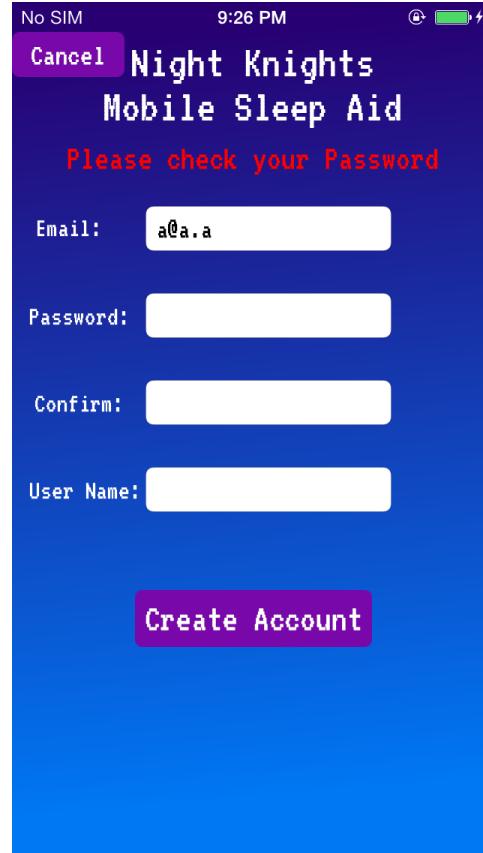
*If the two password fields do not match the confirm password field turns red and the warning message updates to display the new error.*



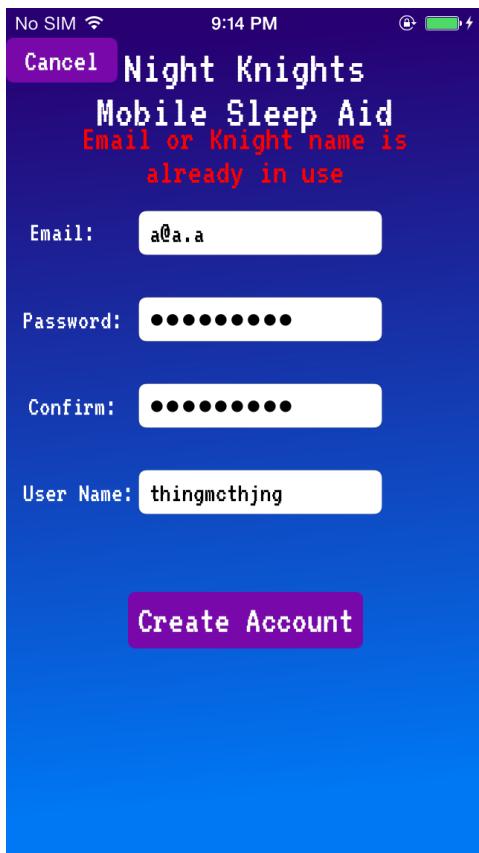
*If the User does not include a username then the username field becomes red and the warning message updates. It also does not allow for spaces to exist in the Username.*



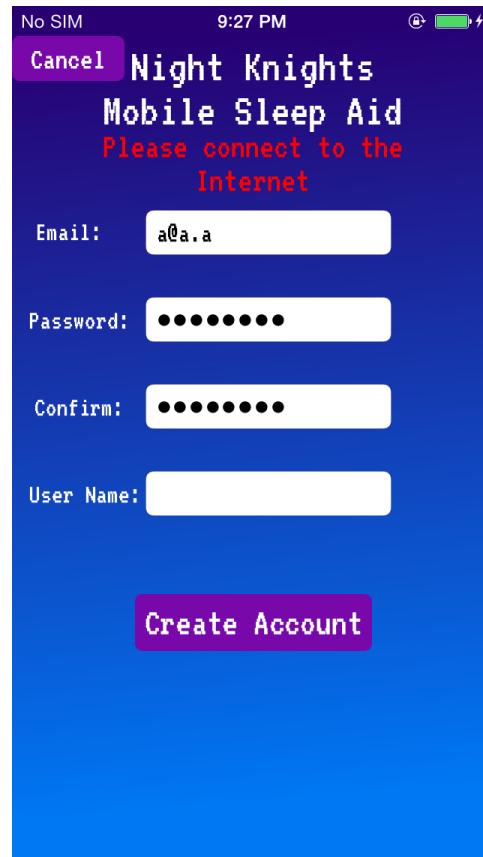
If a User presses Create Account without having entered any information the Email text field becomes red and the Warning message informs the user to check if their email is proper.



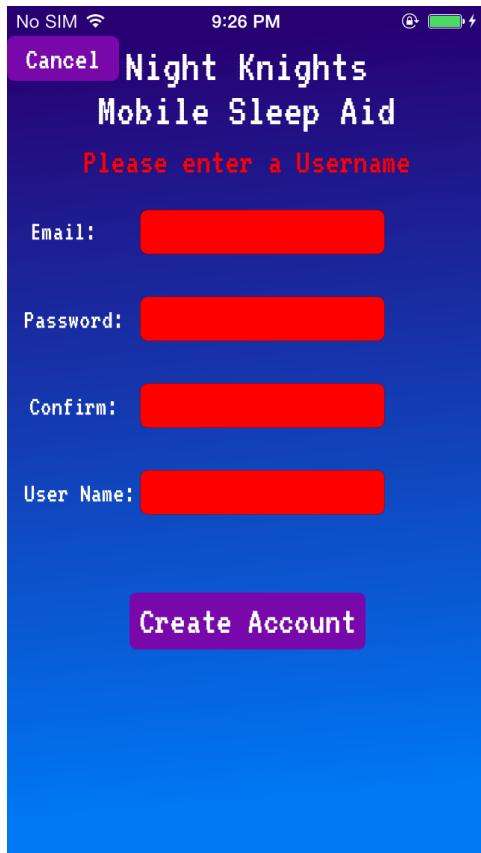
If the User pressed create account without having entered a password then the warning label updates to alert the user to check if their password is correct.



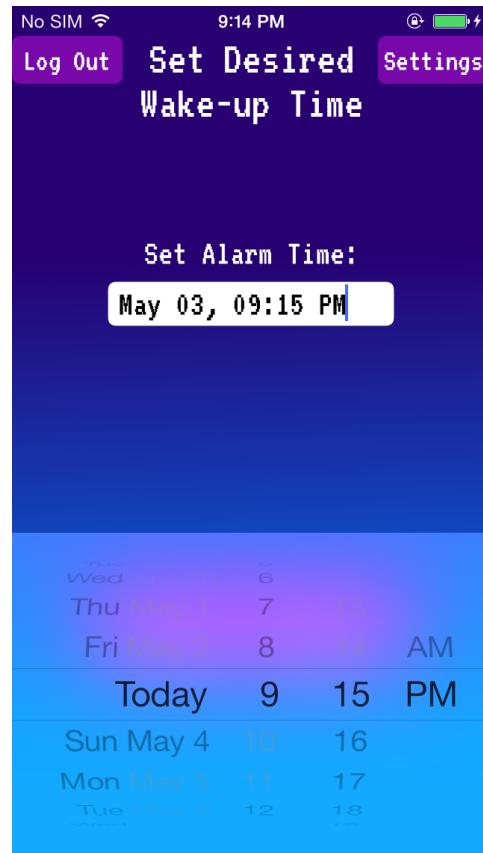
*If the chosen email or username has already been used the Warning label updates to inform the User that they have been taken*

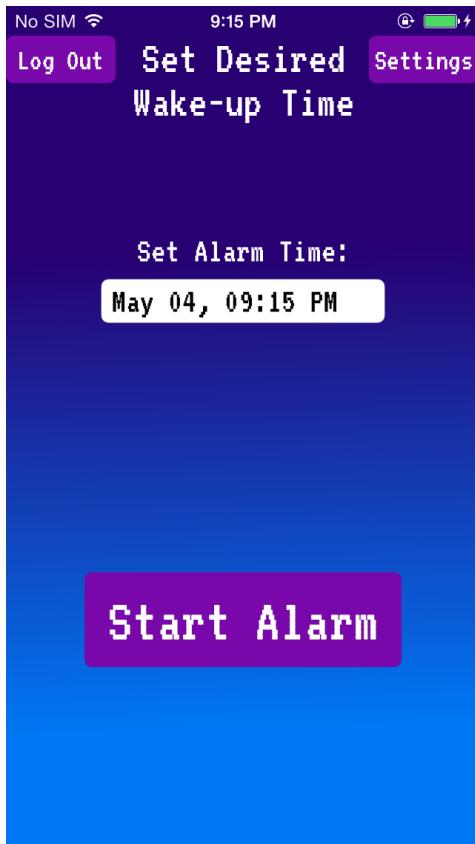


*If the user is not connected to the internet the Warning message will update to inform the User.*

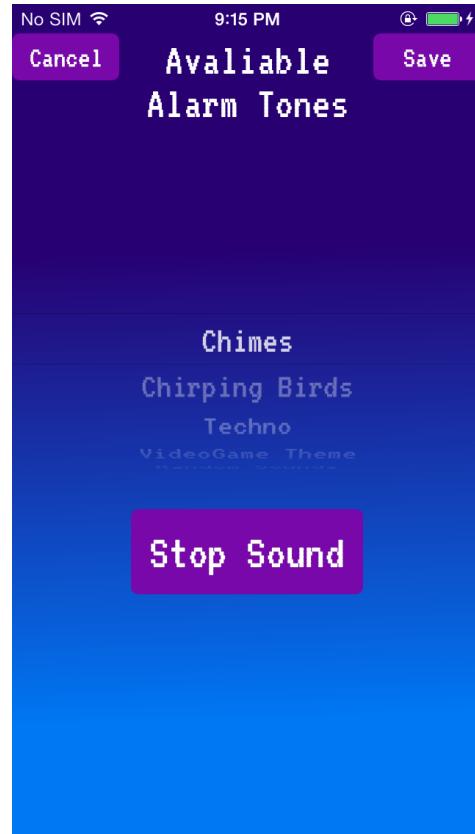


If a user goes through all fields but does not put anything in them, they will all become red with the Warning message displaying the last error.

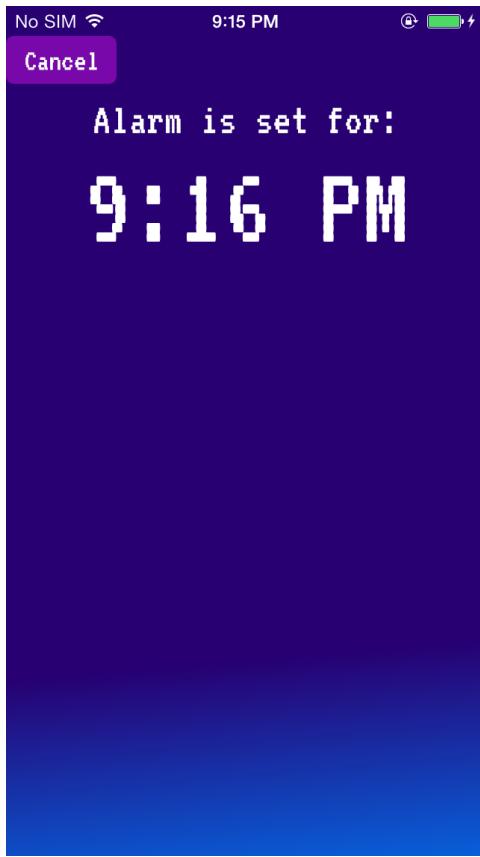




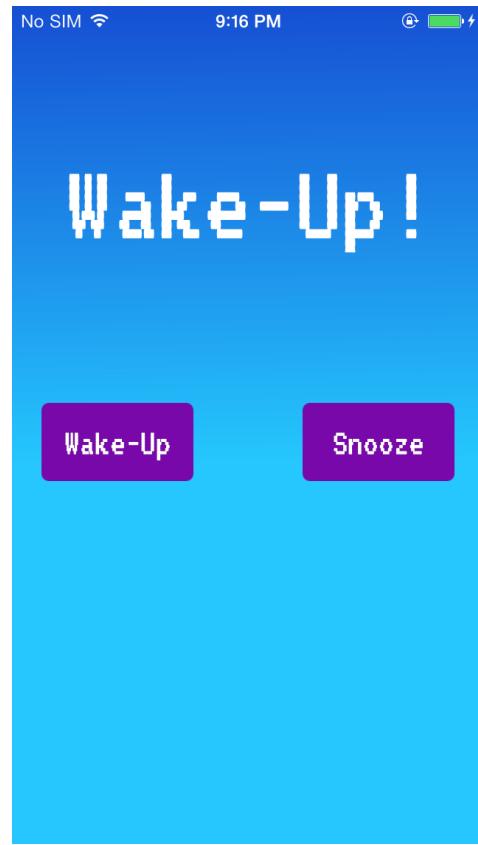
If it is not the first time a user has used the app, the DatePicker will not be called and instead the text label will display the last alarm that was set day corrected to when it would fall with in the next 24 hours.



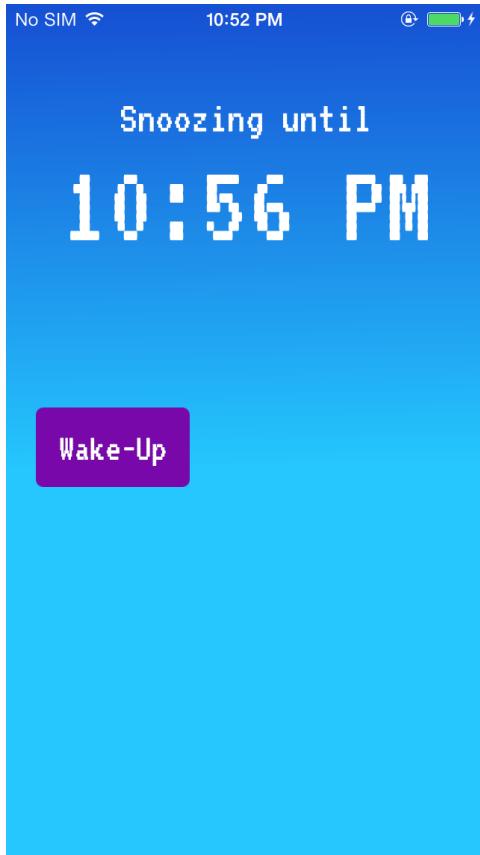
If the user presses the Settings button from the previous screen they call up a settings page where they can listen to the various alarm wake up tones the application uses and chooses whether or not that they want to save their selection.



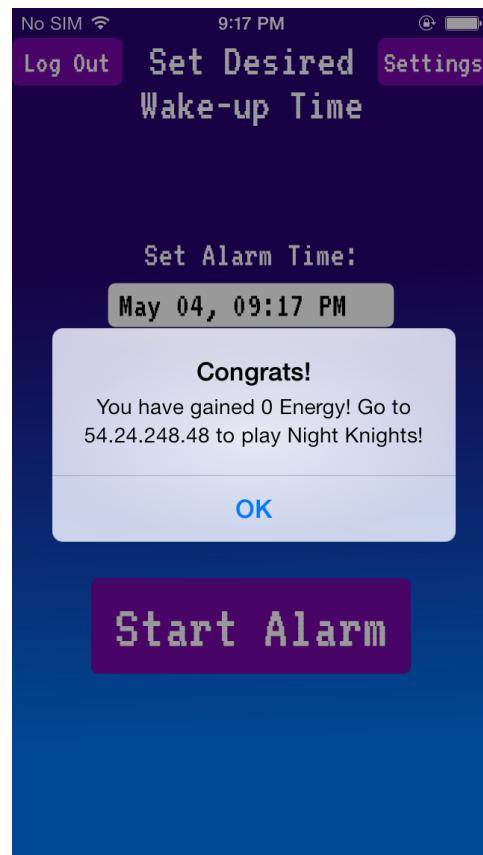
*When the User presses the Start Alarm in the SetAlarmView they are brought to this view where the app will stop until the alarm goes off or the User presses Cancel.*



*Once the alarm triggers the background of the View changes the center text also updates to display Wake-Up! the Cancel button is hidden and the Wake-up and snooze buttons become visible.*



If the User presses snooze, the labels change to display to the User when the alarm will next go off. The wake-up button still remains visible if the User wants to get up before the End of the Snooze alarm.



If the User was logged in to their account and they pressed the Wake up button they are greeted by an UIAlertView that displays their energy gained from sleeping and gives the web address to the online game to spend their newly earned energy.

## Testing:

We largely tested our product ourselves and through our testing team. We performed a few impromptu hallway tests while we were working on the project, but no formal testing was carried out. From the small number of hallway tests we did, we were able to get some helpful insight into issues with our button placement and other minor UI issues.

We also looked to the TA for feedback on our application. Because Matt had studied at the Guildhall, he was an extremely valuable asset when testing the game. He was able to give us information on game design best practices and helped us to stay on track with our vision. Most of the critical feedback we received was in regard to style and scope, though Matt also helped us to test for more esoteric concepts such as game balance and entertainment.

Our test team was helpful at finding bugs for the most part, with a few rough patches. They found a few good bugs that we hadn't, including a few that broke the game entirely. However, they didn't give us any feedback on our design choices and created issues only for bugs. They also made a few duplicate issues and reported already-known issues from the iteration release. We also had to close a few issues when the testers failed to elaborate on what was going wrong and we were unable to determine the cause of an issue.

As a test team, we did fairly well at finding the other team's bugs. We gave a lot of good feedback on the project, along with some minor stylistic changes and suggestions to make things smoother. Almost everything that we made an issue about was fixed or taken into consideration. We stayed in good communication with the team we were testing and any questions we had about their application or website were promptly answered.

## Team Reflection:

One of the biggest technical challenges we faced was creating the world boss battle system. The world bosses are Nightmares with lots of health points that multiple players could fight together. However, in order to create this group battle, we had to think of how we were going to implement it. We ended up with a series of triggers and stored procedures to handle some of the big issues like world boss death and distributing items to the players through a message system they could view at the home screen.

For the game, Anthony had to learn about CreateJS and its four sub-libraries. There was good documentation online for the library, but very few code samples. There wasn't a large community using the library and only a few places to ask questions about it. Whenever we hit problems related to the library, Anthony's only option was to use a lot of trial and error to find a solution. This cost us a lot of time that could have been spent on other features.

We had a lot of ambition for the project, which caused us a lot of design and scope issues. Although we completed what we set out to do, we almost got ourselves into a situation where the project would have been impossible to complete given the timeframe. If we wouldn't have met with Matt to discuss our project's scope, we might not have readdressed our initial, infeasible plans. If we got to do this project over, we would have to take our limits into account for the scope of the project.

With regards to the website, it would have been beneficial to hash out styling earlier in the development process rather than saving it for the final/polish-focused iteration. Though our intention was to save aesthetics for the end and worry about functionality first, the nature of web development dictates that these two concepts work intimately alongside each other. (Some functionality is essentially only implemented in CSS, such as modal dialog boxes.)

Another thing we would do differently would be to focus more on refining our design. We ended up with lots of things that weren't being used (eg, some superfluous API endpoints) or left out due to our aforementioned scope issues, and our design suffered because of it. If we got a second chance, we would work to pare-down our design and ensure a clean and unified look across all aspects of the project.

For the mobile application we spent the first 2 iterations focusing mostly on the core functionality of the application which caused a lot of tension in this last 2 weeks on getting the UI to where we wanted. We started it felt like a little too late in trying to get the color scheme to where we all liked it. If we could go back and tell ourselves if we should do anything with the mobile app, we would probably say get a color scheme/idea down early in efforts to alleviate future stress on how will the mobile app and website look, and also to plan better the Iteration feature sets because they put a lot of the core functionality in the first feature set and had the next 2 play catch up while implementing some of the more finesse details.

## Extra Features:

For the game, there were a lot of features we would have liked to add. There are only a couple of weapons, and we would like to add a lot more to keep the players entertained and motivated. An important feature to implement if we were looking to add weapons would be a better way to display weapons through a new inventory interface. Combat could also be better, with new features and game mechanics to add strategy and depth to the game.

The magic stat was dropped during a drastic design change in iteration two, switching from spells to skills. To get that "classic RPG" feel we were pushing for during the initial design it would be nice to discuss how magic fits into the world we created and how we could use it to improve the game. We also would like an artist to make some better looking graphics for the game, as most had to be drawn by Anthony (who is not at all an artist). There are also a few game balance issues and some aesthetic changes that we would like to address if we had more time.

With respect to the website, a fair number of stretch goals (searchable leaderboards, the ability to utilize password recovery via email, stat-tracking, et al.) had to be cut to complete the core features in time. There is still room for polish and new/extraneous content on many pages, and the site is moderately-intolerant of smaller screen sizes. If the past few weeks have been any indication, extra development time could produce a plethora of new features added, not to mention numerous enhancements and tweaks to existing pages.

For the mobile application features, we would like to implement a more robust cheat detection to prevent a User from using the alarm clock when they aren't sleeping to gain more energy. Also, we would like to be able to expand the list of sounds that the alarm can make to include songs from the User's Music Library. Another thing that we had talked about adding was the ability to

“save” a user’s energy if they were unable to connect to the server at the time they woke up. The app would record the energy gained for each day until it could successfully connect to the server and upload the saved energy. This way, the User would be able to gain energy even if they didn’t have a connection for a short period of time.

# Appendix A:

## Data Dictionary:

Night Knights DB:

- “Users”, this table holds simple account information of this application’s users
  - id
    - Int of size 11, i.e. INT(11), Primary Key, Autoincrement, not a nullable field.
  - username
    - Variable Char of size 32, i.e. VARCHAR(32), Unique Key, not a nullable field.
  - email
    - Variable Char of size 64, i.e. VARCHAR(64), Unique Key, not a nullable field.
  - password
    - Variable Char of size 128, i.e. VARCHAR(128), not a nullable field.
  - PRIMARY
    - *Index on `id` field, default primary index for table.*
  - username\_UNIQUE
    - *Index on `username` field, allows for good lookup speed on queries involving `username` enforces unique key on `username`.*
  - email\_UNIQUE
    - *Index on `email` field, allows for good lookup speed on queries involving `email` field such as query used for logging in. Enforces unique key on `email`.*
- “Characters”, this table holds the data that associate with a single user that is applicable to the application’s game.
  - id
    - **Int of size 11, INT(11), Primary, and Foreign Key, not a nullable field. This attribute is a foreign key in reference to the “Users” table’s `id` attribute. The combination of primary and foreign keys makes it so that a user may be associated with one and only one character.**
  - name
    - **Variable Char of size 32, VARCHAR(32), Foreign and Unique Key, not a nullable field. This attribute is a foreign key in reference to the “Users” table’s `username` attribute. The reason for this foreign key relationship, even though it duplicates some data, is to avoid any costly joins between the Users and Characters tables.**
  - energy
    - Int of size 11, INT(11), not a nullable field, default value of 250.

- experience
    - Int of size 11, INT(11), not a nullable field, default value of 0.
  - level
    - Int of size 11, INT(11), not a nullable field, default value of 1.
  - PRIMARY
    - *Index on `id` field, default primary index for table.*
  - name
    - *Index on `name` field. Required index for the Foreign key relation constraint on the `name` field. Also enforces the Unique key constraint.*
- “Monsters”, this table holds the blueprints for various monsters that users can fight on the web-client.
  - id
    - Int of size 11, INT(11), Primary Key, Autoincrement, not a nullable field.
  - name
    - Variable Char of size 32, VARCHAR(32), not a nullable field.
  - attack\_seed
    - Int of size 11, INT(11), not a nullable field, default value of 1.
  - defense\_seed
    - Int of size 11, INT(11), not a nullable field, default value of 0.
  - magic\_seed
    - Int of size 11, INT(11), not a nullable field, default value of 0.
  - health\_seed
    - Int of size 11, INT(11), not a nullable field, default value of 10.
  - img\_url
    - Variable Char of size 128, VARCHAR(128), not a nullable field.
  - PRIMARY
    - *Index on `id` field, default primary index for table*
- “Messages”, this table holds the stored messages for a player if they have participated in a world boss battle and the world boss has been defeated.
  - character\_id
    - **Int of size 11, INT(11), Primary and Foreign Key, not a nullable field**
  - date\_created
    - Timestamp, TIMESTAMP, Primary Key, not a nullable field, default value of current timestamp.
  - message
    - Text, TEXT, not a nullable field.
  - unread
    - Tinyint of size 1, TINYINT(1), not a nullable field, default value of 1.
  - PRIMARY
    - *Two part index on the `character\_id` and `date\_created` fields, default primary key for table.*
- “Inventories”, this table holds all the inventory items a particular character has acquired.
  - item\_id

- Int of size 11, INT(11), Primary and Foreign Key, not a nullable field.
- character\_id
  - Int of size 11, INT(11), Primary and Foreign Key, not a nullable field.
- is\_equipped
  - Tinyint of size 1, TINYINT(1), not a nullable field, default of 0.
- PRIMARY
  - Two part index on the `item\_id` and `character\_id` fields, default primary key for table.
- item\_id
  - Index on the `item\_id` field, allows for Foreign key constraint (having index where field is first in sequence).
- character\_id
  - Index on the `character\_id` field, allows for Foreign key constraint (having index where field is first in sequence).
- “Items”, this table holds the achievable items that are used in the application’s game.
  - id
    - Int of size 11, i.e. INT(11), Primary Key, Autoincrement, not a nullable field.
  - name
    - Variable Char of size 32, VARCHAR(32), not a nullable field.
  - attack\_stat
    - Int of size 11, INT(11), not a nullable field, default value of 1.
  - defense\_stat
    - Int of size 11, INT(11), not a nullable field, default value of 0.
  - magic\_stat
    - Int of size 11, INT(11), not a nullable field, default value of 0.
  - classification
    - Variable Char of size 32, VARCHAR(32), not a nullable field
  - img\_url
    - Variable Char of size 128, VARCHAR(128), not a nullable field
  - PRIMARY
    - Index on the `id` field, default primary index for the table.
- “World\_Fights”, this table holds a character’s state when fighting a world boss. If a character has an instance of a fight for a specific boss who is killed, that player receives an inventory item and a message.
  - boss\_id
    - Int of size 11, INT(11), Primary and Foreign Key, not a nullable field.
  - character\_id
    - Int of size 11, INT(11), Primary and Foreign Key, not a nullable field.
  - damage\_done
    - Int of size 11, INT(11), not a nullable field, default value of 0.
  - active
    - Tinyint of size 1, TINYINT(1), not a nullable field, default value of 1.
  - PRIMARY

- Two part index on the `boss\_id` and `character\_id` fields, default primary key for table.
- boss\_id
  - Index on the `boss\_id` field, allows for Foreign key constraint (having index where field is first in sequence).
- character\_id
  - Index on the `character\_id` field, allows for Foreign key constraint (having index where field is first in sequence).
- “World\_Bosses”, this table holds instances of Monsters called World Monsters which have increased stats and are able part of the multiplayer aspect of the game.
  - id
    - Int of size 11, INT(11), Primary Key, Autoincrement, not a nullable field.
  - monster\_id
    - Int of size 11, INT(11), Foreign Key, not a nullable field.
  - boss\_health
    - Int of size 11, INT(11), not a nullable field.
  - boss\_attack
    - Int of size 11, INT(11), not a nullable field.
  - boss\_defense
    - Int of size 11, INT(11), not a nullable field.
  - boss\_magic
    - Int of size 11, INT(11), not a nullable field.
  - achievable\_item\_id
    - Int of size 11, INT(11), Foreign Key, not a nullable field.
  - PRIMARY
    - Index on the `id` field, default primary key for table.
  - monster\_id
    - Index on the `monster\_id` field, allows for Foreign key constraint (having index where field is first in sequence).
  - achievable\_item\_id
    - Index on the `achievable\_item\_id` field, allows for Foreign key constraint (having index where field is first in sequence).
- “Area\_Monsters”, this table holds instances of Monsters that are associated with specific areas.
  - area\_id
    - Int of size 11, INT(11), Primary and Foreign Key, not a nullable field.
  - monster\_id
    - Int of size 11, INT(11), Primary and Foreign Key, not a nullable field.
  - PRIMARY
    - Two part index on the `area\_id` and `monster\_id` fields, default primary key for table.
  - area\_id

- *Index on the `area\_id` field, allows for Foreign key constraint (having index where field is first in sequence).*
- *monster\_id*
  - *Index on the `monster\_id` field, allows for Foreign key constraint (having index where field is first in sequence).*
- “Areas”, holds the data associated with a specific area in the game. Mainly used to store the background image of an area view.
  - *id*
    - Int of size 11, INT(11), Primary Key, Autoincrement, not a nullable field.
  - *name*
    - Variable Char of size 32, VARCHAR(32), not a nullable field.
  - *img\_url*
    - Variable Char of size 128, VARCHAR(128), not a nullable field.
  - *PRIMARY*
    - *Index on the `id` field, default index for the table.*