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## **BETA Universe Systems Initiative Table Application**

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## Introduction

The Initiative Table application for “BETA Universe Systems” provides a host of quality-of-life features that handle many of the administrative and organizational aspects of the “BETA Universe Systems” table-top RPG game. Through the app, game masters can create sessions of a game and invite other players to play in real-time. The significance of this project is that players can enjoy the role-playing narrative aspect of the game without being disrupted by whose turn it is and without the extraneous calculations that, for example, can determine if their attack successfully connected or if it failed. This application is optimized for both desktop and mobile viewing to allow for portability and comfort when interacting with the game to meet the description as mentioned earlier. As described by the client, the lengthy calculations will be reduced by the application’s built-in rule correlating and equation calculating matrix to distribute appropriate numbers and information to the player efficiently. The Initiative Table application will meet this objective by giving the player several interfaces for which they can fill in the missing information for proper calculations. No notable differences have been made since the previous documentation. Our current implementation continues to use Vue.js, Vuetify, and Axios for client-side (front-end, and Microsoft’s ASP.NET Core framework for server-side (back-end).

# Stakeholders' Interviews Summary

The following is a summary of the interviews that took place with three main stakeholders. The team provided each stakeholder with a list of questions, and their responses were captured in-person or through email. The three stakeholders we chose to interview are John Molt, Barbara Molt, and Jason Molt. The team chose the three of them for the interviews because they are active players of the game and have many years of experience in web development.

John Molt was chosen not only because he is our advisor and creator of the game but also due to his many years of full-stack web development experience. Barbara Molt was interviewed because of her experience being a front-end web developer on top of being an active player. Jason Molt was selected due to his experience playing the game and being a full-stack web developer who is currently the CTO & Co-Founder of a startup company.

## **1. Based on your technical background, what do you feel makes a web application attractive to use?**

- The stakeholders had a unanimous answer to this question. They believed that a web application should have logical steps and minimal distractions. They said that the main attractiveness of web applications is that they can run on any device without any installation as long as you have an internet connection. A web single-page application lacks some of the graphical power that can be found on a native iOS or Android app, but it can display and render faster.

## **2. Based on the requirements discussions we have had, If you could pick a single feature to 100% ensure it makes it in the final product, what would it be?**

- The stakeholders had a unanimous answer to this question as well. They believed that the initiative table must be included. Throughout a game session, it can be very tedious and time-consuming to check who's turn it is and can often lead to problems where someone's turn may have been skipped. It would also provide players with a visual timeline to keep track of everything that has occurred.

- 3. On what kind of device do you anticipate yourself using the application?**
  - The stakeholders had varying answers for this. Some will use the application primarily on a laptop or desktop through a chrome browser on windows 10; however, some of them will want to use it on their phone mainly.
  
- 4. Based on your technical background, what do you feel is the most challenging part of web development/software engineering in general?**
  - The stakeholders had varying answers for this. Some of them answered that typically, it is when a product continually gets more and more complex requirements-wise. It can halt development and testing in the process, but they do not anticipate that happening here. They also answered that sometimes meeting with customers can be tricky since they do not always know what they want and that dividing development work in a team can also pose a challenge.
  
- 5. What problem do you find constantly occurs during gameplay that this application would solve?**
  - The stakeholders had some slightly different answers for this. Some of them answered that typically, the time to resolve combat (calculations, counting, equations) can be laborious, which slows down and reduces the overall time spent on the narrative. The best game sessions balance the time spent on the narrative and combat. They also said that keeping track of who's turn it is usually ends up with a lot of backtracking as to who's turn it previously was. This application would provide a history that would resolve this issue.
  
- 6. What are some applications that you use daily that you find have an accessible, elegant, and intuitive design?**
  - The stakeholders mentioned a variety of different applications. They said project management applications like ClickUp and Messagedesk which feature simple material designs and more robust industry applications like Visual Studios Code and Reaper(DAW).

**7. How should the team go about implementing a secure sign-in process? Design-wise or implementation-wise.**

- The stakeholders mentioned a variety of options for authentication. They noted that the application does not need a robust, secure authentication system. Only enough for a user to be able to log in and use the application. However, a captcha to prevent bot registrations and email confirmation when registered would be nice to have. They recommended using JSON web tokens and hashing passwords in a database for storage.

**8. Compared to similar applications on the market, what features will make this product stand out?**

- The stakeholders were not aware of many other products similar to this one. However, one stakeholder mentioned that stand alone physical tracking devices take more time than this application will take, and game system agnostic trackers fail in many ways.

**9. What features have you really liked or disliked about similar applications you have seen?**

- Again, the stakeholders were not aware of truly similar applications. One stakeholder mentioned Astral Virtual Tabletop and Roll20.net as good examples, however, they did not suit the needs of his company's game.

**10. What do you think will be some of the biggest obstacles or challenges when developing this product?**

- The stakeholders saw real time synchronization during the complex attack loop of gameplay to be a challenging development issue, as well as not knowing what you don't know.

**11. What are the long term goals of this application?**

- Digitization of gameplay so that remote play is possible while still preserving the ability to play on a physical tabletop, to act as a stepping stone into marketing a suite of applications for the game, and virtual commerce were some of the long term goals mentioned by the stakeholders.

**12. On average, how many users do you foresee logging into a single session? (How many players are in a single game?)**

- The stakeholders were in general agreement on 5-7 players, with an upper limit of 10.

**13. What knowledge or skills can we assume of the target audience? What does not need to be explained within the application?**

- Basic math, metric system, character classes, rules of gameplay and PC combat.

**14. What does a complete, successful product look like given the time constraints?**

- A working initiative table to track player order, and an overall quicker, smoother experience running combat during gameplay.

**15. What is your dream outcome of this product given no constraints?**

- Being able to run a session quickly and the application being accepted and used by many people.

# Technical Requirements

## Functional Requirements

FR01.	[1]	ITA shall allow the user to create an account.
FR02.	[1]	ITA shall allow the user to authenticate into their account.
FR03.	[1]	ITA shall allow the user to create a session.
FR04.	[1]	ITA shall allow the user to delete a session.
FR05.	[1]	ITA shall allow the user to join a real-time session.
FR06.	[1]	ITA shall allow the user to send messages to other users.
FR07.	[2]	ITA shall allow the user to create character profiles.
FR08.	[2]	ITA shall display a character creation interface.
FR09.	[2]	ITA shall allow the user to edit character profiles.
FR10.	[2]	ITA shall allow the user to delete character profiles.
FR11.	[2]	ITA shall display the initiative table data.
FR12.	[2]	ITA shall display a chat log.
FR13.	[2]	ITA shall allow the user to select an action.
FR14.	[2]	ITA shall allow the user to select one or more targets.
FR15.	[2]	ITA shall allow the user to confirm their action.
FR16.	[2]	ITA shall display the “attack” interface.
FR17.	[2]	ITA shall allow the user to input a value for an attack roll.
FR18.	[2]	ITA shall allow the user to select a weapon for an “attack” action.
FR19.	[2]	ITA shall display the “defense” interface for an attacked user to defend.
FR20.	[2]	ITA shall allow the user to input values for the “defense” action.
FR21.	[2]	ITA shall allow the user to select a defensive item for a “defense” action.
FR22.	[2]	ITA shall display an intervention prompt for non-current action users.
FR23.	[2]	ITA shall display an “intervention” interface.
FR24.	[2]	ITA shall allow the user to input values for “intervention” action if qualified.
FR25.	[2]	ITA shall allow the user to select the “move” action.
FR26.	[2]	ITA shall allow the user to select the “hold” action.
FR27.	[2]	ITA shall allow the user to select the “wait” action.
FR28.	[2]	ITA shall display actions in the chat log for record keeping.
FR29.	[2]	ITA shall allow the game master to start and end sessions.
FR30.	[2]	ITA shall allow the game master to signal to players.
FR31.	[3]	ITA shall generate an auto XP tally report.
FR32.	[3]	ITA shall add endurance statistic tracking.

**Table 1:** All the requirements that ITA will meet by the end of Fall 2021 semester, [1], and Spring 2022 semester, [2], additional items that are not required, but nice to have, [3].



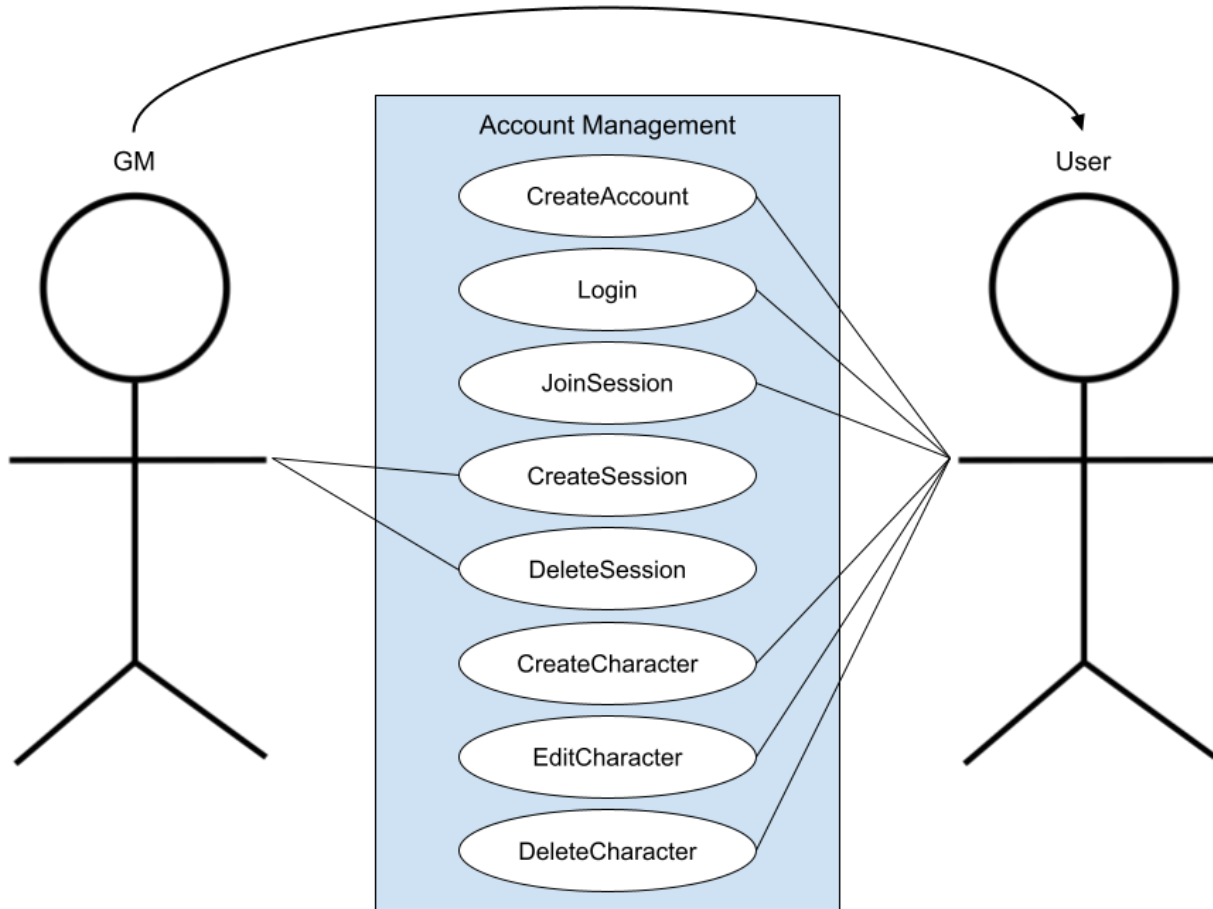
## Non-Functional Requirements

- |  |
|--|
| NFR01. [1] ITA will utilize Vue.js., Vuetify, Axios., ASP.NET Core. and SQL databases. |
| NFR02. [2] ITA will contain a home interface.  |
| NFR03. [2] ITA will contain a session interface.                                       |
| NFR04. [2] ITA will contain a last modified date field for all SQL table records.      |
| NFR05. [2] ITA will contain a creation date field for all SQL table records.           |
| NFR06. [2] ITA will contain a delete flag field for all SQL table records.             |
| NFR07. [2] ITA will contain a user record creation field for all SQL table records.    |
| NFR08. [2] ITA will be optimized on mobile devices.                                    |

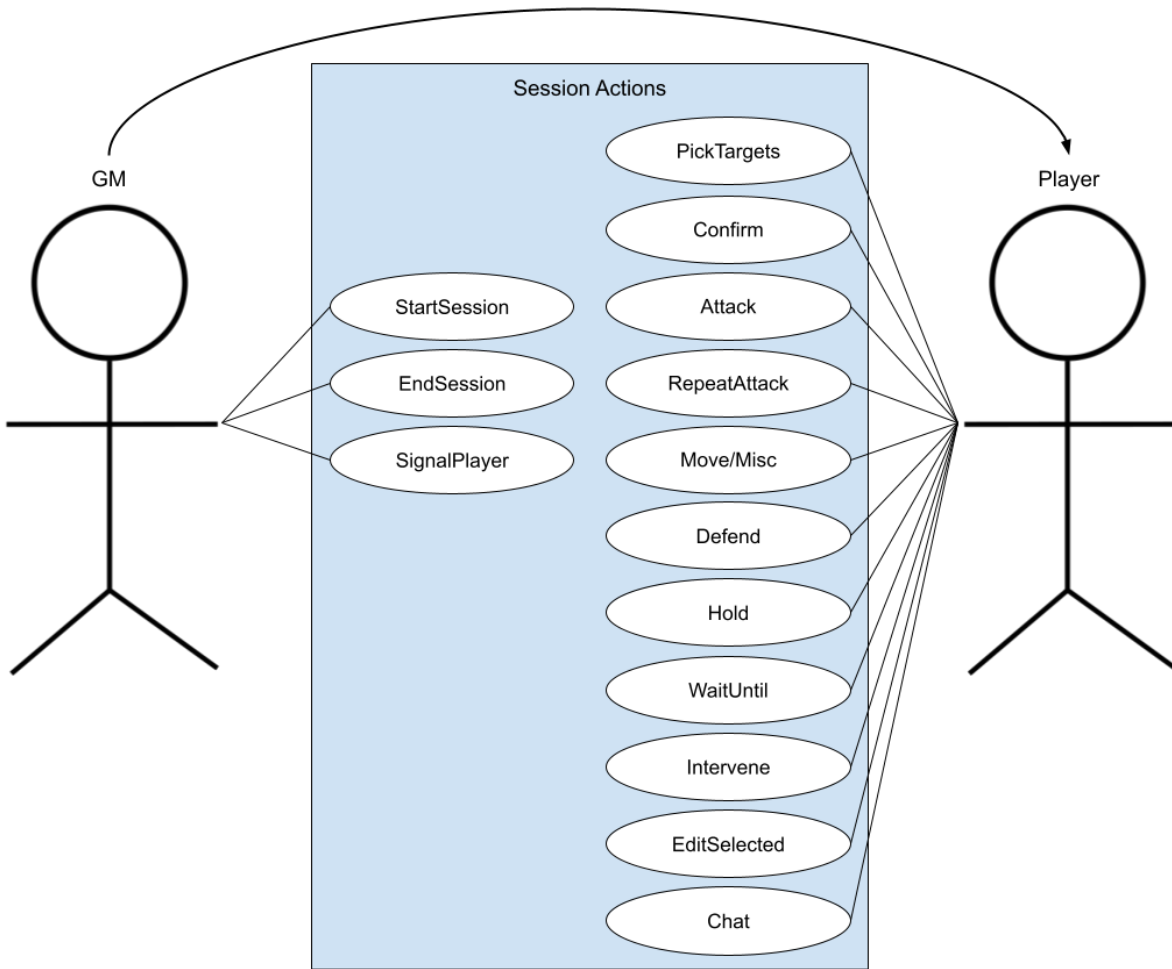
**Table 2:** All the non-functional requirements that ITA will meet by the end of Fall 2021 semester, [1], and Spring 2022 semester, [2], additional items that are not required, but nice to have, [3].

# Use Case Modeling

## Use Case Diagram



**Fig. 1:** Use case diagram showing the available actions users have when managing their accounts.



**Fig. 2:** Use case diagram showing the actions players and GMs can take during a session.

## Detailed Use Cases

Note: Both players and GMs share certain actions. There is no difference in behavior between a player performing an action and a GM performing the same action.

### Account Management

ID	Use Case	Description
UC01	CreateAccount	Players can create an account by providing an email and password.
UC02	Login	Players can log into registered accounts by providing an email and password.
UC03	JoinSession	After login, users will be able to see all available sessions, which they can click on to join.
UC04	CreateSession	(GM only) GMs can create new sessions by providing a name.
UC05	DeleteSession	(GM only) GMs can delete existing sessions by clicking on a session's delete button.
UC06	CreateCharacter	Players can create characters to use in various sessions. Characters have various attributes like their name, equipment, and stats.
UC07	EditCharacter	Players can edit their characters' names, equipment, and stats.
UC08	DeleteCharacter	Players can delete their characters by clicking on that character's delete button.

**Table 3:** Detailed use case descriptions for the account management actions.

### Session Actions

ID	Use Case	Description
UC09	PickTargets	Certain actions, like attacking and chatting, require the player to select the target(s) for that action.
UC10	Attack	The active character takes an attack action against designated targets with a specified weapon.

UC11	RepeatAttack	A convenience option. Will launch a new attack with the same data/settings as the previous one.
UC12	Move/Misc	The player moves their character to a new position on the field, and their initiative will then be updated. Miscellaneous actions performed outside of the scope of the app will also be performed.
UC13	Defend	The character being attacked makes a defense roll against an attack with their current armor and/or shield.
UC14	Hold	The player decides to take no action on their turn. Holds after the first will decrease a player's number of actions by 1.
UC15	WaitUntil	The player declares a condition that may be met. Players in waiting have their turns skipped. If the condition is met, the player can immediately take action, even when it is not their turn.
UC16	Intervene	During certain actions, most notably attacking, players who aren't targets of the attack may jump in to defend their teammates.
UC17	EditSelected	Allows a selected character to be edited. Examples include changing their names, affiliations, or number of actions.
UC18	Chat	Players can communicate with each other through text. Messages can be sent both publicly and privately.
UC19	Confirm	The active character confirms their action.
UC20	StartSession	(GM only) The GM starts the session, preventing others from joining. Prompts all players to roll for their initial initiative values.
UC21	EndSession	(GM only) The GM ends the current session. All player actions are disabled and an optional ending message may be displayed to everyone.

UC22	SignalPlayer	(GM only) The GM selects a player to perform their action on the current segment. The selected player's controls will be activated.
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**Table 4:** Detailed use case descriptions for the session actions.

## Detailed Templates

Case ID	UC10: Attack
Actor	Current Character
Precondition(s)	1. The character has remaining actions
Flow of Events	<ol style="list-style-type: none"> <li>1. The player selects the characters they wish to target</li> <li>2. The player chooses their weapon <ol style="list-style-type: none"> <li>a. If a ranged weapon is chosen, determine range</li> </ol> </li> <li>3. The player selects a skill</li> <li>4. The player is given the option to roll dice to hit</li> <li>5. The player calculates their result based on modifiers and roll</li> <li>6. Wait for defender</li> <li>7. The attack either hits or misses <ol style="list-style-type: none"> <li>a. If missed, a chat would appear in the chat log describing so.</li> </ol> </li> <li>8. Wait for intervention</li> <li>9. Determine the location of the strike</li> <li>10. Determine damage</li> <li>11. Determine the effects to that location</li> </ol>
Postcondition(s)	<ol style="list-style-type: none"> <li>1. The character's order in the initiative order has changed</li> <li>2. The chat log is updated</li> </ol>

**Table 5:** Template for the *Attack* use case.

Case ID	UC13: Defend
Actor	Defending Character
Precondition(s)	1. The character has remaining actions
Flow of Events	1. The player rolls a defense roll and adds their armor 2. The player calculates their result based on modifiers, armor, and roll
Postcondition(s)	1. The character's order in the initiative order has changed 2. The chat log is updated

**Table 6:** Template for the *Defend* use case.

Case ID	UC19: Confirm
Actor	Any Player
Precondition(s)	1. The character has remaining actions 2. The player selects what action or event they want to take 3. The player selects all of the details
Flow of Events	1. The players action or event is locked in 2. The player's action/event takes place
Postcondition(s)	1. The results of the action take place 2. The character's order in the initiative order has changed 3. The chat log is updated

**Table 7:** Template for the *Confirm* use case.

Case ID	UC16: Intervene
Actor	Any Player
Precondition(s)	<ol style="list-style-type: none"> <li>1. An attack must be declared on another character.</li> <li>2. Each intervening player must click the intervene button within 5 seconds of being prompted.</li> <li>3. Each intervening character must have remaining actions.</li> </ol>
Flow of Events	<ol style="list-style-type: none"> <li>1. Each intervening player rolls to determine if they are able to intervene in the attack.</li> <li>2. Each qualified intervening player now becomes a defender of the attack, and performs the actions described in UC13.</li> <li>3. Intervention is finished when all defenders have been struck.</li> </ol>
Postcondition(s)	<ol style="list-style-type: none"> <li>1. All characters involved in the attack will have their initiatives changed.</li> <li>2. The chat log is updated.</li> </ol>

**Table 8:** Template for the *Intervene* use case.



Case ID	UC20: StartSession
Actor	GM of session
Precondition(s)	<ol style="list-style-type: none"> <li>1. GM must be logged in and must join the session they wish to start.</li> <li>2. All players to be involved in the session must be joined before the session begins.</li> <li>3. All characters to be used in the session must be placed within "US" and "THEM" groups.</li> </ol>
Flow of Events	<ol style="list-style-type: none"> <li>1. Once all players and characters are ready, the GM clicks the start button.</li> <li>2. All players will receive a prompt asking if they wish to perform their rolls by hand or let the computer roll for them.</li> <li>3. All characters will roll random numbers to determine their initial initiative value.</li> <li>4. The main UI will be updated, showing the names and initiative values of all characters, in descending order.</li> </ol>
Postcondition(s)	<ol style="list-style-type: none"> <li>1. The GM's SignalPlayer button will now be active, which allows the GM to enable a player's action buttons for their turn.</li> </ol>

**Table 9:** Template for the *StartSession* use case.

# Requirement Traceability Matrix

The following tables contain our requirement traceability matrix. The matrix was divided into two tables to preserve formatting and for readability.

Requirement Traceability Matrix FR01 - FR16																						
	UC01	UC02	UC03	UC04	UC05	UC06	UC07	UC08	UC09	UC10	UC11	UC12	UC13	UC14	UC15	UC16	UC17	UC18	UC19	UC20	UC21	UC22
FR01	■																					
FR02		■																				
FR03				■																		
FR04					■																	
FR05			■																			
FR06																			■			
FR07						■																
FR08						■																
FR09							■														■	
FR10								■														
FR11									■													
FR12																					■	
FR13										■	■	■	■	■	■	■	■	■	■	■		
FR14									■													
FR15																					■	
FR16											■											■

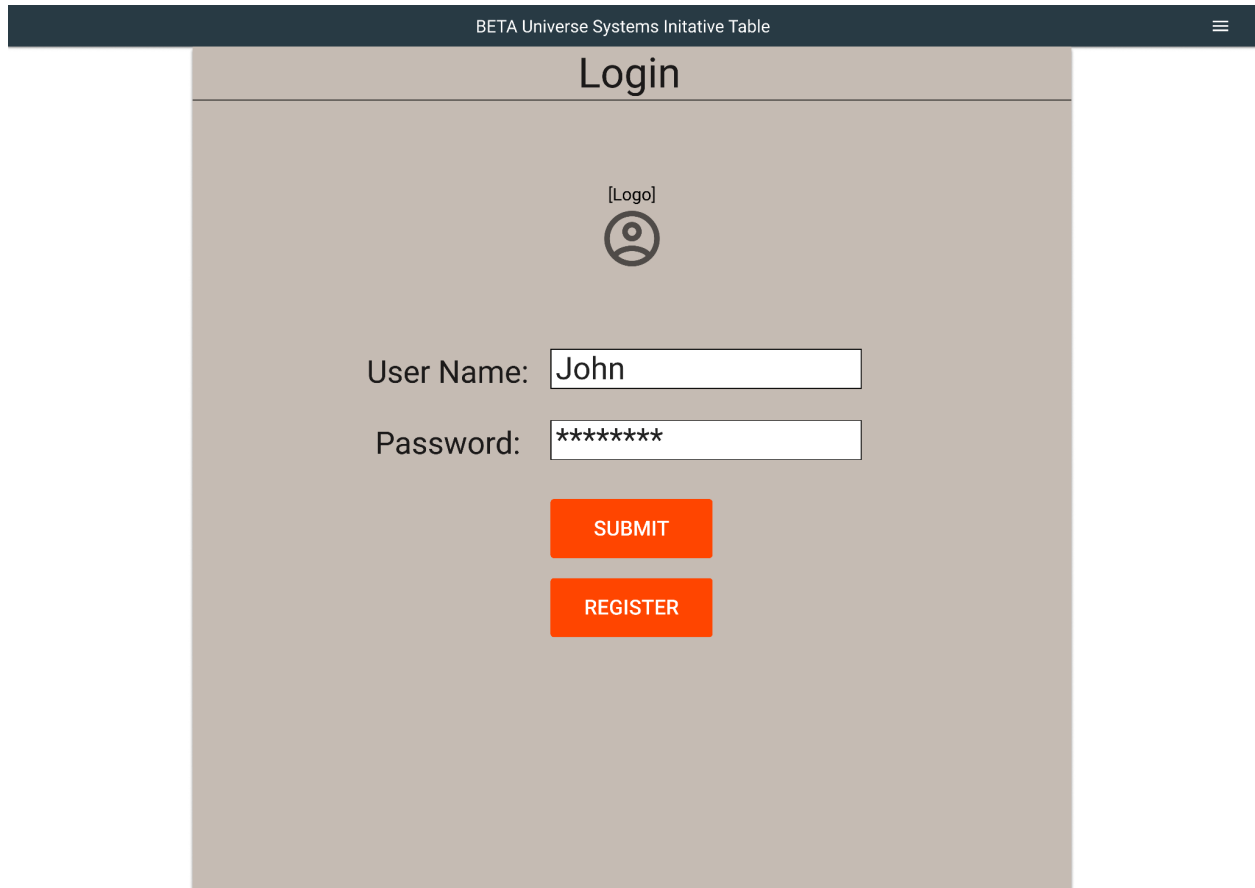
**Fig. 3:** Requirement Traceability Matrix for functional requirements 1 - 16.

Requirement Traceability Matrix FR17 - FR32																						
	UC01	UC02	UC03	UC04	UC05	UC06	UC07	UC08	UC09	UC10	UC11	UC12	UC13	UC14	UC15	UC16	UC17	UC18	UC19	UC20	UC21	UC22
FR17										█												
FR18										█												
FR19												█							█			
FR20												█										
FR21												█										
FR22																█						
FR23																█						
FR24																█						
FR25												█										
FR26														█								
FR27															█							
FR28										█	█	█	█	█	█	█			█			
FR29																				█	█	
FR30																						█
FR31										█	█	█	█	█	█	█					█	
FR32						█	█															

**Fig. 4:** Requirement Traceability Matrix for functional requirements 17 - 32.

# Initial Snapshots

The following figures are snapshots of the system's potential user interface. Note: The user interface slightly varies between the two main roles GM and player. Buttons colored in yellow only appear for the GM, everything else appears for both.



**Fig. 5:** Login UI (Desktop). The initial login screen for the website. Users with accounts can use their username and password to access their account and enter the main portion of the application. New users can access the registration through the register button.

# Login

[Logo]



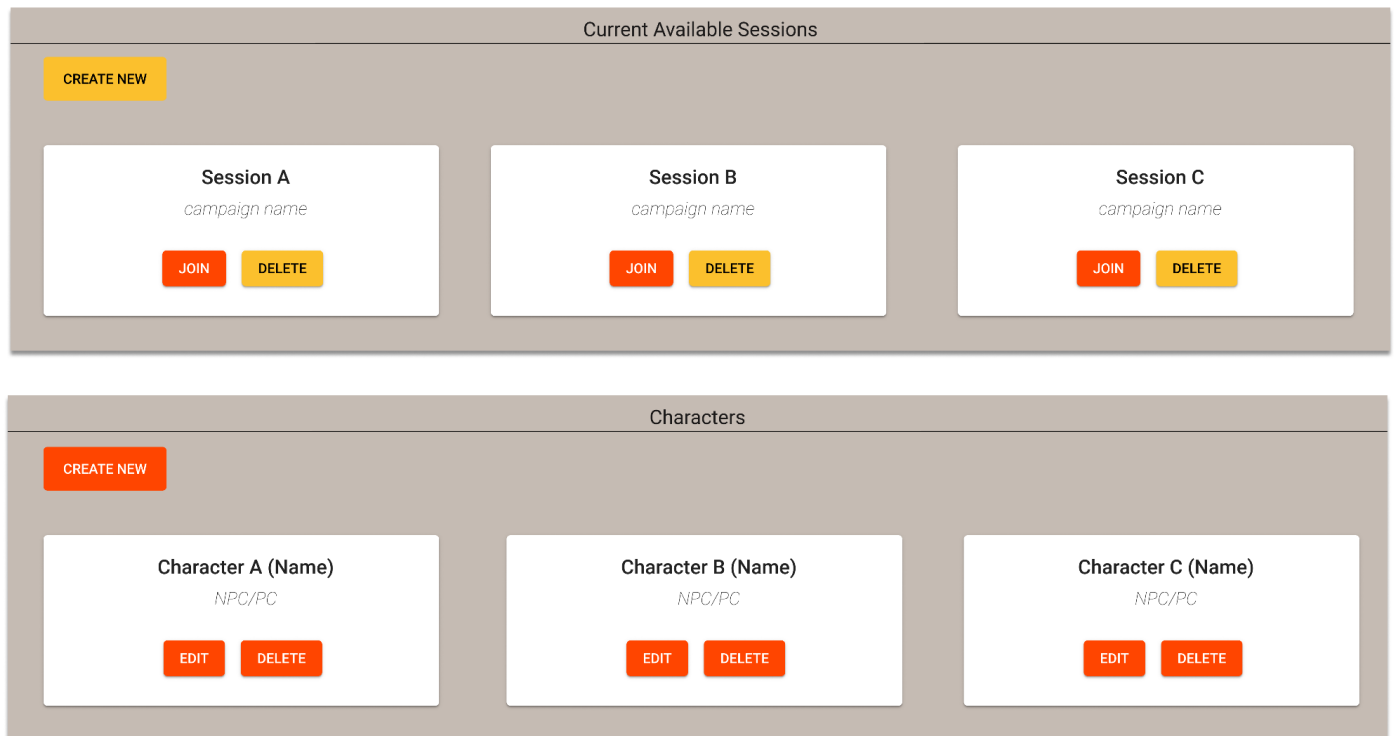
User Name:

Password:

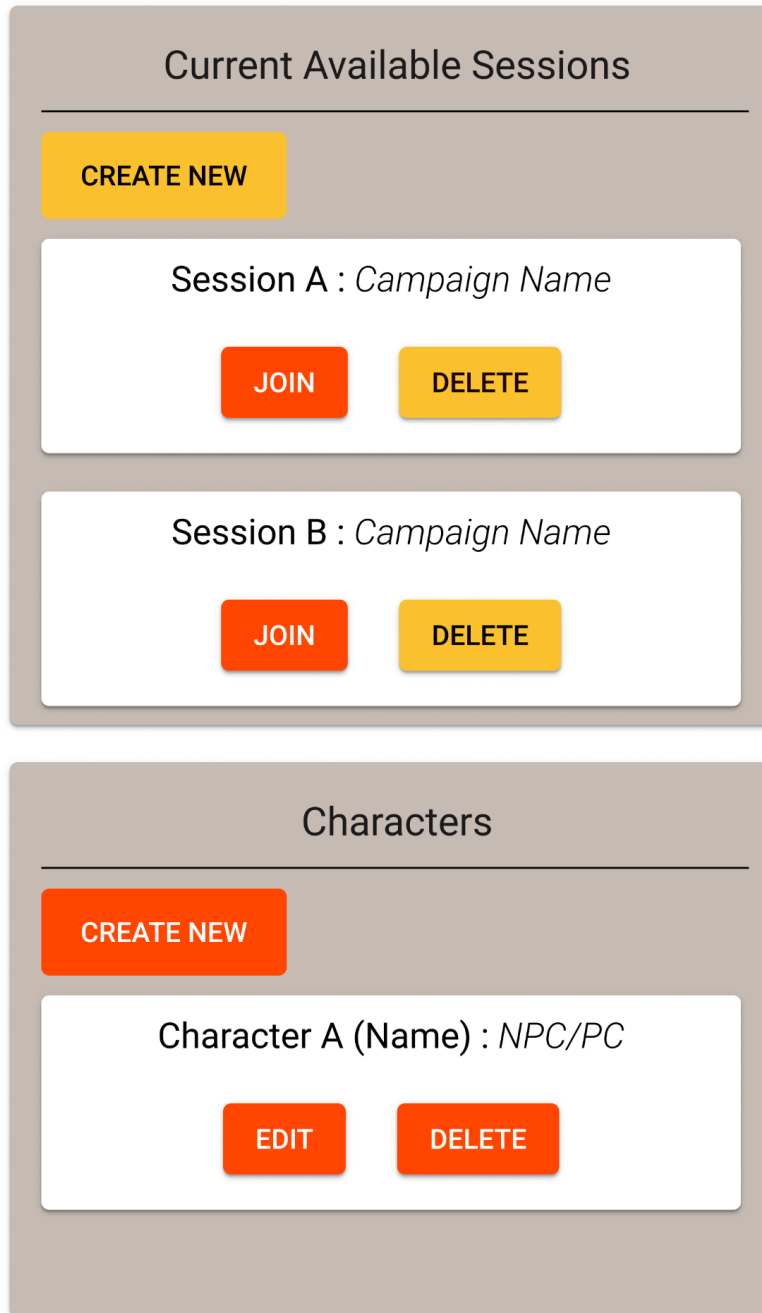
[SUBMIT](#)

[REGISTER](#)

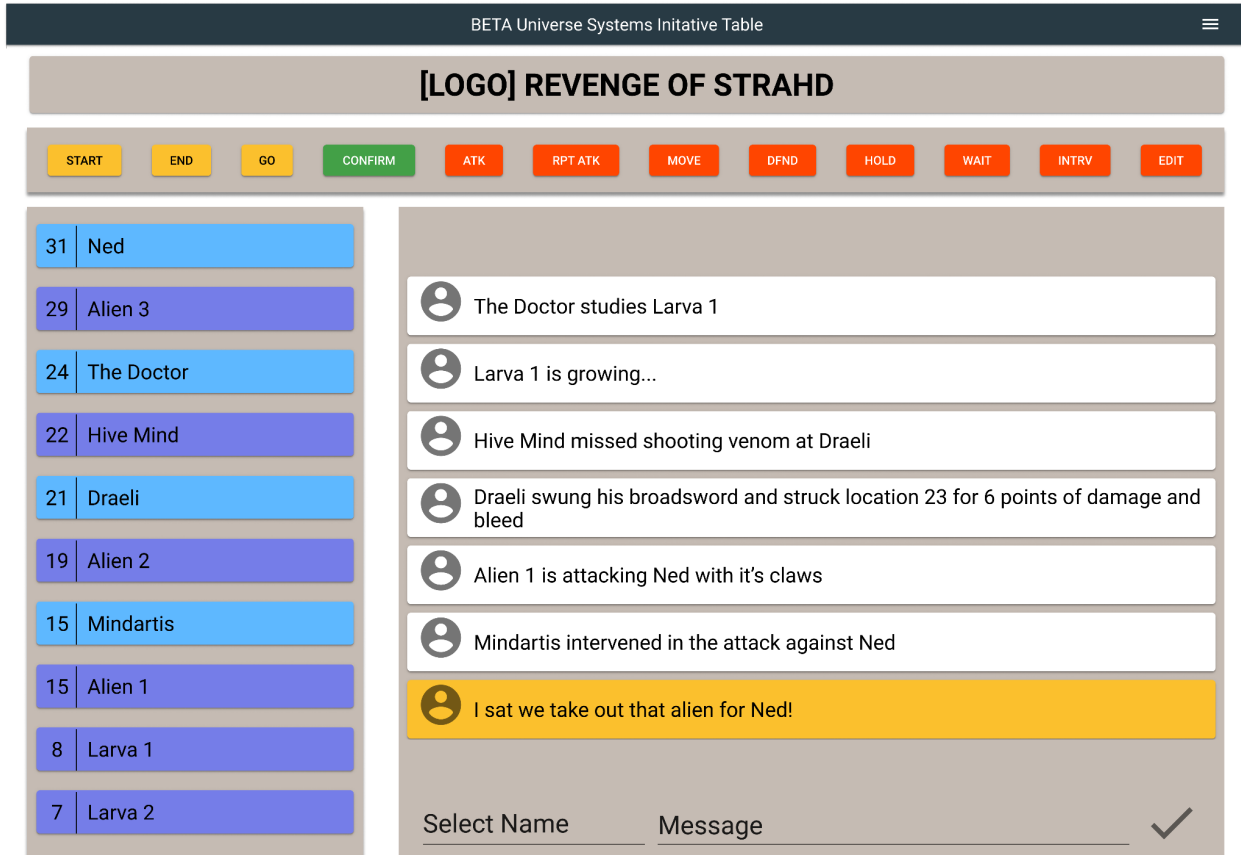
**Fig. 6:** Login UI (Mobile). Mobile version of the login page. There is not much difference from the desktop version other than scaling the page size to the appropriate mobile aspect ratio.



**Fig. 7:** Home page UI (Desktop). After logging in as a regular player, the player is presented with a section of the available sessions. Each card in the section represents a session with a button to join. There is also a section for the characters the player has created. Each card represents a character, and there are buttons to edit, delete and add the individual characters. When logged in as a GM, there are two additional functions: creating a new session and deleting a session.

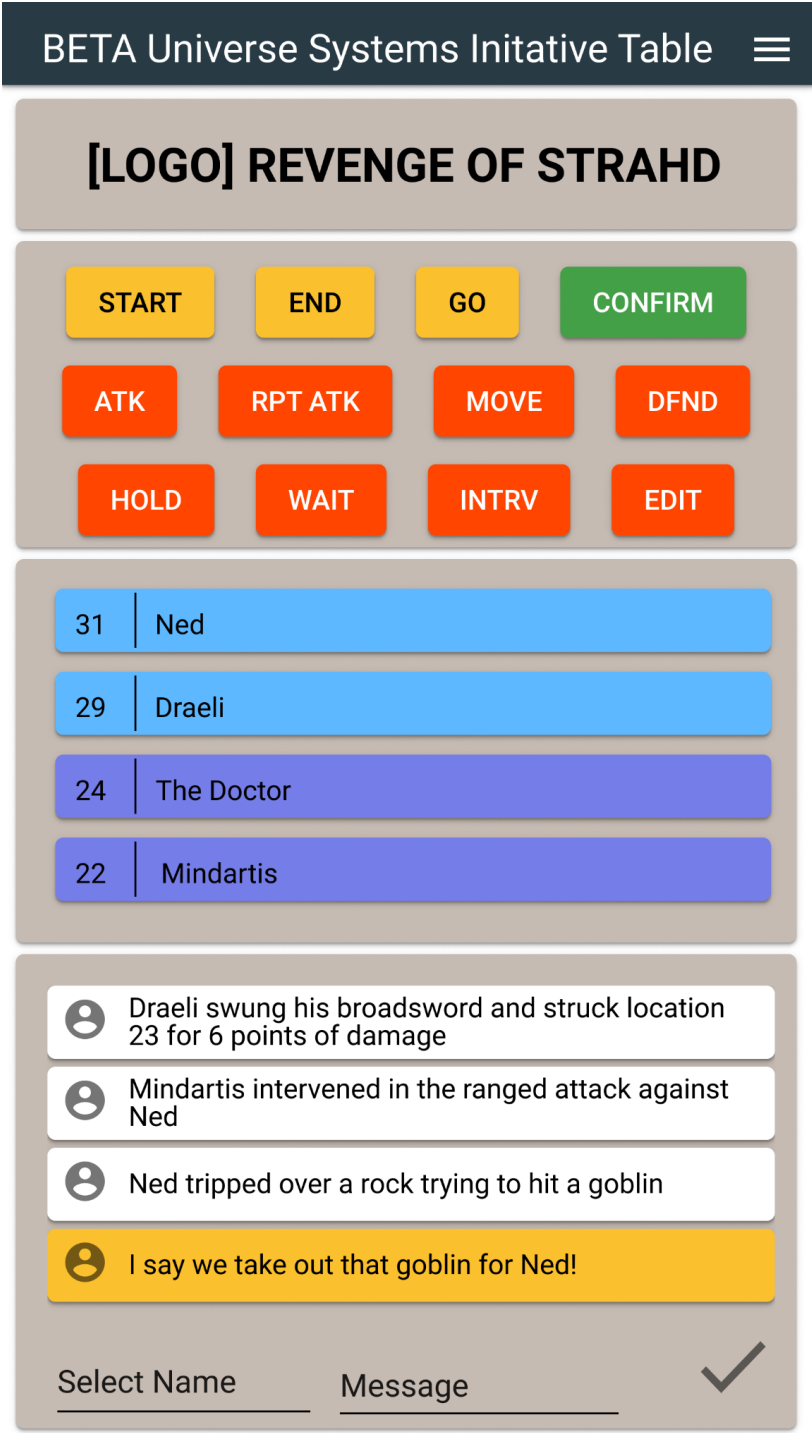


**Fig. 8:** Home page UI (Mobile). For the mobile version of the homepage UI, the same functionality is present; however, the two-session and character sections have been resized to fit a mobile size screen. The cards now take up less vertical space to make up for the change in screen size.



**Fig. 9:** Session UI (Desktop). The session UI is one of the critical components of the application. This UI comes after a player joins a session and displays game specific information and interaction. The top bar shows the campaign name chosen by the GM. The bar just underneath the campaign name is the button palette, which gives the players interactivity to make actions within the game. The left side bar holds the initiative table information, which keeps track of the player turn order. The color of each name denotes the different teams. The right and largest area displays the chat log. The chat log displays actions that have been taken, results of those actions, and player chat messages. The bottom of the chat area is the area where players can choose who to send a message, type in their message, and click the send icon.





**Fig. 10:** Session UI (Mobile). The same functionality is present for the mobile version of the session UI; however, the four main sections have been condensed vertically to present the information. The button palette now wraps to make sure they are all accessible.

## Glossary

Word	Definition/ Abbreviation
<b>Check</b>	A task the PC needs to perform in order to perform an action, such as jumping a chasm.
<b>END</b>	Endurance.
<b>GM</b>	Game master.
<b>Go</b>	Signals it is player x's turn.
<b>Hold</b>	Do nothing, in reference to an option on a character's turn.
<b>Initiative</b>	A stat with a dice roll that determines the order that the characters move in, higher number first.
<b>Intervention</b>	A character can attempt to interrupt another action.
<b>ITA</b>	Initiative Table Application.
<b>Location</b>	It is referring to where on the body you are interacting with.
<b>NPC</b>	A non-player character.
<b>PC</b>	Player character.
<b>Range</b>	The number of spaces from point a to point b.
<b>Round</b>	A full rotation of the initiative order.
<b>RPG</b>	Role playing game.
<b>Saving Roll</b>	A check in order to prevent someone from occurring, such as being poisoned.
<b>Segment</b>	The current initiative value.
<b>Segment Count</b>	The number of segments that have passed.
<b>Session</b>	Each time the group meets to continue the game.
<b>Stats</b>	The integer number corresponding to a specific skill, strength stat.
<b>XP</b>	Experience points.

**Table 10:** The table above contains 20 glossary terms surrounding the project's problem domain.

## References

*Jean Yang, Vijay Janapa Reddi, Yuhao Zhu, and Peter Bailis. 2016. Research for Practice: Web Security and Mobile Web Computing: Expert-curated Guides to the Best of CS Research. Queue 14, 4 (July-August 2016), 80–95. DOI:<https://doi.org/10.1145/2984629.3005356>*

The article above informs us how to better our security and authentication for our application. We are having users enter their email address and password; we want to make sure that information is protected so unauthorized users can not get access to their account.

*John S. Tonello. 2017. The full stack project. Linux J. 2017, 281, Article 1 (September 2017).*

This article is about the full stack project. Full stack development is used to help develop front end to back end development. Full stack development is also useful for mobile applications. This is how we are coding our project, one part will be a mobile application and another part will be a mobile application. Full stack development is also used for web based applications.

*John Molt. 2017. Beta Universe Systems Book of Player Character Combat.*

This is the book that we are digitizing. It is our reference material that our mentor has written for his tabletop role playing game. This book details every aspect of combat and everything that he wants us to automate. If we ever have a question we reference this book.

*Richard W. C. Lui. 2005. Security models for authorization, and delegation and accountability. Ph.D. Dissertation. University of Hong Kong (People's Republic of China). Order Number: AAI0809504.*

The article is about the different security models used for authentication and authorization. It also talks about the different roles users may have and each role has a different amount of access than other users. This is applicable in our case since we will have a player role and a GM role.

*Seikyung Jung. 2018. Web development with node.js. J. Comput. Sci. Coll. 33, 6 (June 2018), 154–156.*

We will be doing web development with Vue and node.js. This book is about web development with node.js and we will be using it as a reference for what to do. It is a tutorial on how to do web development with node.js. We are going to walk ourselves through it to get more familiar with it.

*Thomas Gustafsson and Jörgen Hansson. 2004. Dynamic on-demand updating of data in real-time database systems. In Proceedings of the 2004 ACM symposium on Applied computing (SAC '04). Association for Computing Machinery, New York, NY, USA, 846–853. DOI:<https://doi.org/10.1145/967900.968074>*

This article is about updating data in real time. Our project deals with a lot of real time updates between each player and GM. This article goes over a strategy on how to solve this, on demand depth first traversal. We want to make sure everyone is updated at the same time without much lag.

<https://kastark.co.uk/rpgs/encounter-tracker/>

This website is similar to our project. It is an initiative tracker where you manually enter your name, initiative number, and HP. This differs from our project in that ours automates all of combat and not just helps with the initiative order.

<https://www.dndbeyond.com/>

This is a D&D reference website where you can store characters, books, classes, pretty much everything you need for D&D. We are aiming to make something like this, but for our role playing system. Our project is step one of that plan that our mentor has.

## Work Contribution

	Andy Alarcon	Jacob Gayban	Mark Graham	Jacob Tucker	Griffin Wagenknecht
Meeting with our advisor for requirement elicitation and UI planning	4.0	4.0	4.0	4.0	4.0
Project Assignment 2 Paper (Writing sections and formatting)	2.0	1.5	4.0	1.5	3.5
UI Design	3.5	0.0	0.0	4.0	0.0
Technical Requirements	0.5	0.0	3.5	0.0	0.0
Requirement traceability matrix	1.5	0.0	0.0	0.0	1.0
Use case templates, diagrams and descriptions	0.0	3.5	0.5	0.0	1.0
Interview questions and summarization	1.0	0.0	0.0	1.5	0.0
Researching Web Development	0.0	3.0	0.0	3.0	2.0
Team meetings	2.0	2.0	2.0	2.0	2.0
Total	14.5	14.0	14.0	14.0	13.5

**Table 11:** The table above shows the amount of time spent by each team member on each activity.