Deliverable F: Prototype I and Customer Feedback

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Introduction

The Ross Video Design Challenge is a project assigned to students by the client Ross Video, in collaboration with the Ottawa Sports and Entertainment Group (OSEG). The goal is to design an innovative interface that controls the various graphical and auditory elements used during sporting events. This system is expected to be produced using Ross Video's very own program, Dashboard, which is built specifically for the purpose of modelling interfaces to be used in live events.

The production team at the TD Place Arena are constantly seeking new ways to improve the fan experience. Fan engagement is extremely important during sporting events, as are functional aspects of the control panel. The project will explore ways to integrate viewer engagement features into the arena's display system.

In the previous deliverable, the team compiled the various subsystem designs of the chosen concept into one comprehensive design drawing. This design was then used as a basis to formulate a schedule of tasks that would need to be completed in order to efficiently develop the product before the final deadline. The various tasks were then analyzed and a series of risks related to the application, development and potentially, functionality of the systems they require were determined. The impact of such risks, the probability of them occurring and priority that each risk would take were established and ranked on a scale of 1-5 (low to high). Utilising these rankings, contingency plans for mitigating these risks were formulated. From the schedule, a bill of materials required for completing the tasks was determined and a basic prototyping test plan was developed. The test plan was described to test the various mechanisms involved in the subsystems of the final design such as, the functionality mechanisms of the homepage as well as data entry capabilities. The plans for a second prototype were also outlined relating to the overall function of each individual subsystem rather than the mechanisms involved in them. Similarly, a second prototype test plan was formulated and from this, the outline for a third prototype compiled. This one is described to test the various components of the system put together as a whole system.

1. Analysis of Critical Components

The critical components focused on in this prototype are tab switching, button functionality, and file upload. Prototype 1 centres on determining the feasibility of general concepts key to the overall flow of the subsystems that make up the Dashboard user interface. Tab switching is an important function to consider because it allows the information specific to each subsystem to be accessed and utilized when necessary. Efficient tab switching allows the user to very quickly reach the controls they require and perform last minute adjustments. The speed of the button in performing its task once it has been pressed plays a role in this. The button must quickly respond and carry out its job when it is needed. The feasibility of using a file upload system to present the information in a few of the subsystems is another component that prototype 1 is analyzing. This is because it is a method that saves the user from having to input the data manually and waste time. Using a file upload allows the data to be displayed quickly and easily.

Tab switching allows the user to access each subsystem quickly such as the fan birthday subsystem below. The functionality of button pressing is a critical component in this system.

Fan birthday subsystem:

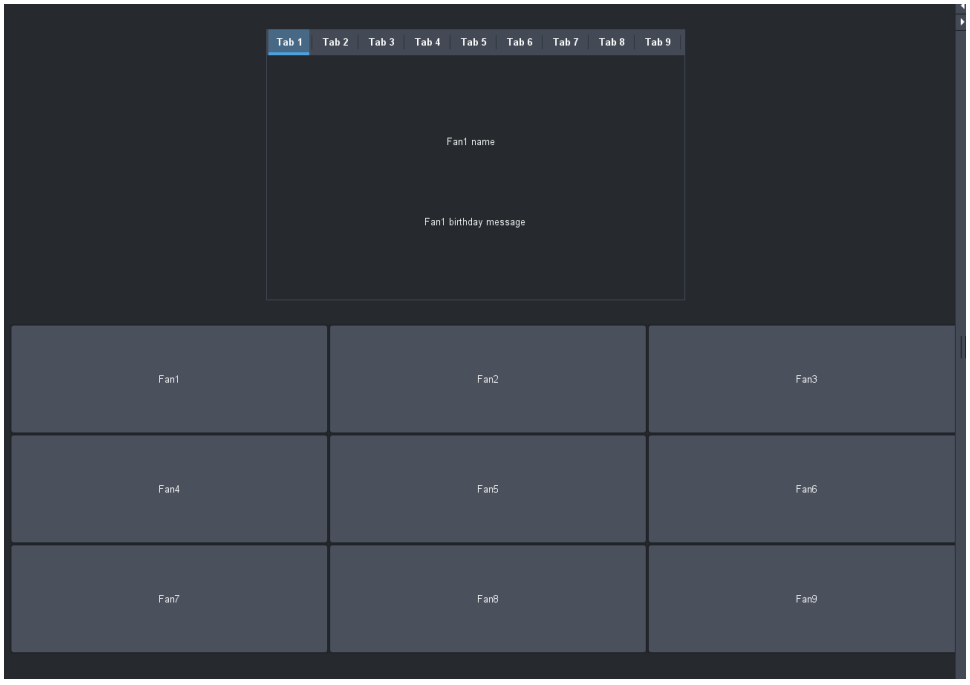


Figure 1. Fan birthday subsystem demonstration after pressing fan 1

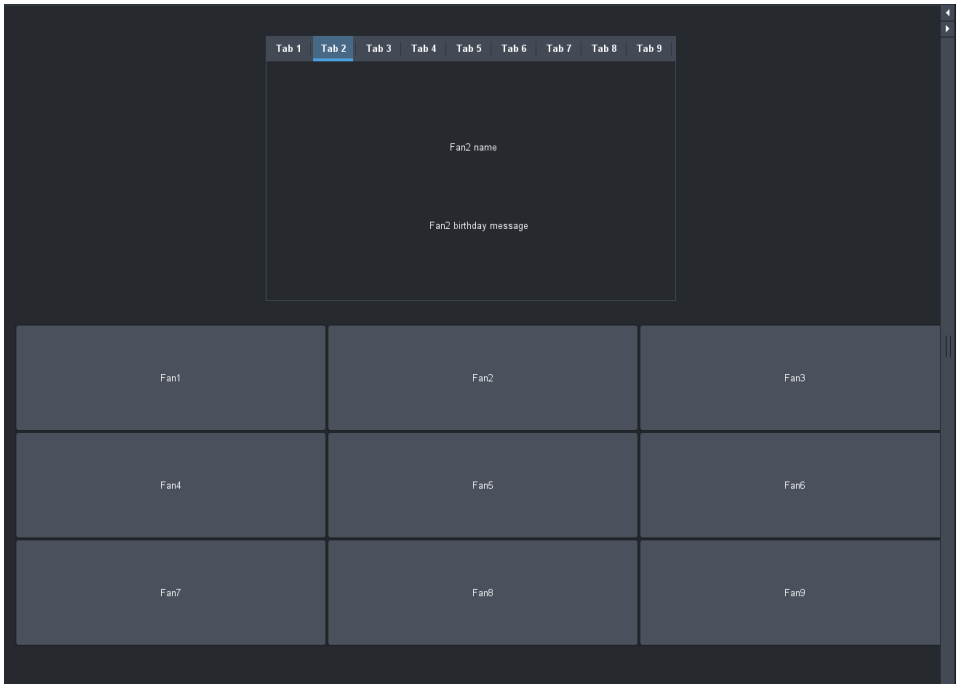


Figure 2. Fan birthday subsystem demonstration after pressing fan 2

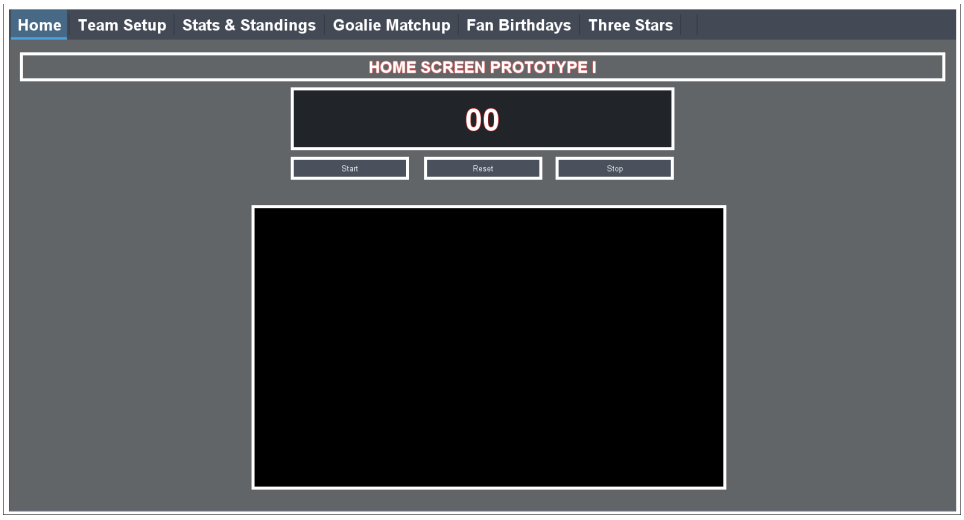


Figure 3. Homescreen Design with Tab Switching and Exit Mechanism at the Top

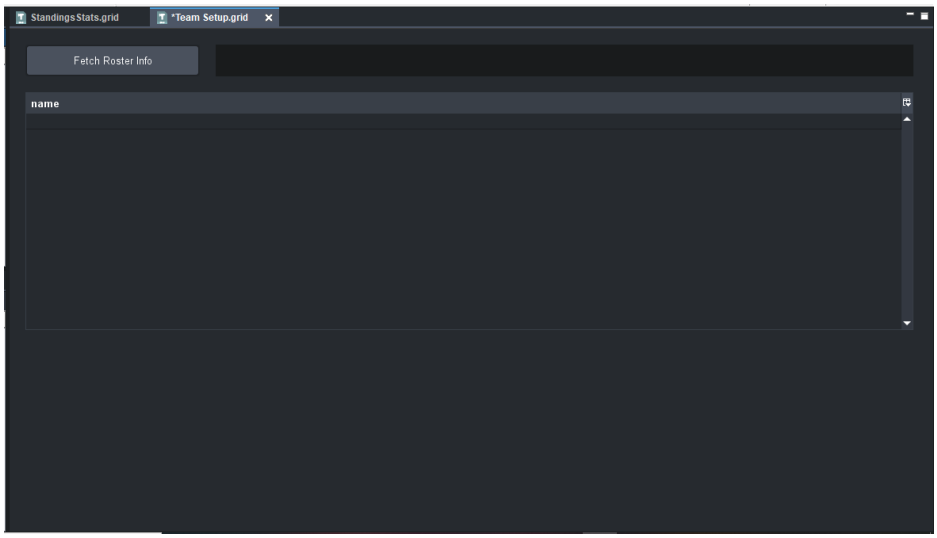


Figure 4. Roster data JSON file upload screen showing blank text box.

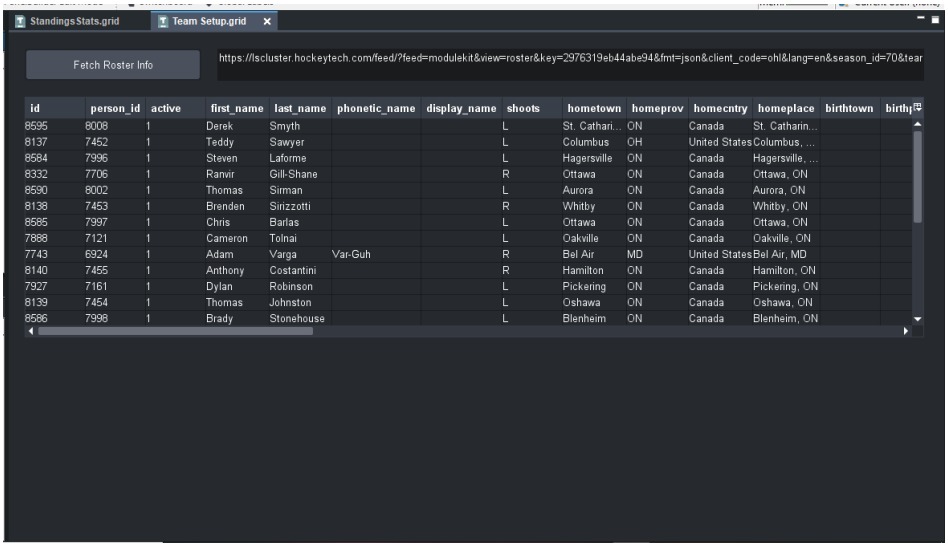


Figure 5. Roster data JSON file upload screen showing data table after link is input and button is pressed.

2. Test Plan, Results and Analysis

Test plans are based on the system as used by a fairly new user. Someone familiar with the topic of Dashboard but not necessarily with this design concept (for example, a group member aside from the person who designed the particular subsystem).

Table 1. Prototype 1 Test Plan

ID	*Test Objective (Why) and Description of Prototype used and of Basic Test Method (What)*	*Description of Results to be Recorded and how these results will be used (How)*	*Desired Results (What counts as success)*	*Estimated duration and planned start date (When)*
1	The basic outline of one or a few of the subsystems as well as the general home screen will be used for testing. A responsiveness test will also be conducted in order to gauge the speed at which the home page responds to user input. The goal is to check for any uncertainties associated with the function of the home page.	The rate of success in 10 uses of the different tab switch buttons will be recorded. Time in seconds for the system to respond to input will also be measured.	Users can find and open a subsystem's menu within 1-3 seconds from the home page.	Test Duration: 20 minutes considering multiple trials are to be conducted. Planned Start Date: October 29, 2021
2			Tab switch buttons function successfully ~100% of the time (10/10 times as long as the user does not make any obvious mistakes).	
3			Menus load within 1 second	
4	Verify feasibility by assessing the functions of the tab switching mechanism and measuring values related to its efficiency. The mechanism to save and switch from one tab to another can be tested using basic tabs without any	The level of success as well as any anomalies of the tab switching mechanism will be observed and used to assess whether the capabilities of the system are practical for the client. Time in seconds taken for a user to switch between multiple	Subsystems should be saved at the top of the screen for easy access.	Test Duration: 10 minutes considering multiple trials are to be conducted. Planned Start Date: October 29, 2021

5	complicated elements on it. The speed at which the program is able to switch from one subsystem to another will be measured to ensure needs for efficiency can be met.	subsystems will be measured.	Capabilities for Switches from one subsystem tab to the next within a second.	
6	Verify the feasibility by checking that each subsystem can successfully return to the home screen and assess the values related to its efficiency. Very few elements are required to test this function and a low fidelity prototype will work since it relates to base functionality rather than specific tasks. A blank popup window will be used to complete this test. Furthermore, the response time of the system to exit out of the subsystem menus	Along with the basic test, average response time over 3 trials for the exit input will be measured as another means of gauging the efficiency of the function. The number of clicks it takes for a user to navigate from a random tab with an open pop up window will be measured.	Close out of a subsystem menu within 2 seconds with one button press.	
7			It takes no more than one click for a user to return back to the home screen and exit a subsystem tab.	Test Duration: 10 minutes considering multiple trials are to be conducted. Planned Start Date: October 29, 2021

	in relation to the input provided by the user will be assessed.			
9	Only one subsystem such as standings/stats will need to be used to test this objective. A software test on Dashboard will be performed using a file uploader to determine the efficiency of the system as well as ease of use. The overall speed at which a user can perform this task and have the system read and display the information from the file will also be measured.	The results will be recorded by observing if the JSON file/ OHL link can be uploaded and converted into a spreadsheet or list. The results will be refined and applied to all subsystems that require this function. Quantitative measurements of the time in seconds required to perform the task and have the system read the file will be taken and used as a means of assessing whether the function is feasible. Number of mouse clicks needed to upload a file will be recorded.	Easily find the uploader and attach a file or link within 5 seconds from the home screen.	Test Duration: 20 minutes considering multiple trials are to be conducted. Planned Start Date: October 29, 2021
10			The file or link should be uploaded, and within 3-4 seconds of uploading, information should be loaded and displayed within the spreadsheet table 1-3 seconds after the upload has been completed.	
			The user needs to click no more than 3 times to finish uploading the file.	

The information collected from this will then be used as a means of determining whether the current system is feasible. If not, developments will be made in order to improve this function in the main subsystems. Any unexpected system responses will be documented.

Table 2. Results for the Speed of Activation of Buttons on Home Screen

Trial #	Speed of Button Activation (s)
1	0.011

2	0.013
3	0.011
4	0.011
5	0.018
6	0.016
7	0.013
8	0.012
9	0.011
10	0.011
AVRG	0.013

The purpose of this test was to measure the speed at which the buttons on the homescreen respond to user input. The time taken for the event of, starting the timer to occur after the button was pressed was recorded. This was done to ensure that the system was capable of running efficiently enough to match the client's fast paced environment. Ten trials were conducted and the results varied from a range of 0.010 seconds to around 0.015 seconds with the average time taken to activate the button being approximately 0.013 seconds. Considering that the time was measured by team members with a stopwatch, there is a substantial amount of inaccuracy associated with the times. Considering the average human reaction time of approximately 250 milliseconds (spectrum.ieee.com, 2021) it can be assumed that the speed to switch between subsystems was practically instantaneous. Performing these trials confirmed the functionality of the buttons as they successfully performed their tasks 100% of the time. This test demonstrated that this subsystem is highly feasible for the overall design and final product.

Table 3. Results for the Speed of Switching Between Subsystems

Trial #	**Speed of Tab Switching (s)**
1	0.015
2	0.012
3	0.011
4	0.011
5	0.015

6	0.013
7	0.011
8	0.010
9	0.015
10	0.012
AVRG	0.013

As stated in the test plan, this test was performed to determine the speed of switching between different subsystems to ensure the process is efficient enough to fit the client's fast-paced environment. Ten trials were performed and it took an average of 0.013 seconds to change from displaying the information on one tab to another. This is well below the desired 1 second speed outlined in the plan. Similarly to the last test, the times were measured by team members with a stopwatch and as a result the average human reaction time of 250 milliseconds can be subtracted. This essentially indicates that the system functioned instantaneously. This test proves the functionality of tab switching because the buttons successfully switch the tabs 100% of the time. Every trial was a success. Prototype 1 demonstrates that the tab switching function is highly feasible for the final product.

Table 4. Results for the Efficiency of Using a File Uploader

Trial #	Speed of User Link Upload (s)	Speed of Information Upload (s)	Total Time (s)
1	1.02	1.04	2.06
2	0.98	1.02	2.00
3	0.99	1.03	2.02
4	0.99	1.03	2.02
5	0.99	1.02	2.01
6	0.99	1.04	2.03
7	1.01	1.02	2.03
8	1.02	1.02	2.04
9	1.01	1.01	2.02

10	0.99	1.04	2.03
AVRG	1.00	1.03	2.03

This test was carried out to ascertain the practicality of using a file upload system to display information. The ease of use and the overall time it takes to upload the link and present the data was noted. It took an average total time of 2.03 seconds for an inexperienced user to upload a link and for that information to be displayed in the desired format. These results fit within the desired criteria outlined in the test plan. The user is able to locate and upload the link in under 5 seconds and the data is presented within 1-3 seconds of this upload being completed, which proves the test to be a success. Using a file upload is very efficient and is much faster than manually inputting the data. It is practical to use this method to display information in the final system.

This subsystem however, needs to be optimized because it can currently only fetch player information and the code has not been made to work with team statistics and season information. Our goal is to be able to use this same system for the Standings/Stats subsystem.

Since in this prototype we proved that we can fetch data from a file upload, our next steps will include being able to use the data in the table for the Goalie Matchup subsystem as well, essentially improving on the capabilities of the current prototype.

3. Feedback and Comments

Feedback and comments were taken from members of the team as well as the family of the individual team members. After the development of the prototype, a series of evaluations were conducted by each team member wherein, we each had an opportunity to test it and provide any initial thoughts. Feedback and comments from team members were generally very positive with the entire group being satisfied with the functionality as observed from the initial tests. The speed, efficiency and overall quality of the design was described by the group members as, “Strong with very few flaws however, with slight room for improvement”. For example, it was commented by one of the team members that the transition between different subsystems could have been smoother and, in the stats subsystem, we can add a search function after we upload the file.

From the family members of the team, the consensus was very positive, with the first time users being able to, very easily, navigate the system and perform the tasks as described by us. Feedback was very positive, with the majority of it referring to the speed of the system. Comments were very positive as well with the majority describing the experience using the system as, “Very efficient, simple and easy to understand”. Overall, the consensus regarding the prototype was very positive.

4. Updated Design Information

4.1. Updated Target Specifications

Table 5. Updated Design Criteria

Rank	Criteria/Metric	Measurement	Ideal Value	Acceptable Values
1	Uses Dashboard software	yes/no	yes	yes
2	Displays a combination of graphics and text	yes/no	yes	yes
3	Configurable display	yes/no	yes	yes
4	Simple and user friendly. Time needed to modify one element (find buttons + input text)	Seconds	10	< 30
5	Device set-up time	Seconds	30	< 60
6	Cost	$ (CAD)	0	0
7	Can set correct screen aspect ratio	yes/no	yes	yes

The overall target specifications have generally remained the same as discussed in Deliverable C. The product still must be developed using Dashboard by Ross Video. Display capabilities of the system must also remain the same with the ability to display graphics in tandem with text being absolutely crucial going forward. A configurable display itself is the target specification required for ease of access. Furthermore, the product still must be simple and easy enough to use so that new individuals are able to navigate the UI and utilize the system without much prior knowledge. Similar to easy usability, the product must still be capable of running on very short notice, within 30 to 60 seconds. The cost of the system itself still needs to be 0 as no other software besides that of Dashboard is to be used to develop the system and Dashboard can be run on practically any system. The display of the panel is also still expected to be able to resize to fit the aspect ratio of any screen size.

Some changes however, have been made to the target specifications In the context of built in information specifically, as discussed in Deliverable C, templates holding information such as player stats, are no longer necessary. The subsystems of the final design have integrated mechanisms that allow for easy implementation of information, *manually*, at similar efficiency to that of pre-built templates. This is expected to be done through the use of file/link uploads and as a result of this, there no longer exists the need for templates. Furthermore, developing the aesthetics to be displayed on screen are not necessarily the requests of the client, but to develop a *system* that is capable of displaying aesthetic graphics. As a result of this, it is no longer required that we consider the aesthetics of the system as the only ones who will see the actual panel are the operators during the event. The capabilities for displaying 15 or more sponsorships is also no longer necessary as it was decided that in this system, such capabilities would not be developed.

4.2. Bill of Materials

The total cost of the project remains 0 dollars. Refer to Deliverable E: Project Plan & Cost Estimate to see full Bill of Materials.

5. Prototype 2 Test Plan

The testing of prototype 2 will focus on assessing various features of each of the subsystems. Many of the subsystems share common characteristics which will only need to be tested once to verify their feasibility and be carried throughout the system.

Table 6. Prototype 2 Test Plan

Test ID	***Test Objective (Why)***	***Description of Prototype used and of Basic Test Method (What)***	***Description of Results to be Recorded and how these results will be used (How)***	***Estimated Test duration and planned start date (When)***
1	Analyze the practicality and efficiency of using a dropdown menu using subsystem A: Team Setup, and subsystem B: Goalie Matchups	A simple focused prototype will be made on Dashboard for this test since only a specific feature of a subsystem is being investigated. This test will be used to confirm the efficiency of using a dropdown menu with pre-saved data compared to inputting the information on the spot. The results will determine the practicality of using this design feature in other subsystems. A physical prototype will be created on	The results will be gathered by determining the amount of time required for all the data to appear once an item is chosen from a dropdown list. Once a team or player is chosen from the dropdown list, all the preset data should appear within a second.	Test duration: 30 minutes Planned start date: November 7th, 2021

		dashboard to be tested.		
2	Verify the feasibility of inputting data into pop-up menus for subsystem D.	A focused, physical prototype will be used. Only a specific design element of subsystem D is required for analysis. The test will focus on the time required to open and close the various pop-ups and input the data.	The results will be recorded by timing any lag between the clicking and the opening of the pop-up or of the closing of the pop-up. Pop-ups have the potential to provide an extra layer of complicacy and risk. If the total time exceeds 5 seconds then another feature may be considered or a supplemental element to speed up the process may be added.	Test duration: 30 minutes Planned start date: November 7th, 2021

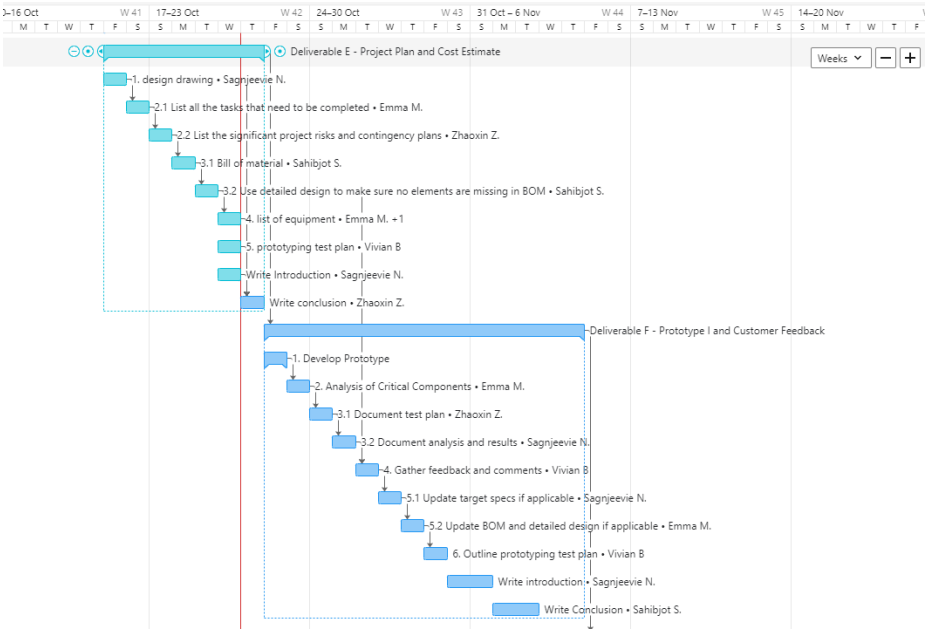
The stopping criteria of the prototype 2 test plan will be once all the desired results are obtained or once it has been determined that those results are not feasible. A prototype of medium fidelity is acceptable based on the objectives of this test phase. Prototype 2 will need to have more detail than prototype 1 and will be closer to the final design but will still be missing some key elements. The objectives for the tests of prototype 2 focus on testing key features common to multiple subsystems. This means that not every subsystem will need to be fully formed and functional in their entirety. For example, the drop down list is common to subsystems A and B and will only need to be prototyped and tested once. For these reasons, a prototype of medium fidelity will be used.

Conclusion

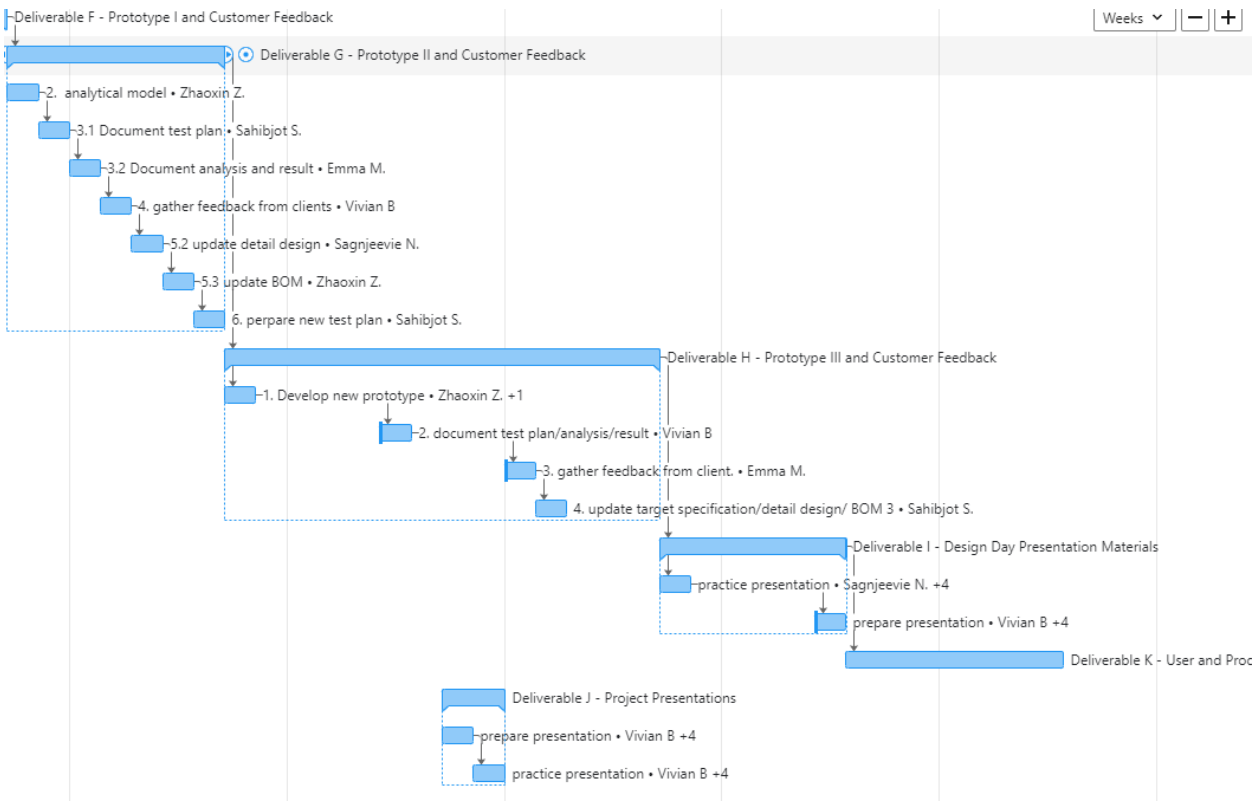
Prototype one was created using the dashboard application by Ross Video. Prototype one tested out the capabilities of the home screens by checking if the tab switch buttons work successfully and that the system is easy to operate. The design should be easy to perform to reach the desired tab in a short amount of time. The test measured the time for accessing each subsystem to ensure that the test didn't take too long, if it did take too long this would indicate that the design might be too complicated. In the following deliverable, a prototype two will be

developed and a test plan is already developed. First, the test will analyze the practicality and efficiency of using a dropdown menu using subsystem A: Team Setup and subsystem B: Goalie Matchups. Furthermore, the test will see if we can input data into pop-up menus for subsystem D. To conclude, the testing process for this prototype was to see the interface's capabilities and accessibility.

Appendix 1



Gantt chart for deliverable E&F



Gantt chart for deliverable G,H,I,J,K

Bibliography

1. Ackerman, E. (2021, June 24). *Upgrade to superhuman reflexes without feeling like a robot*. IEEE Spectrum. Retrieved November 6, 2021, from https://spectrum.ieee.org/enabling-superhuman-reflexes-without-feeling-like-a-robot.