

Florida International University
School of Computing and Information Sciences

Software Engineering Focus

Final Deliverable

Project Title: Interactive Smart Table v2.0

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Abstract

As technology takes over meeting and conference rooms, the desk remains unchanged and offline. This can reduce interaction and engagement which can decrease productivity and lower the effectiveness of the event. The Interactive Smart Table (IST) is a table for the conference or meeting room that connects every member together through a smart display on every desk sit. The smart display is powered by the Interactive Smart Table Software Suite; a collaboration suite that provides a shared canvas, file sharing and slide presentation capabilities enabling the event members to be more engaged and productive. This document presents the information necessary to gain a good understanding of the design and implementation of the software suite that powers the Interactive Smart Table.

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INTRODUCTION

Tables in conference and meeting rooms have stayed without many changes. Meeting participants usually bring their own devices (tablets, laptops, etc.) to collaborate and interact. However, most of the time these devices are of different types or have different software systems which can limit how much they can contribute or collaborate with each other.

The IST aims at creating a table in which every sit is connected with each other through a smart touch screen that is powered by Interactive Smart Table Software Suite (ISTSS). The ISTSS connects every table sit in a p2p configuration and provides three major components; Canvas, Presentation and File Sharing. ISTSS is stateful, meaning that any user (sit) can switch between any of these components a go back to the previous one without losing anything done on any particular component.

The Canvas component allows for all users to write, manipulate media such as images or videos and many other things in real time. This can be useful if while in a meeting a concept or idea must be visualized or if something needs to be quickly sketched. The Presentation component allows any user to start presenting slides. However, only the meeting initiator can do so. Meeting members can only view the presentation slide and annotate the current slide. Users can also share files such as documents, media, etc.

The IST project is divided into two major components; The ISTSS and the platform in which it runs.

Current System

There are some solutions that have a similar idea, for instance Microsoft Hub or the Smartboard product. However, the average price for these devices is around \$4000 which makes it a novelty item and not an actual choice. Currently more than 80% of meeting and conference rooms have a single table and every meeting participant brings their own device with different software systems installed on them. The meetings are usually mono directional, and collaboration is limited. The tables usually are offline or have limited connectivity. Some of the conference meeting tables come with small form factor computers at every sit but no software that connects them together or that provides collaboration tools.

Purpose of New System

The main goal of the IST project is to make meetings and brainstorming sessions more engaging and collaborative by connecting every meeting member with each other and providing a set of tools to enhance the event. To achieve this goal IST is built with two major components; The hardware and the software suite. The hardware is composed of a smart touch screen that brings every sit online and can have different input devices connected to it. The software runs on the smart screen and connects every sit together and provides different components to enhance collaboration.

The software suite was designed with portability and efficiency in mind. This has two major benefits; It decouples the hardware from the software and it allows the application to run on commodity hardware. The touch screen device can be designed with low end hardware to minimize cost and the software can be run on most platforms while still providing an excellent experience.

USER STORIES

The following section provides the detailed user stories that were implemented in this iteration of the Interactive Smart Table project. These user stories served as the basis for the implementation of the project's features. This section also shows the user stories that are to be considered for future development.

Implemented User Stories

Story	Description	Acceptance Criteria
INTR-60	Research if input should come from screen or external device.	Input will be from either external device or touch feature on screen.
INTR-61	Research screens that will integrate well with raspberry pi and support input method.	- Raspberry pi supports screen output - Raspberry pi supports input method.
INTR-62	Integrate screen with raspberry pi.	- Raspberry pi outputs correctly to the screen - Input method works correctly on the raspberry pi and on the screen.
INTR-63	Go over documentation for interactive smart table software built by previous team.	- Installation of software is fully understood. - Understanding of how the software works and its purpose is gathered
INTR-64	Installation of previous software on hardware platform.	- The software runs on raspberry pi without any issues - The software is accessible without any issues.
INTR-70	As a user I would like to have the option to write on a canvas.	- User can select canvas tool and write on it - All users can view the changes in real time

INTR-71	UI Redesign to be more modular so more features are included	• A user initiates a meeting • A meeting initiator starts a presentation • A user shares a file • A user annotates on presentation • Users see meeting feed in feedback component
INTR-72	As a user I want to create a meeting and invite meeting members so that I can present and share documents.	• Meeting is created and unique ID is generated for meeting. • Initiator device becomes meeting admin and rest of devices meeting members. • No other member can start another meeting until current meeting ends.
INTR-76	As meeting initiator I would like to end a meeting	• User clicks end meeting
INTR-77	As a user I would like to have a component that will allow me to brainstorm by putting different types of content so that I can more easily put a meeting or presentation together	• User drags an image to the canvas • User drags a video into the canvas • User sees video summary in canvas • User writes a comment around the content dropped into the canvas • User writes a comment around the video. • User deletes content from canvas. • User exports all content into PDF file.
INTR-78	As a user I want to be able to clear the canvas so that I can start anew.	• User hits clear menu action and all elements on the canvas are removed.

INTR-79	As a user I want to be able to group multiple items into a single item so that I can manipulate them as a unit.	User selects different elements on the canvas and combines it into one
INTR-81	As a user I want to be able to have a shared canvas so that every action done on said canvas can be reflected remotely to other meeting participants and vice versa.	- User draws on canvas and other participants see drawings in real time - User drops a shape and the same shape is seen by other meeting participants - User presents and other users can see all actions done by presenter as well as the slides - User shares a file and other meeting participants can see the file

Pending User Stories

Story	Description	Acceptance Criteria
INTR-67	As a user I want to be able to share documents with meeting members.	- User selects and uploads document to meeting space. - All users have access to documents and documents can be opened
INTR-73	As a meeting initiator I want to be able to present.	- Meeting initiator can open presentation and start presentation - Presentation is broadcasted to meeting members
INTR-80	As a user I want to be to record the canvas so that I can share it and other users can refer back to what was done.	- User hits record button and canvas actions and elements are recorded - User is able to export recording into a video format

PROJECT PLAN

This section describes the planning that went into the realization of this project. This project incorporated the agile development techniques and as such required the sprints to be planned. These sprint plannings are detailed in the section. This section also describes the components, both software and hardware, chosen for this project.

Hardware and Software Resources

The following is a list of all hardware and software resources that were used in this project:

Hardware:

Development Machine

- MacBook Pro (2016 – First Generation) 3.7 GHz Intel Core i5, 16 GB RAM @ 2133 MHz

Testing Hardware

- Two Raspberry Pi Zero W with 1 GHz Single Core Processor and 512 MB of RAM
- One Raspberry Pi 3 Model B+ with 1.4 GHz Cortex-A53 Quad Core Processor and 1 GB RAM

Software:*Development*

- macOS Mojave, Raspbian (kernel 4.14), Ubuntu Server (v18.04)
- Microsoft Visual Code with Vim package installed (v1.33.0)
- Vim (v8.0)
- phpMyAdmin (v4.6.6) – Used to manage MySQL database through the web
- MySQL Workbench (v8.0) – Used to design the ER Diagrams
- Visual Paradigm (v15.2) – Used to design all UML diagrams
- Postman (v7.0.7) – Used to test REST API endpoints and backend Core
- VirtualBox (5.2.26) – Used to simulate peers on the network running the application
- Docker (v2.0.0.3) – Used to host the development server
- MySQL Server (5.7.25) – Used as the database server
- Apache Web Server (2.4.29) – Used to host the backend and anything web related.

Version Control

- Git
- GitHub (<http://www.github.com>)
- Bit Bucket

Documentation

- Confluence – Used to manage project through Agile methodology
- Jira – Used to track issues, user stories, tasks, sprints, etc.
- HipChat – Used for communication

Sprints Plan

Sprint 1

20190120 : Sprint 1 Planning Meeting Minutes

Attendees: William Escudero, Hadi Alhaffar

Start time: 9:00am

End time: 9:50

After discussion, the velocity of the team were estimated to be 50.4

The product owner chose the following user stories to be done during the next sprint. They are ordered based on their priority.

- Story INTR-60 - Research if input should come from screen or external device. Done
- Story INTR-61 - Research screens that will integrate well with raspberry pi and support input method. Done
- Story INTR-62 - Integrate screen with raspberry pi. Done
- Story INTR-63 - Go over documentation for interactive smart table software built by previous team. Done
- Story INTR-64 - Installation of previous software on hardware platform. Done
- Story INTR-65 - [DROPPED] Replace development stack by LAMP Stack. Done

The team members indicated their willingness to work on the following user stories.

- William Escudero
 - Story INTR-60 - Research if input should come from screen or external device. Done
 - Story INTR-61 - Research screens that will integrate well with raspberry pi and support input method. Done
 - Story INTR-62 - Integrate screen with raspberry pi. Done
 - Story INTR-63 - Go over documentation for interactive smart table software built by previous team. Done
 - Story INTR-64 - Installation of previous software on hardware platform. Done
 - Story INTR-65 - [DROPPED] Replace development stack by LAMP Stack. Done

Sprint 2

20190204 : Sprint 2 Planning Meeting Minutes

Attendees: William Escudero, Hadi Alhaffar

Start time: 9:00am

End time: 9:50

The total hours for this sprint is 104, 70% of that is 72.8

After discussion, the velocity of the team were estimated to be 50.96

The product owner chose the following user stories to be done during the next sprint. They are ordered based on their priority.

- INTR-71 - UI Redesign to be more modular so more features are included Done
- INTR-72 - As a user I want to create a meeting and invite meeting members so that I can present and share documents. Done
- INTR-73 - As a meeting initiator I want to be able to present. To Do

The team members indicated their willingness to work on the following user stories.

- William Escudero
 - INTR-71 - UI Redesign to be more modular so more features are included Done
 - INTR-72 - As a user I want to create a meeting and invite meeting members so that I can present and share documents. Done
 - INTR-73 - As a meeting initiator I want to be able to present. To Do

Sprint 3

20190218 : Sprint 3 Planning Meeting Minutes

Attendees: William Escudero, Hadi Alhaffar

Start time: 9:00am

End time: 9:50

The total hours for this sprint is 96, 70% of that is 67.2

After discussion, the velocity of the team were estimated to be 47.6

The product owner chose the following user stories to be done during the next sprint. They are ordered based on their priority.

- User Story INTR-70 - As a user I would like to have the option to write on a canvas. Done
- User Story INTR-73 - As a meeting initiator I want to be able to present. To Do
- User Story INTR-67 - As a user I want to be able to share documents with meeting members. To Do
- User Story INTR-76 - As meeting initiator I would like to end a meeting Done

The team members indicated their willingness to work on the following user stories.

- William Escudero
 - User Story INTR-70 - As a user I would like to have the option to write on a canvas. Done
 - User Story INTR-73 - As a meeting initiator I want to be able to present. To Do
 - User Story INTR-67 - As a user I want to be able to share documents with meeting members. To Do
 - User Story INTR-76 - As meeting initiator I would like to end a meeting Done

Sprint 4

20190304 : Sprint 4 Planning Meeting Minutes

Attendees: William Escudero, Hadi Alhaffar

Start time: 9:00am

End time: 9:50

After discussion, the velocity of the team were estimated to be 69.2

The product owner chose the following user stories to be done during the next sprint. They are ordered based on their priority.

- User Story INTR-67 - As a user I want to be able to share documents with meeting members. To Do
- User Story INTR-73 - As a meeting initiator I want to be able to present. To Do
- User Story INTR-74 - [DROPPED] As a user I would like to view meeting feedback on a live feed Done
- User Story INTR-77 - As a user I would like to have a component that will allow me to brainstorm by putting different types of content so that I can more easily put a meeting or presentation together Done

The team members indicated their willingness to work on the following user stories.

- William Escudero
 - User Story INTR-67 - As a user I want to be able to share documents with meeting members. To Do
 - User Story INTR-73 - As a meeting initiator I want to be able to present. To Do
 - User Story INTR-74 - [DROPPED] As a user I would like to view meeting feedback on a live feed Done
 - User Story INTR-77 - As a user I would like to have a component that will allow me to brainstorm by putting different types of content so that I can more easily put a meeting or presentation together Done

Sprint 5

20190317 : Sprint 5 Planning Meeting Minutes

Attendees: William Escudero, Hadi Alhaffar

Start time: 9:00am

End time: 9:50

After discussion, the velocity of the team were estimated to be 54.8

The product owner chose the following user stories to be done during the next sprint. They are ordered based on their priority.

- User Story INTR-78 - As a user I want to be able to clear the canvas so that I can start anew. Done
- User Story INTR-79 - As a user I want to be able to group multiple items into a single item so that I can manipulate them as a unit. Done
- User Story INTR-81 - As a user I want to be able to have a shared canvas so that every action done on said canvas can be reflected remotely to other meeting participants and vice versa. Done
- User Story INTR-73 - As a meeting initiator I want to be able to present. To Do
- User Story INTR-67 - As a user I want to be able to share documents with meeting members. To Do

The team members indicated their willingness to work on the following user stories.

- William Escudero
 - INTR-78 - As a user I want to be able to clear the canvas so that I can start anew. Done
 - INTR-79 - As a user I want to be able to group multiple items into a single item so that I can manipulate them as a unit. Done
 - INTR-81 - As a user I want to be able to have a shared canvas so that every action done on said canvas can be reflected remotely to other meeting participants and vice versa. Done
 - INTR-73 - As a meeting initiator I want to be able to present. To Do
 - INTR-67 - As a user I want to be able to share documents with meeting members. To Do

Sprint 6

20190331 : Sprint 6 Planning Meeting Minutes

Attendees: William Escudero, Hadi Alhaffar

Start time: 9:00am

End time: 9:50

After discussion, the velocity of the team were estimated to be 55.9

The product owner chose the following user stories to be done during the next sprint. They are ordered based on their priority.

- User Story INTR-81 - As a user I want to be able to have a shared canvas so that every action done on said canvas can be reflected remotely to other meeting participants and vice versa. Done
- User Story INTR-76 - As meeting initiator I would like to end a meeting Done
- User Story INTR-73 - As a meeting initiator I want to be able to present. To Do
- User Story INTR-67 - As a user I want to be able to share documents with meeting members. To Do

The team members indicated their willingness to work on the following user stories.

- William Escudero
 - INTR-81 - As a user I want to be able to have a shared canvas so that every action done on said canvas can be reflected remotely to other meeting participants and vice versa. Done
 - INTR-76 - As meeting initiator I would like to end a meeting Done
 - INTR-73 - As a meeting initiator I want to be able to present. To Do
 - INTR-67 - As a user I want to be able to share documents with meeting members. To Do

SYSTEM DESIGN

This section contains information on the design decisions that went into this project. The architecture patterns are outlined and explained. The entire system is shown in a package diagram and the subsystems are explained. Finally, the design patterns used in the project are discussed.

Architectural Patterns

The Interactive Smart Table Software Suite (ISTSS) is composed of two major subsystems; The backend and the application. The MVC architectural pattern was used for the backend while the Event Driven and Hybrid p2p architectural patterns were used for the application.

Backend (MVC/MC)

The MVC architecture was selected for the backend because it decouples the presentation layer (View) from the data (Model) and operation (Controller) layers. The backend is composed of the core and REST API subsystems. The core implements all main functionality and accesses the database directly through active records. The API exposes the core through the REST component which provides authentication/authorization functionality, request/reply formatting etc. for the application. The application sends the request to the backend where it is processed by the REST endpoint and it is passed to the core subsystem. Once the processing is finished the core passes the reply to the REST subsystem at which point it is sent to the application as reply. The View component from MVC pattern is not needed as the backend is used only as a data processing subsystem.

Application (Event Driven & Hybrid P2P)

The application was built with a hybrid p2p architecture because every sit is treated as a peer on the network and every peer is connected to each other. Different tables form different clusters of p2p networks. When the application starts it makes a call to the backend's REST API to get a list of the active peers (sits) on the network for a particular table. Once the peer list is received it connects to each peer and marks the meeting initiator peer as special.

Every action generated within the application is treated as an event and broadcasted to every active peer (sit) on a table. This is where the Event Driven architecture comes into play. For instance, when PEER_A uses the Canvas component to write, that action is treated as an event and sent over the network, every connected peer receives the event and updates the UI accordingly. Since the underlying framework of the application is ElectronJS which leverages

NodeJS, all callbacks are delegated to the event loop and they are executed using different threads, this allows for the UI to be non-blocking and for the application to run smoothly.

System and Subsystem Decomposition

The IST project is composed of two major subsystems the backend and the application. The application in turn is divided into three subsystems.

Backend

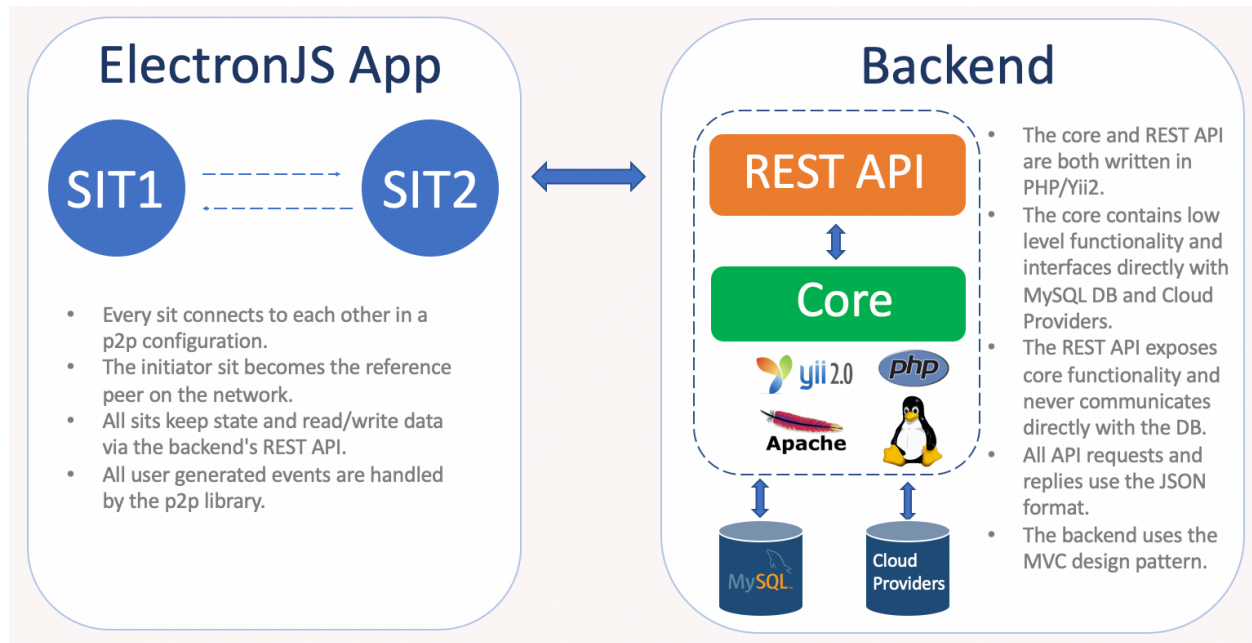
The backend is the data processing subsystem and it exposes the core functionality through a REST API. The application sends a request to the backend and the backend replies with some data. The application then uses this data to update whatever it needs to in terms of UI components or states. The backend does not keep any states (stateless). The backend also functions as the p2p index server (super peer)

Application

The application uses three subsystems working together to achieve its goal. The network, backend and event subsystems are combined to create MUEE, Multi User Event Engine. MUEE

- Backend.js: This component handles all the communication between the application and the backend. It contains all the requests to the backend's API and it is used by the Network and Event subsystem in order to update states, get statuses, etc.
- Network.js: This component implements the p2p functionality for the application. It creates a TCP client and a TCP server when the application starts and starts to listen for peer connections. Network.js also contains the implementation of the MUEE Protocol which is fundamental and it is used to encode actions into events and sent over the network. The protocol is used by Event.js
- Event.js: This library takes any action generated within the application and encodes it into an event using the MUEE protocol. For instance when a user draws on canvas a representation of that action using MUEE protocol can be expressed as
<user_action>:<action_type>:<action_data>:<delimiter>

Deployment Diagram



Design Patterns

Design patterns are employed to design subsystems while architectural patterns are used for an overall design of the whole system. Architectural patterns are high level strategies used to design whole system while design patterns are medium level strategies used to design subsystems and solve recurring tasks. Below is an overview of the different design patterns used to design the backend and the application.

Application

Observer: The observer pattern was used to design the Event.js component. Every action generated on the application is converted to an event by having a list of dependents called observers which “listens” for state changes on any register subject. a Subject is an object that maintains states which when changed any observer paying attention will pick it up.

Iterator: The iterator pattern was also used on the Event.js component. Since every event generated was sent to every peer, there could be multiple events in a queue for any particular peer. The queue in the implementation is nothing more than an aggregation of events and every event might be different from each other. The iterator pattern iterates over the aggregated events that a peer might need to process at any time and processes them regardless of the type of event. The iterator pattern provides a generic way to iterate over a list of different types.

Backend

Factory: The factory pattern was used to design the REST component. The factory pattern allows for a generic way to create class objects by describing the type of object that it is needed within a certain context. For the REST component the endpoints were created using the factory pattern, based on the type of request, endpoint name and request body the correct endpoint object was created. Replies within the REST component was designed using this pattern was well.

Façade: The Façade pattern was used to expose the Core functionality to the REST component. Some of the core functionality does not need to be made public. The façade pattern hides details from the end user and only allows it to access public methods. The goal is to abstract the end user from the core code which was achieved by only allowing certain functionality through the REST component.

SYSTEM VALIDATION

System Validation

The system was validated by using unit testing and integration testing. This section describes the tests and the condition in which they were executed.

Tests

[INTR62] - Integrate screen with raspberry pi.

- **Test Case ID:** INTR62-T01
- **Description**
 - Test that screen comes on when connected to the Raspberry Pi
 - Test touch capabilities of the screen is supported by the Raspberry Pi
- **Criteria**
 - Raspberry Pi is connected to the screen
 - Raspberry Pi is on
- **Expected Outcome**
 - User should be able to see the screen
 - User should be able to interact with the screen via touch
- **Actual Outcome**
 - User could see the screen
 - User was not able to interact with the screen via touch.
- **Status (pass | fail | partial)**
 - partial

[INTR70] - As a user I would like to have the option to write on a canvas.

- **Test Case ID:** INTR70-T01
- **Description**
 - Test the user can select the freehand drawing tool
 - Test the user can change the color, Thickness of the brush
 - Test the user can resize and move drawing around the canvas
- **Criteria**
 - User is on Canvas component
- **Expected Outcome**
 - User should be able to use the freehand drawing tool to draw lines on the canvas
 - User should be able to change the color of the lines and thickness of the tool
- **Actual Outcome**
 - User could draw on the canvas with different colors and drawing tool sizes.
- **Status (pass | fail | partial)**
 - pass

[INTR72] - As a user I want to create a meeting and invite meeting members so that I can present and share documents.

- **Test Case ID:** INTR72-T01
- **Description**
 - Test the user gets the landing page with [Start Meeting] button, if no meeting is in progress.
 - Test user can get to main working window when the meeting is created.
- **Criteria**
 - The application is not running
 - There is no meeting in progress
 - Backend must be running
 - User must click [Start Meeting] button
- **Expected Outcome**
 - When the user opens the application, the landing page with [Start Meeting] button should show.
 - Once the user clicks on start meeting, a meeting should be created and the user should see the main working window.

- **Actual Outcome**
 - The application opened and user gets the landing page with [Start Meeting] button.
 - A meeting is created.
 - The user is redirected to the main working window after the meeting is created.
- **Status (pass | fail | partial)**
 - pass
- **Test Case ID:** INTR72-T02
- **Description**
 - Test the user gets the landing page with [Join Meeting] button, if there is a meeting in progress.
 - Test the user can get the main working window after clicking [Join Meeting]
- **Criteria**
 - The application is not running
 - There is a meeting in progress
 - Backend must be running
 - User must click [Join Meeting] button
- **Expected Outcome**
 - When the user clicks [Join Meeting] the user should be able to get to the main working window
 - The user should get the main working window after joining meeting
- **Actual Outcome**
 - The application opened and user gets the landing page with [Join Meeting]
 - The user is redirected to the main working window after clicking [Join Meeting]
- **Status (pass | fail | partial)**
 - pass

[INTR76] - As meeting initiator I would like to end a meeting

- **Test Case ID:** INTR76-T01
- **Description**
 - Test the user can click on [End Meeting] button
 - Test the user can get landing page to start meeting
- **Criteria**
 - The application is running
 - There is a meeting in progress
 - Backend must be running

- User must click [End Meeting] button
- **Expected Outcome**
 - When the user is clicks on [End Meeting] the meeting ends
 - The user gets landing page to start meeting
- **Actual Outcome**
 - The user is redirected to landing page to start meeting.
- **Status (pass | fail | partial)**
 - pass

[INTR77] - As a user I would like to have a component that will allow me to brainstorm by putting different types of content so that I can more easily put a meeting or presentation together.

- **Test Case ID:** INTR77-T01
- **Description**
 - Test the user can drag and drop images of any type.
 - Test the user can resize and move dropped image.
- **Criteria**
 - The application is running
 - User is in meeting
 - User must be on Canvas component
- **Expected Outcome**
 - User drags and drops image onto canvas
 - User can resize and move image.
- **Actual Outcome**
 - An image is dragged and dropped onto the canvas by the user
 - The image is resized and can be dragged around inside the canvas.
- **Status (pass | fail | partial)**
 - pass

- **Test Case ID:** INTR77-T02
- **Description**
 - Test the user can drag and drop YouTube videos onto canvas
 - Test the user can resize and move dropped video
 - Test the user can play dropped video by double clicking it.
- **Criteria**
 - The application is running
 - User is in meeting
 - User must be on Canvas component
 - User drags YouTube link onto Canvas
- **Expected Outcome**
 - User drags and drops YouTube onto video.
 - Representation of video in canvas is generated.
 - User can playback video that is on canvas by double clicking it
- **Actual Outcome**
 - A dragged and dropped YouTube link becomes a video on the canvas.
 - The video is resized and can be dragged around inside the canvas.
 - The user plays the video by double clicking it
- **Status (pass | fail | partial)**
 - pass

[INTR78] - As a user I want to be able to clear the canvas so that I can start anew.

- **Test Case ID:** INTR78-T01
- **Description**
 - Test the user can click [Clear Canvas] from drop down menu.
 - Test the elements on canvas are removed
- **Criteria**
 - The application is running
 - User is in meeting
 - User must be on Canvas component
- **Expected Outcome**
 - User can remove all elements from canvas.
- **Actual Outcome**
 - All elements are removed after user clicks [Clear Canvas]
- **Status (pass | fail | partial)**
 - pass

[INTR79] - As a user I want to be able to group multiple items into a single item so that I can manipulate them as a unit.

- **Test Case ID:** INTR79-T01
- **Description**
 - Test the user can select any number of elements at once by pressing shift and clicking on them
 - Test all selected elements on canvas are grouped by pressing cmd+g or ctrl+g
- **Criteria**
 - The application is running
 - User is in meeting
 - User must be on Canvas component
- **Expected Outcome**
 - User can select any number of elements.
 - User can group any number of elements together.
- **Actual Outcome**
 - All selected elements are grouped together
- **Status (pass | fail | partial)**
 - pass

[INTR81] - As a user I want to be able to have a shared canvas so that every action done on said canvas can be reflected remotely to other meeting participants and vice versa.

- **Test Case ID:** INTR81-T01
- **Description**
 - Test the application connects to the correct to meeting initiator peer
- **Criteria**
 - User clicks [Join Meeting] button
 - The application is running
 - Backend must be running
 - There must be a meeting in progress
- **Expected Outcome**
 - The application connects to the initiator peers
- **Actual Outcome**
 - The application is connected to initiator peer
- **Status (pass | fail | partial)**
 - pass

- **Test Case ID:** INTR81-T02
- **Description**
 - Test the application starts server
- **Criteria**
 - User clicks on [Start Meeting] button
 - The application is running
 - Backend must be running
 - No meeting must be in progress
- **Expected Outcome**
 - The application starts a server.
- **Actual Outcome**
 - The application has started server and is listening on defined port.
- **Status (pass | fail | partial)**
 - pass

- **Test Case ID:** INTR81-T03
- **Description**
 - Test actions generated by user such as drawing or dragging and dropping media are converted to events
 - Test events are propagated through the network to all connected peers
 - Test events are replicated as actions on all connected peers
- **Criteria**
 - Application is running
 - Action is generated
 - Backend must be running
 - User is in a meeting
 - User is using component (Canvas | Present | File Share)
- **Expected Outcome**
 - Any event generated by the user must be transmitted and replicated on all other peers connected to a meeting.
- **Actual Outcome**
 - Some events get replicated successfully, other events fail to generate any action on the other peers connected to meeting
- **Status (pass | fail | partial)**
 - partial

GLOSSARY

- MUEE : Multi User Event Engine
- ISTSS: Interactive Smart Table Software Suite

APPENDIX

Appendix A - UML Diagrams

All UML diagrams found herein were created with abstraction and generalization in mind in order to give a better understanding of the system as a whole.

Use Cases

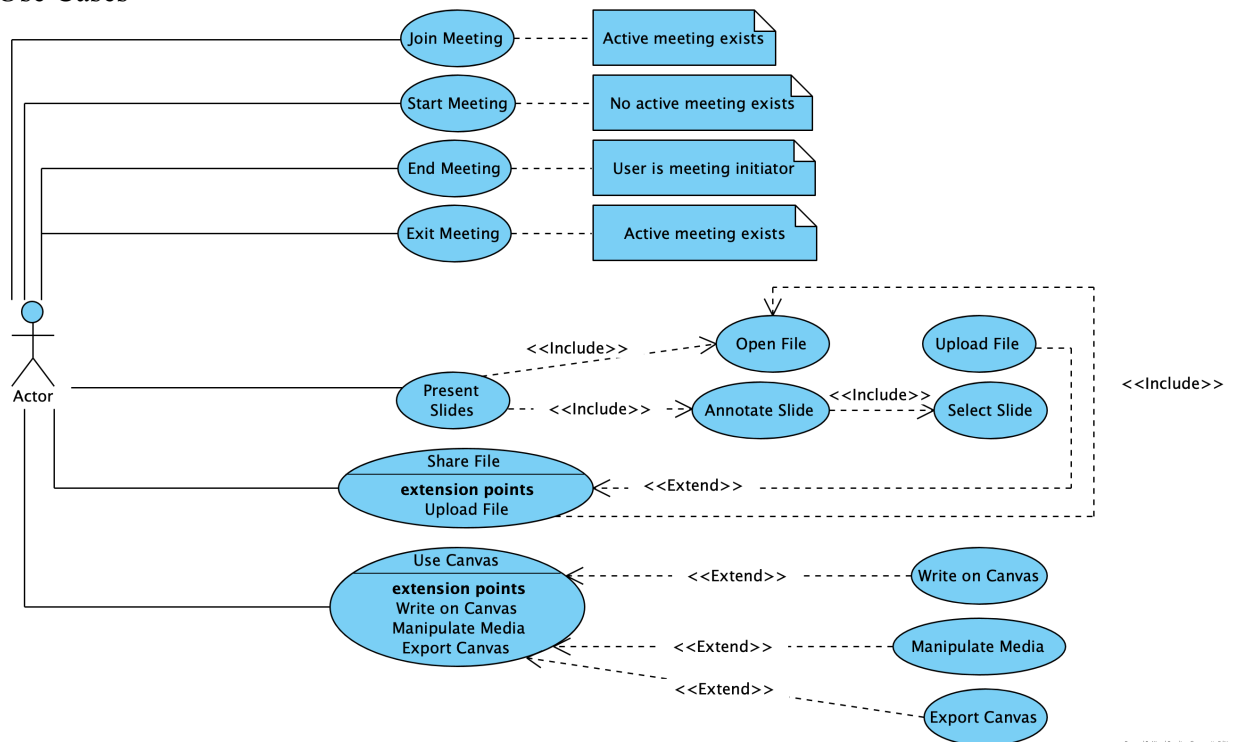


Figure 1 [INTR73, INTR72] High level overview

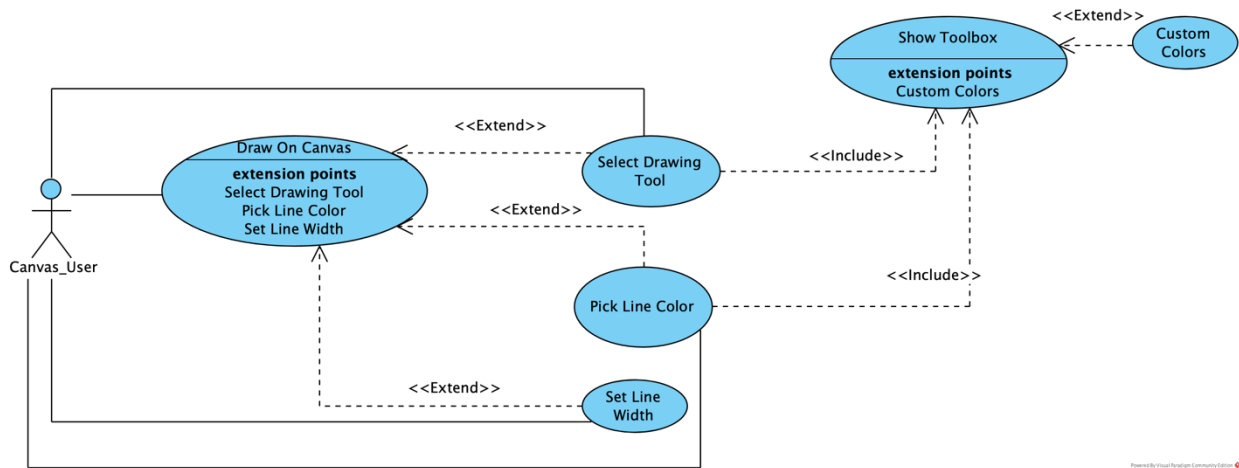


Figure 2 [INTR70-UC] - As a user I would like to have the option to write on a canvas.

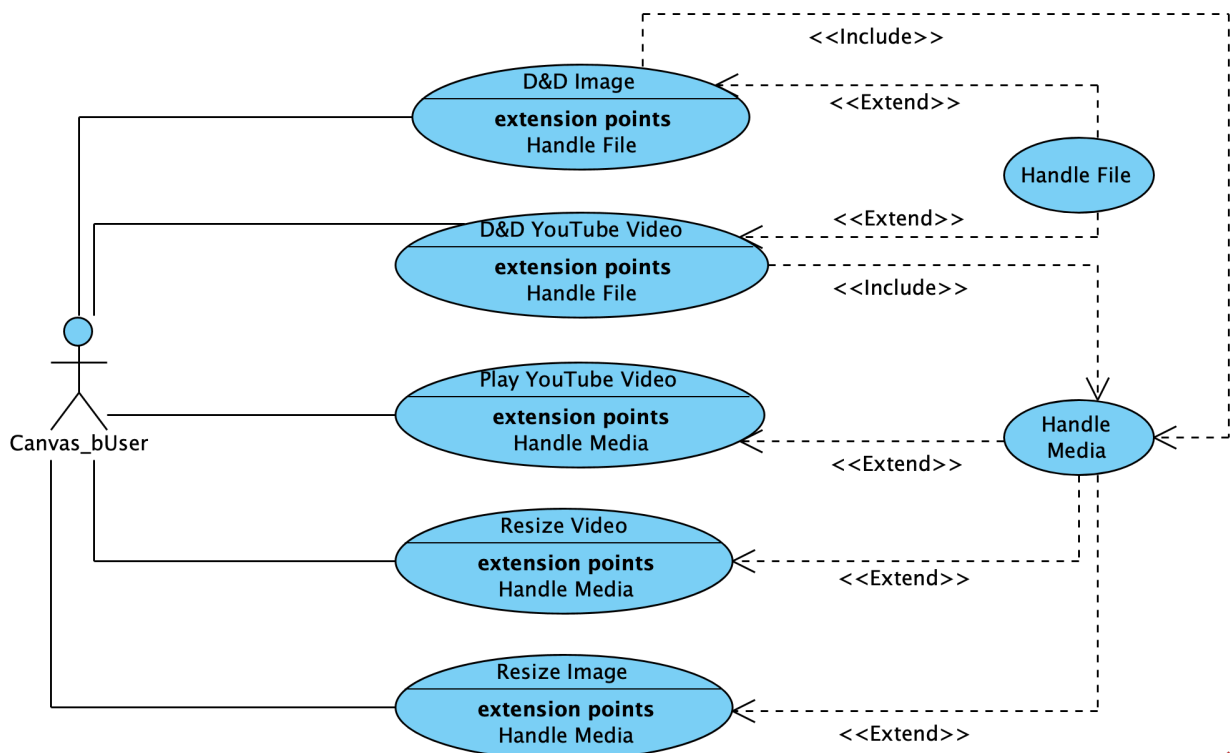


Figure 2 [INTR77-UC01] - As a user I would like to have a component that will allow me to brainstorm by putting different types of content so that I can more easily put a meeting or presentation together.

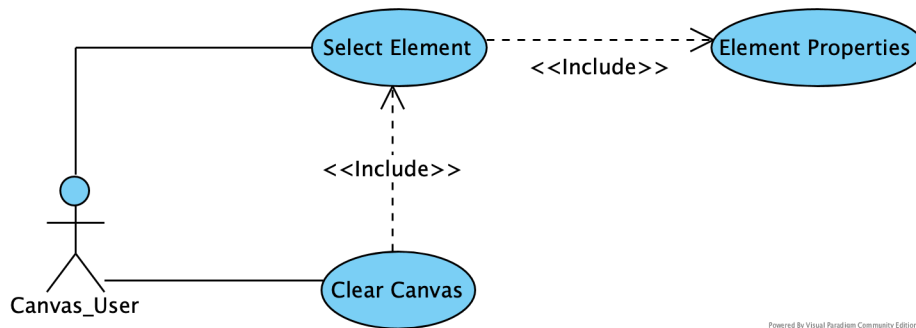


Figure 3 [INTR78-UC01] - As a user I want to be able to clear the canvas so that I can start anew.

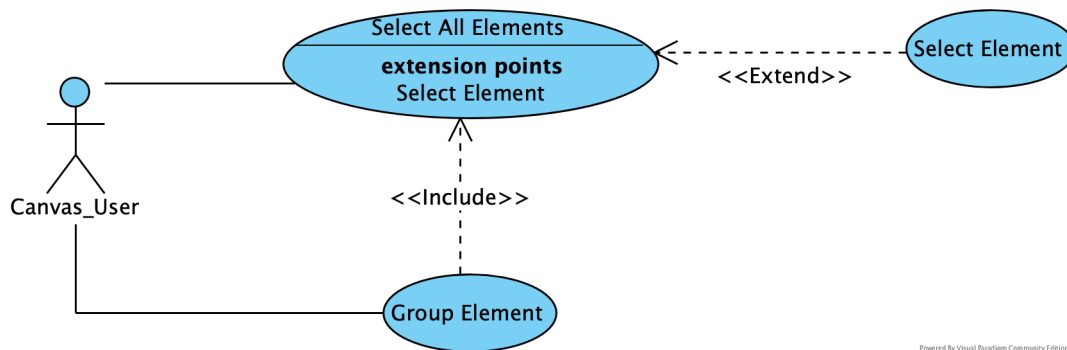


Figure 4 [INTR79-UC01] - As a user I want to be able to group multiple items into a single item so that I can manipulate them as a unit.

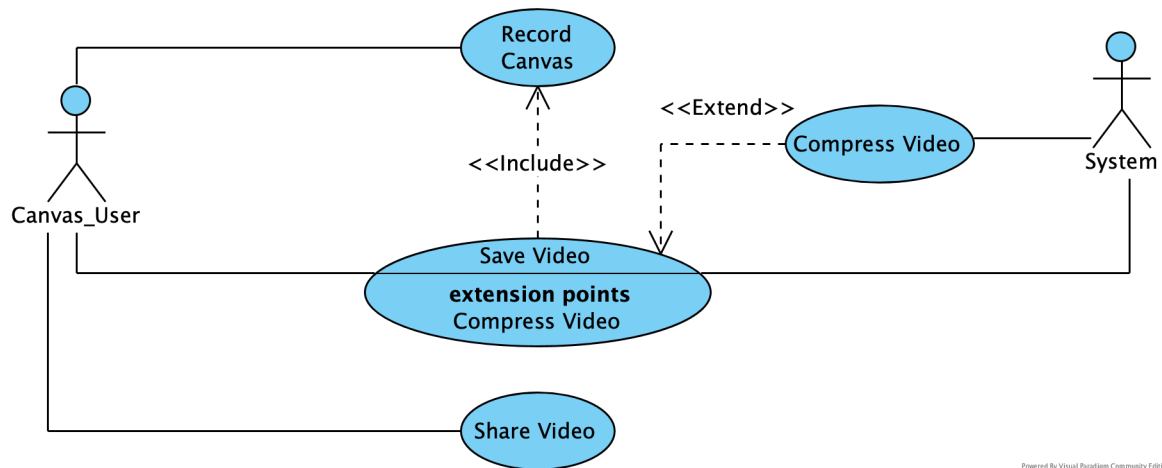


Figure 5 [INTR80-UC01] - As a user I want to be to record the canvas so that I can share it and other users can refer back to what was done.

Sequence Diagrams

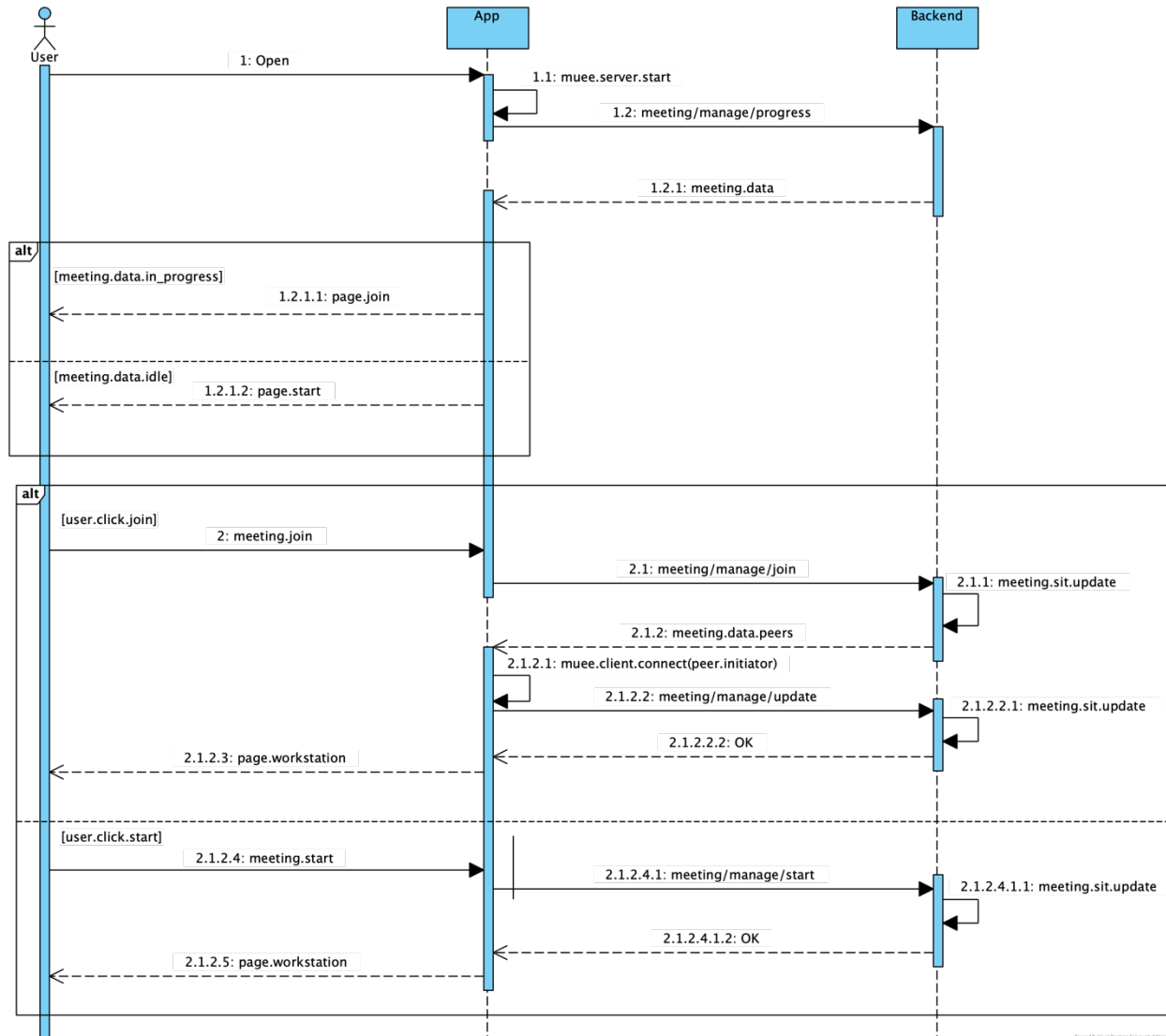


Figure 6 [Join/Create Meeting] High level overview

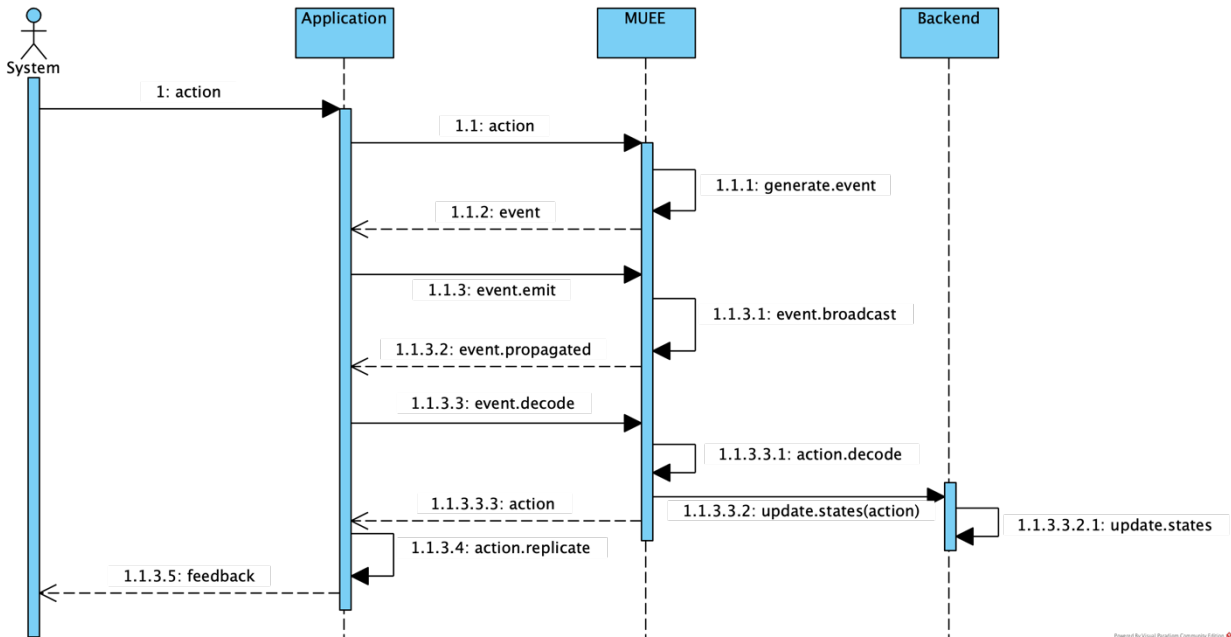
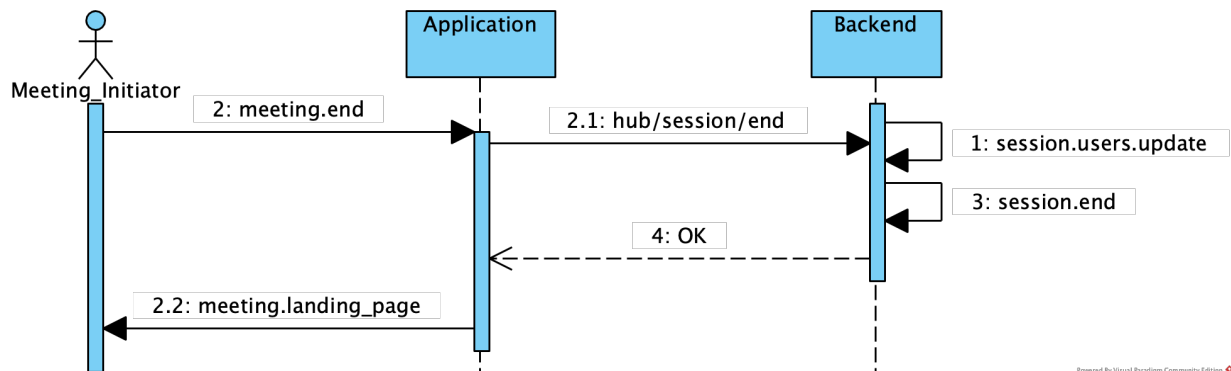
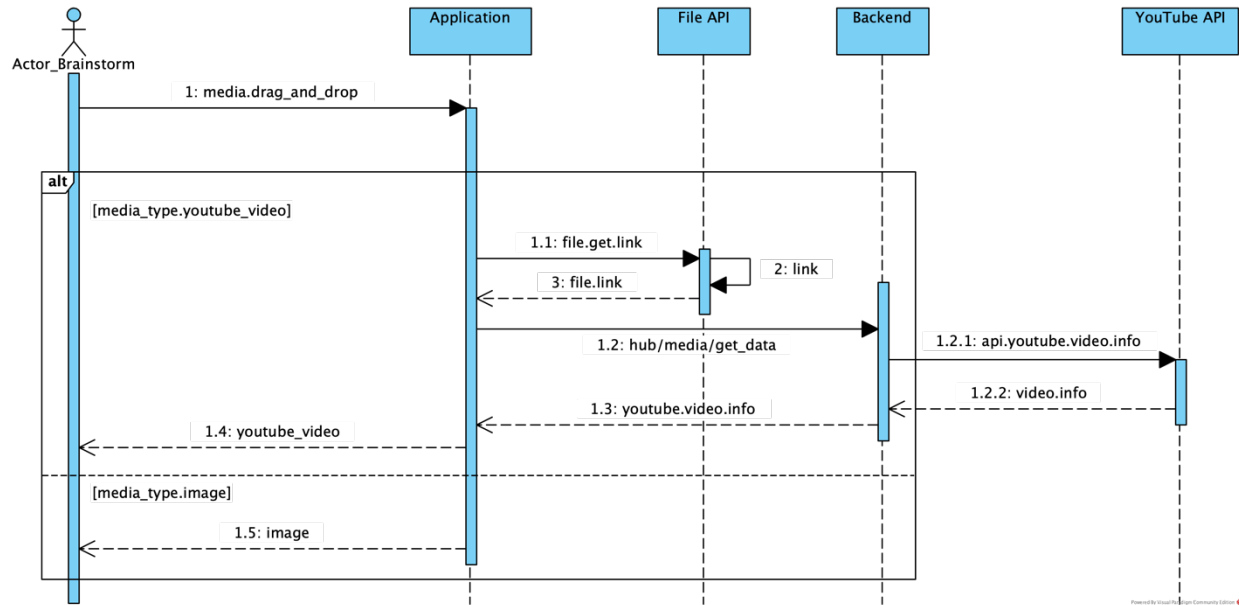


Figure 7 [INTR81-SD01] - As a user I want to be able to have a shared canvas so that every action done on said canvas can be reflected remotely to other meeting participants and vice versa.



Class Diagrams

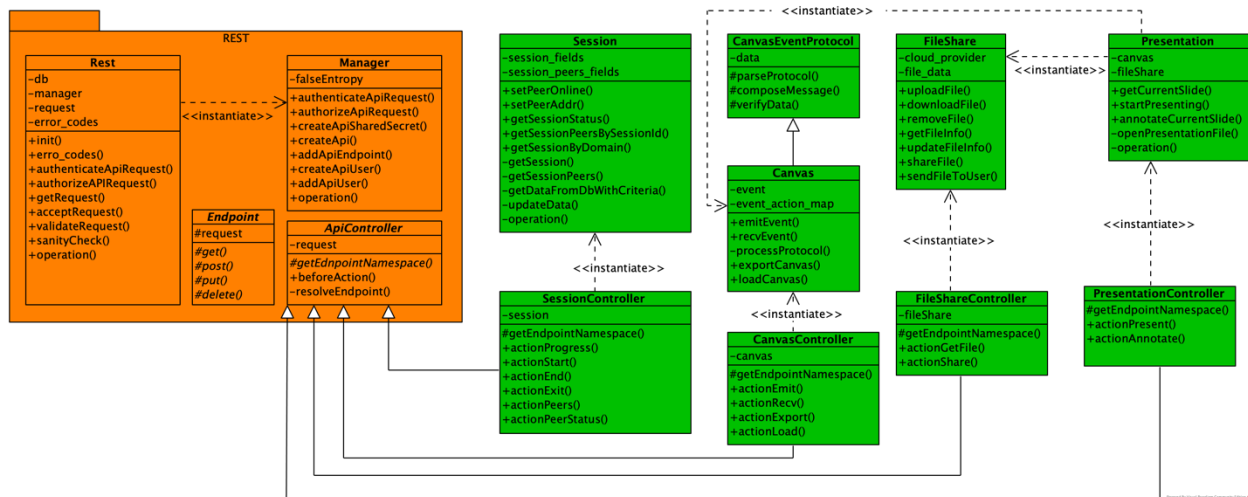


Figure 10 [Backend] High level overview

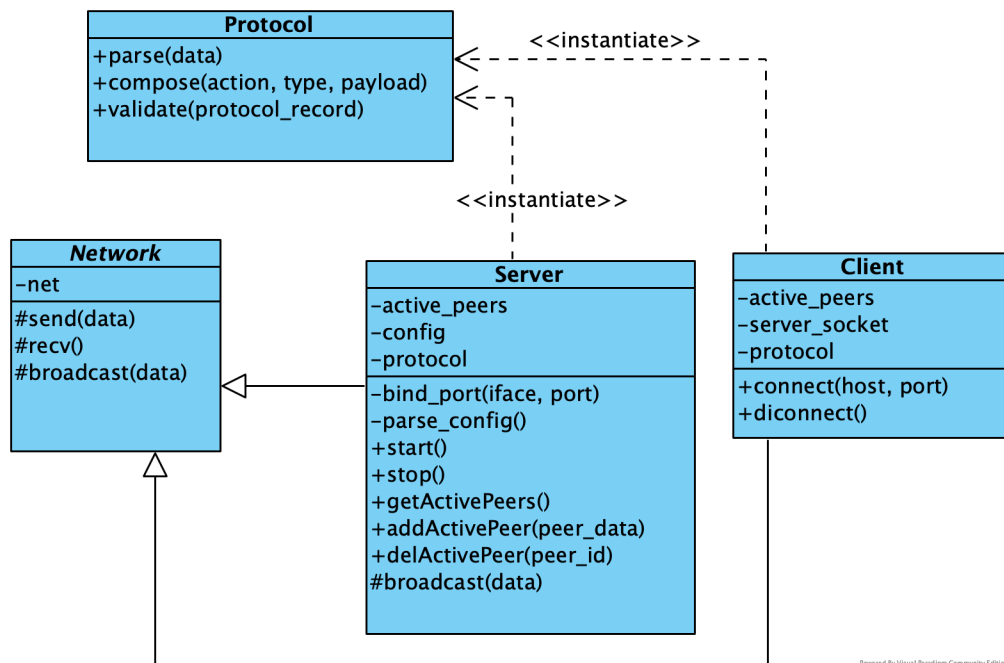


Figure 11 [Application/Network] The Networking class diagram for the application

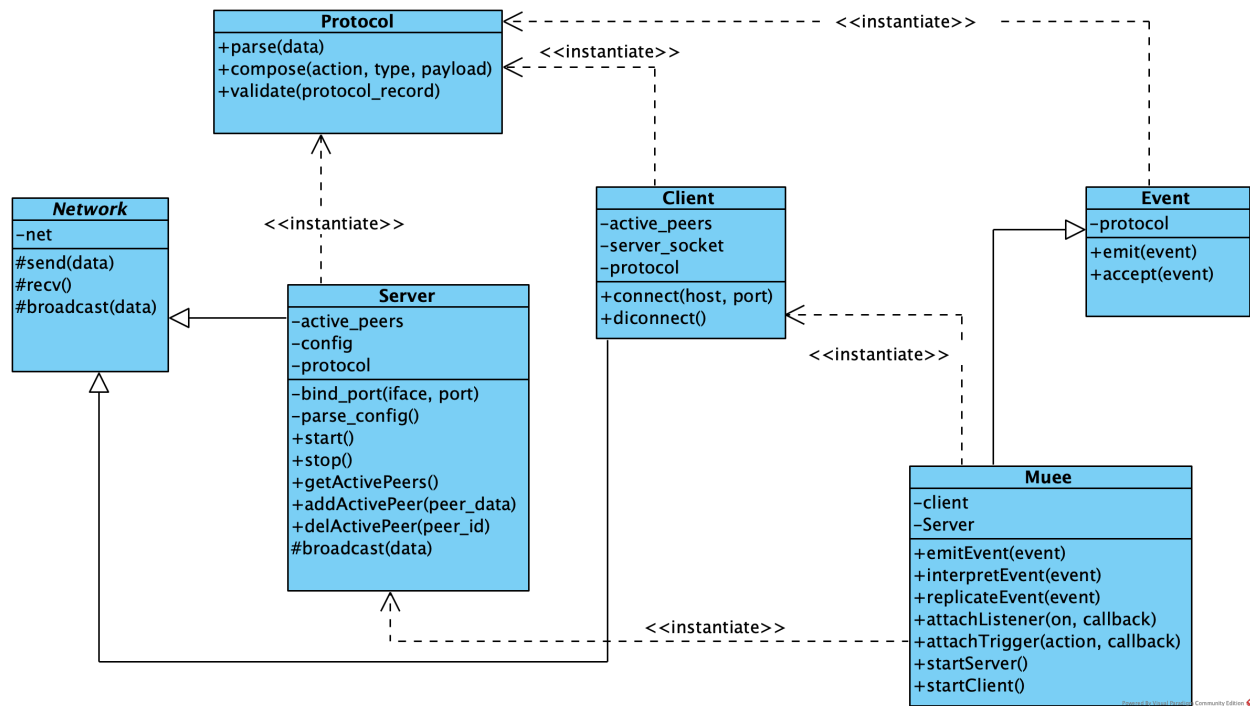


Figure 12 [Application/Muee] The subsystem that provides networking, event handling and backend access

Appendix B - User Interface Design

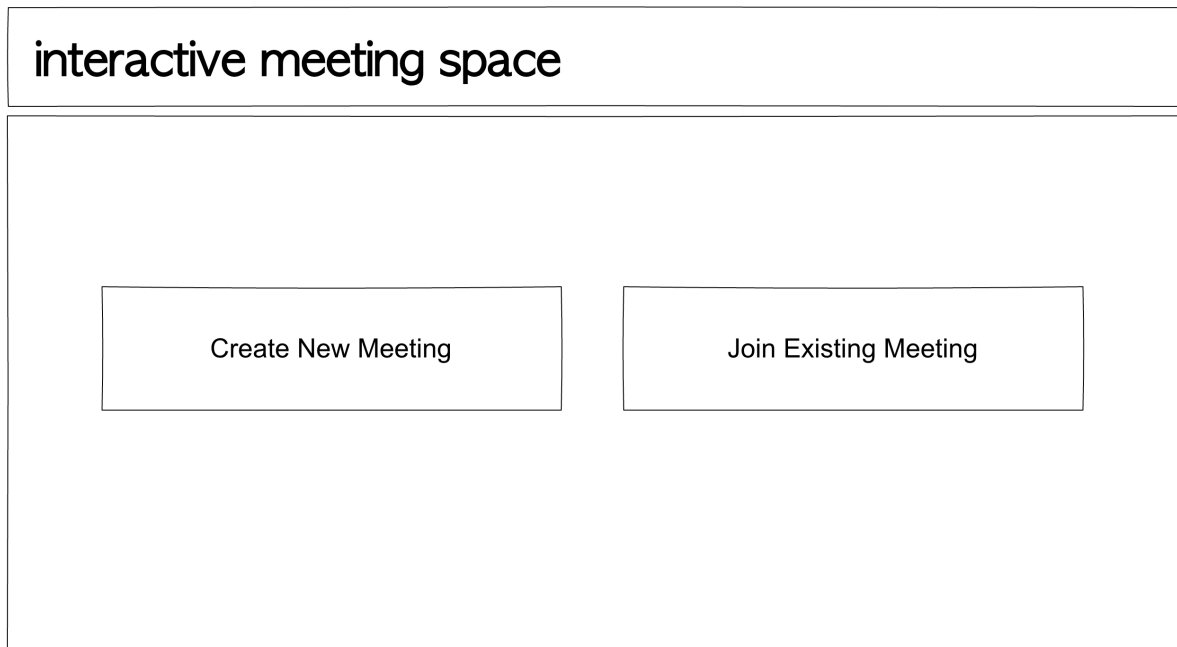


Figure 13 – First draft of the landing page

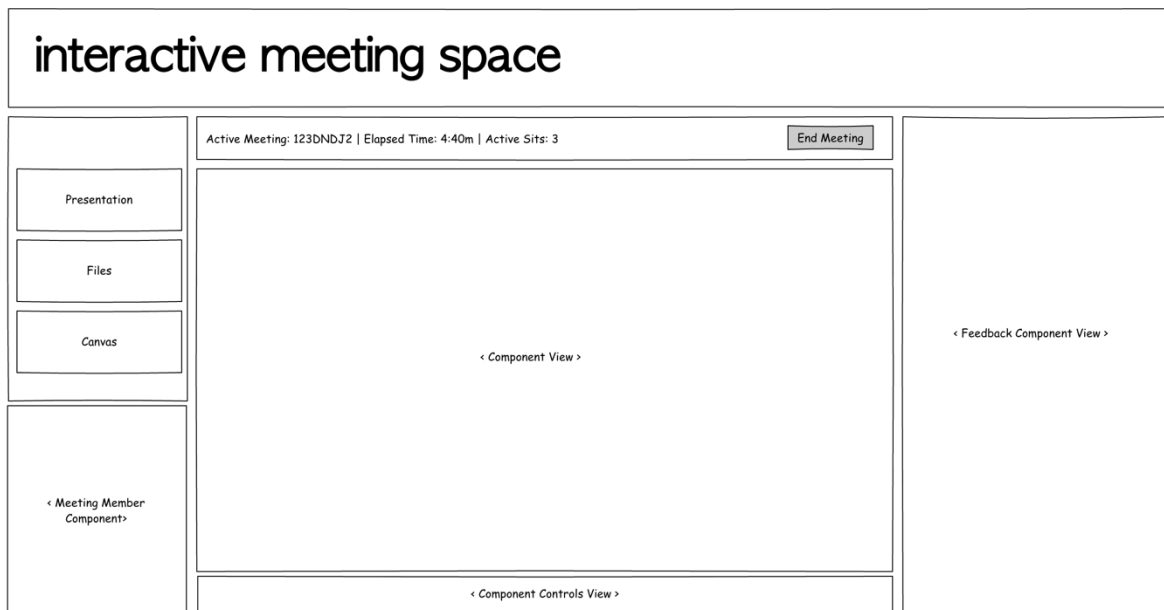


Figure 14 – Draft of main working space

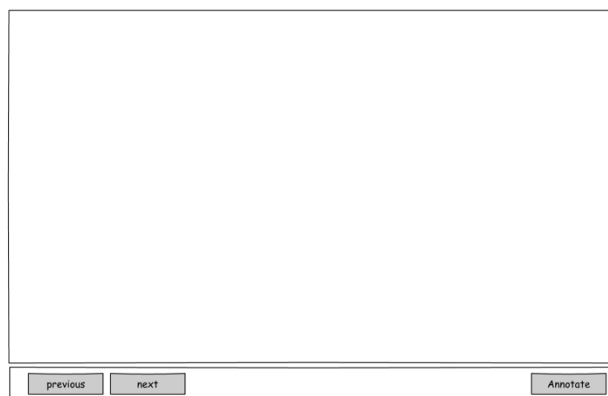


Figure 15 – Draft for presentation component

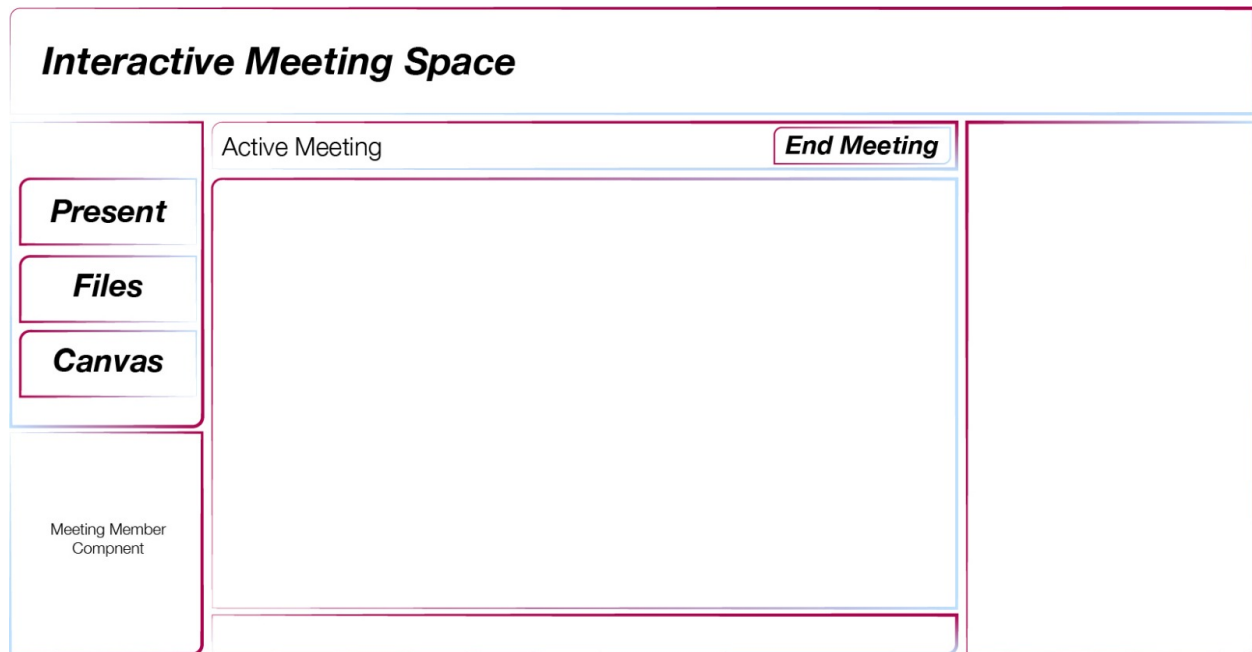


Figure 16 – Redesign main working space

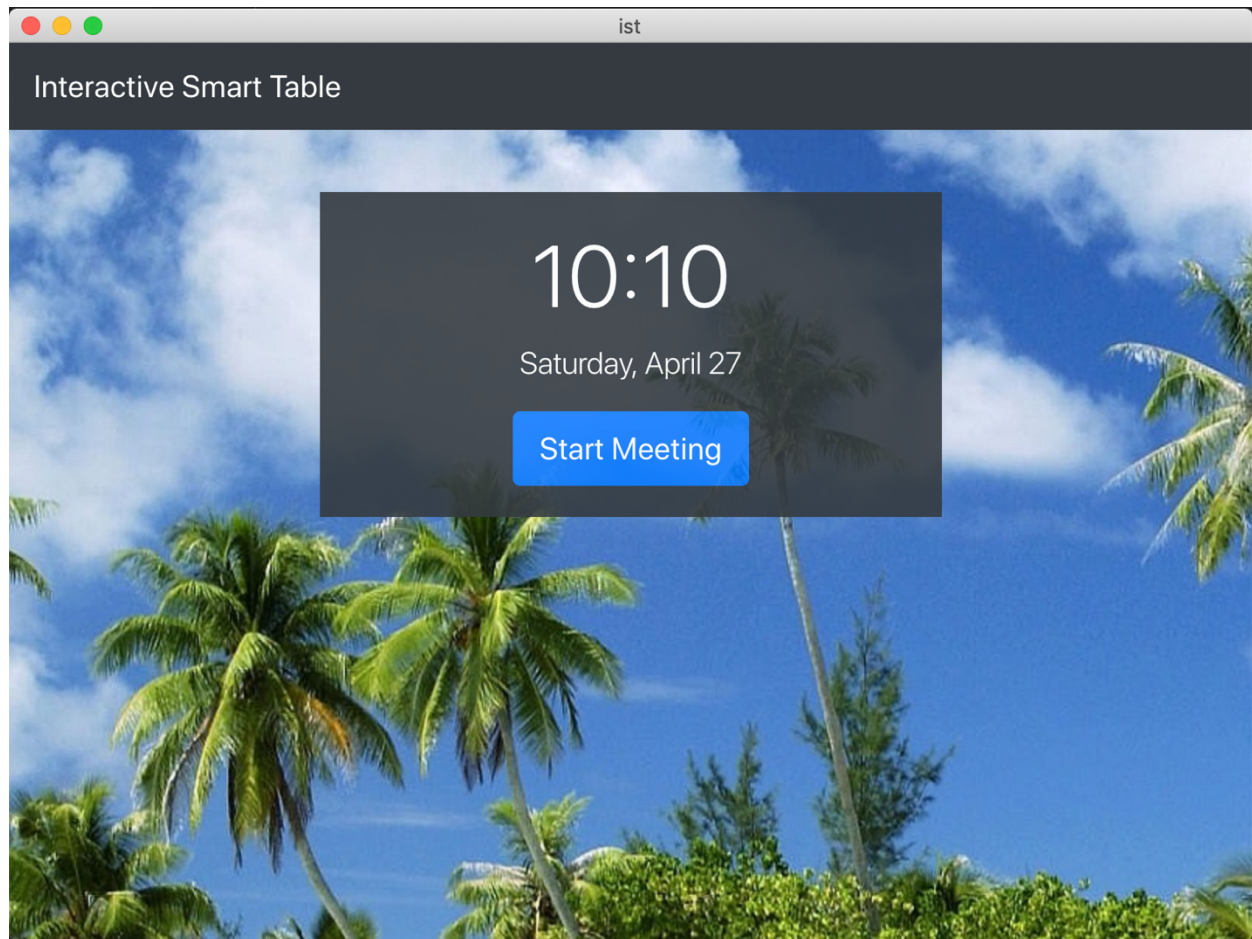


Figure 17 – Main landing page

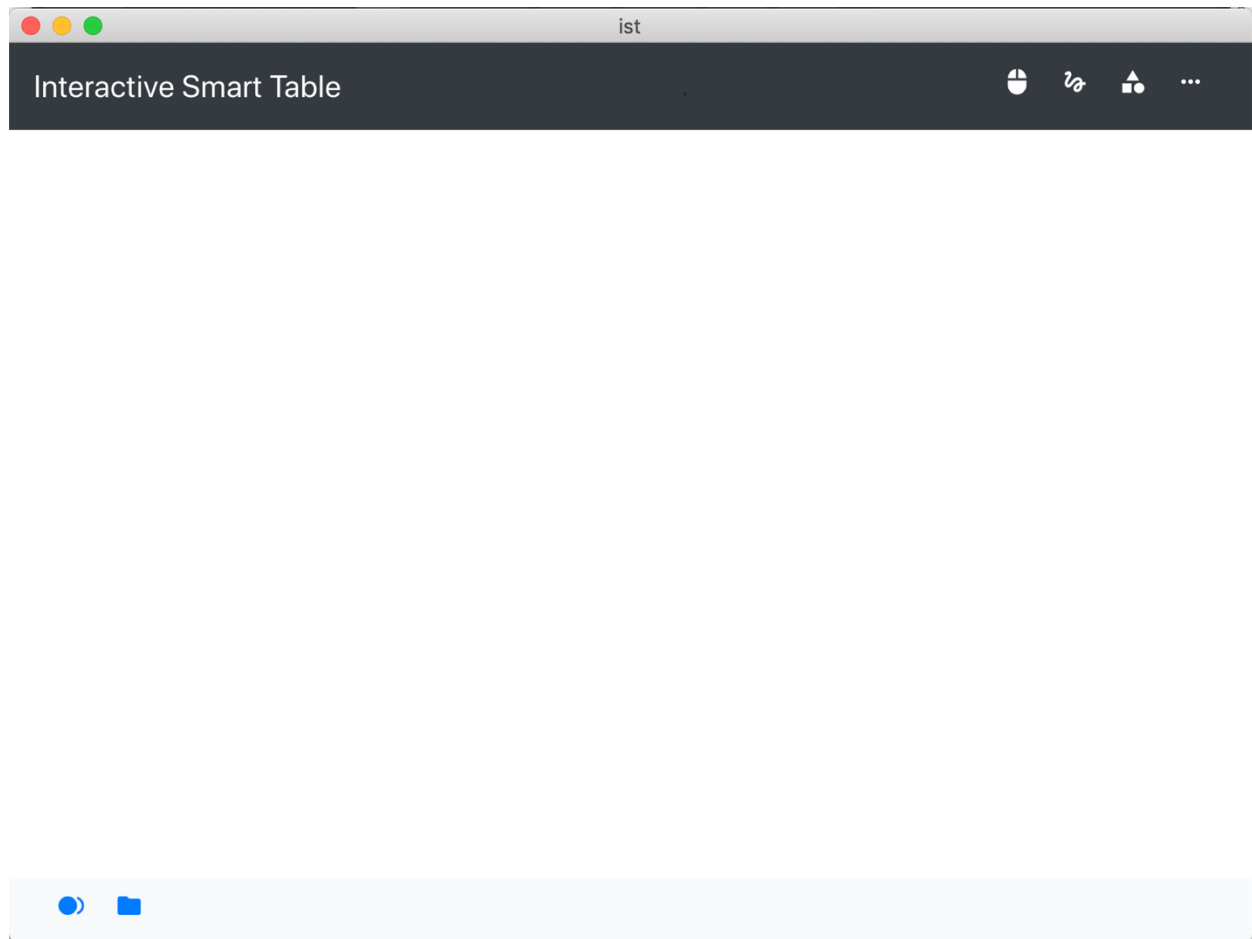


Figure 18 – Main working window

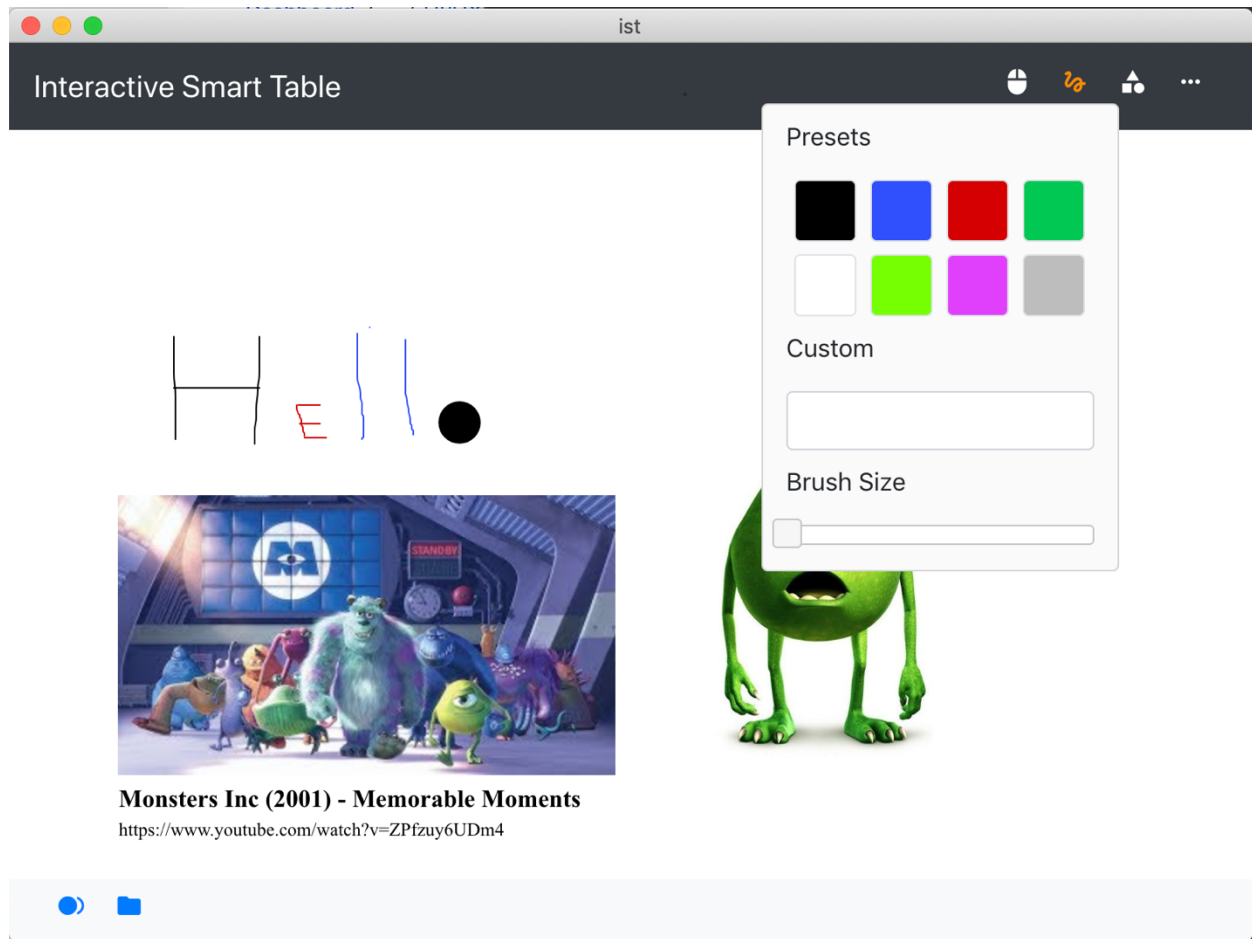


Figure 19 – Main window with toolbox and media

Appendix C - Sprint Review Reports

Sprint 1

20190201 - Sprint 1 Review Meeting Minutes

Attendees: William Escudero

Start time: 6:00pm

End time: 6:15pm

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners: All.

- User Story INTR-60 - Research if input should come from screen or external device. Done
- User Story INTR-61 - Research screens that will integrate well with raspberry pi and support input method. Done
- User Story INTR-62 - Integrate screen with raspberry pi. Done
- User Story INTR-64 - Installation of previous software on hardware platform. Done

The following ones were rejected and moved back to the product backlog to be assigned to a future sprint at a future Spring Planning meeting.

- User Story INTR-63 - Go over documentation for interactive smart table software built by previous team. Done
- User Story INTR-65 - [DROPPED] Replace development stack by LAMP Stack. Done

Sprint 2

20190216 - Sprint 2 Review Meeting Minutes

Attendees: William Escudero

Start time: 6:00pm

End time: 6:15pm

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners: All.

- User Story INTR-71 - UI Redesign to be more modular so more features are included
Done
- User Story INTR-72 - As a user I want to create a meeting and invite meeting members so that I can present and share documents. Done

The following ones were rejected and moved back to the product backlog to be assigned to a future sprint at a future Spring Planning meeting.

- User Story INTR-73 - As a meeting initiator I want to be able to present. To Do

Sprint 3

20190228 - Sprint 3 Review Meeting Minutes

Attendees: William Escudero

Start time: 6:00pm

End time: 6:15pm

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners: All.

- User Story INTR-70 - As a user I would like to have the option to write on a canvas. Done
- User Story INTR-76 - As meeting initiator I would like to end a meeting Done

The following ones were rejected and moved back to the product backlog to be assigned to a future sprint at a future Spring Planning meeting.

- User Story INTR-67 - As a user I want to be able to share documents with meeting members. To Do
- User Story INTR-73 - As a meeting initiator I want to be able to present. To Do

Sprint 4

20190315 - Sprint 4 Review Meeting Minutes

Attendees: William Escudero

Start time: 6:00pm

End time: 6:15pm

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners: All.

- User Story INTR-77 - As a user I would like to have a component that will allow me to brainstorm by putting different types of content so that I can more easily put a meeting or presentation together Done
- User Story INTR-73 - As a meeting initiator I want to be able to present. To Do

The following ones were rejected and moved back to the product backlog to be assigned to a future sprint at a future Spring Planning meeting.

- User Story INTR-74 - [DROPPED] As a user I would like to view meeting feedback on a live feed Done
- User Story INTR-67 - As a user I want to be able to share documents with meeting members. To Do

Sprint 5

20190329 - Sprint 5 Review Meeting Minutes

Attendees: William Escudero

Start time: 6:00pm

End time: 6:15pm

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners: All.

- User Story INTR-78 - As a user I want to be able to clear the canvas so that I can start anew. Done
- User Story INTR-79 - As a user I want to be able to group multiple items into a single item so that I can manipulate them as a unit. Done

The following ones were rejected and moved back to the product backlog to be assigned to a future sprint at a future Spring Planning meeting.

- User Story INTR-81 - As a user I want to be able to have a shared canvas so that every action done on said canvas can be reflected remotely to other meeting participants and vice versa. Done
- User Story INTR-73 - As a meeting initiator I want to be able to present. To Do
- User Story INTR-67 - As a user I want to be able to share documents with meeting members. To Do

Sprint 6

20190412 - Sprint 6 Review Meeting Minutes

Attendees: William Escudero

Start time: 6:00pm

End time: 6:15pm

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners: All.

- INTR-81 - As a user I want to be able to have a shared canvas so that every action done on said canvas can be reflected remotely to other meeting participants and vice versa. Done
- INTR-76 - As meeting initiator I would like to end a meeting Done

The following ones were rejected and moved back to the product backlog to be assigned to a future sprint at a future Spring Planning meeting.

- INTR-73 - As a meeting initiator I want to be able to present. To Do
- INTR-67 - As a user I want to be able to share documents with meeting members. To Do

Sprint 7

20190427 - Sprint 7 Review Meeting Minutes

Attendees: William Escudero

Start time: 6:00pm

End time: 6:15pm

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners: All.

- INTR-80 - As a user I want to be to record the canvas so that I can share it and other users can refer back to what was done. Done
- INTR-82 - Create Presentation Poster Done
- INTR-83 - Create Final Document Done
- INTR-84 - Create Presentation Slides Done
- INTR-85 - Create Final Videos Done

The following ones were rejected and moved back to the product backlog to be assigned to a future sprint at a future Spring Planning meeting.

- INTR-67 - As a user I want to be able to share documents with meeting members. To Do
- INTR-73 - As a meeting initiator I want to be able to present. To Do

Appendix D - User Manuals, Installation/Maintenance Document, Shortcomings/Wishlist Document and other documents

SHORTCOMINGS / WISHLIST

The project is composed of two major components; The hardware and the software suite. Below is a description of the major shortcomings. There is also a list of the features that need to be included in the next iteration of the platform.

Shortcomings

- Hardware
 - The smart screen that goes in every sit needs a touch screen of at least 17". However, a touch screen that size was not viable for the price point. I ended up using a 7" touchscreen from the raspberry pi foundation.
 - After realizing the touch screens 17" or higher were beyond the price point for the project, I made the attempt to implement touch capabilities on a regular screen using infrared sensors. However, the complexity of it was too greater in terms of time required for completion. The infrared hardware had to be design and the drivers for the Linux Kernel needed to be written to add support for the Raspberry Pi.
- Software Suite
 - The networking component took a long time to design and implement. The reason was that after having the initial design for the shared canvas there was a delay when broadcasting the data for the events generated for the user. So I had to design a new protocol that will allow me to broadcast the event data without any delays. This meant the shared canvas had to be redesigned.

Features

- Software
 - Currently the fire sharing component is not completed. This component needs to be implemented for next iteration because it is essential and required for the Presentation component. The way a user presents is by selecting a file provided by the file sharing component

- The Presentation component is the other major component that needs to be implemented. This component allows the meeting initiator to start presenting.
- Saving the canvas and reloading it is partially completed. This needs to be completed. Saving it as a PNG or PDF is not working correctly as there are alignment issues.
- Key bindings for common actions need to be implemented. For instance ctrl/cmd-z to undo canvas actions, Copy and Paste functionality needs to be done as well.
- Support for more basic shapes need to be added.
- A media property submenu needs to be implemented. So when the user double clicks an element on the canvas a submenu should show so with the properties that can be change for the element in question.

INSTALLATION GUIDE

This document provides a step by step guide on how to install the backend and the application for this project. This document assumes the user has a basic understanding of UNIX/Linux tools and the command line. The first part of this document describes how to install the backend in a Linux environment while the second part describes how to get the application running for macOS.

BACKEND

The backend was written in PHP using the yii2 framework. It uses Apache2 webserver and MySQL as the database. The OS of choice is Ubuntu 18.04.

Installing Apache2, PHP and MySQL

First lets install the latest updates for the OS

```
root@132f793ac7df:/# apt update && apt upgrade -y
```

Once completed lets install Apache2

```
root@132f793ac7df:/# apt install apache2 -y
```

Let's install PHP7

```
root@132f793ac7df:/# apt install php7.2 -y
```

After php7 is installed we have to install the module for Apache2 so that apache is able to understand PHP files

```
root@132f793ac7df:/# apt install libapache2-mod-php
```

Our webserver installation is completed so let's bring up the server to test it

```
root@132f793ac7df:/# service apache2 start
* Starting Apache httpd web server apache2
```

If it gives a warning such as

```
AH00558: apache2: Could not reliably determine the server's fully
qualified domain name
```

It can be safely ignore. Now open a web browser and visit `http://localhost` a Apache2 Ubuntu default webpage should appear



At this point the webserver is running with default configuration. Let's test if the PHP installation is working correctly. Go into the default directory where Apache2 looks for files to serve.

```
root@132f793ac7df:~# cd /var/www/html
root@132f793ac7df:/var/www/html#
```

We are going to create a php file that will call the `phpinfo()` function. Type the following

```
root@132f793ac7df:/var/www/html# echo "<?=phpinfo();?>" >> info.php
```

a new file called 'info.php' should exist. Open your web browser again but this time go to `http://localhost/info.php`



Now that we now Apache2 and PHP are installed and working correctly is time to install the MySQL server

```
root@132f793ac7df:/var/www/html# apt install mysql-server -y
```

Let's bring up the service so that we can configure it

```
root@132f793ac7df:/var/www/html# service mysql start
* Starting MySQL database server mysqld
```

Type

```
root@132f793ac7df:/var/www/html# mysql
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 4
Server version: 5.7.25-0ubuntu0.18.04.2 (Ubuntu)

Copyright (c) 2000, 2019, Oracle and/or its affiliates. All rights reserved.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input
statement.

mysql> show databases;
+-----+
| Database                |
+-----+
| information_schema      |
| mysql                   |
| performance_schema      |
| sys                     |
+-----+
```

```
4 rows in set (0.00 sec)

mysql> quit
Bye
root@132f793ac7df:/var/www/html#
```

At this point we now that mysql is up and running. Next we need to configure it in order to be able to use.

```
root@132f793ac7df:/var/www/html# mysql_secure_installation

Securing the MySQL server deployment.

Connecting to MySQL using a blank password.

VALIDATE PASSWORD PLUGIN can be used to test passwords
and improve security. It checks the strength of password
and allows the users to set only those passwords which are
secure enough. Would you like to setup VALIDATE PASSWORD plugin?

Press y|Y for Yes, any other key for No: n
Please set the password for root here.

New password:
```

Set the new password. In this guide I have set the password as test1234

```
By default, a MySQL installation has an anonymous user,
allowing anyone to log into MySQL without having to have
a user account created for them. This is intended only for
testing, and to make the installation go a bit smoother.
You should remove them before moving into a production
environment.
```

```
Remove anonymous users? (Press y|Y for Yes, any other key for No) : y
Success.
```

```
Normally, root should only be allowed to connect from
'localhost'. This ensures that someone cannot guess at
the root password from the network.
```

```
Disallow root login remotely? (Press y|Y for Yes, any other key for No) :
y
Success.
```

```
By default, MySQL comes with a database named 'test' that
anyone can access. This is also intended only for testing,
and should be removed before moving into a production
environment.

Remove test database and access to it? (Press y|Y for Yes, any other key
for No) : y
- Dropping test database...
Success.

- Removing privileges on test database...
Success.

Reloading the privilege tables will ensure that all changes
made so far will take effect immediately.

Reload privilege tables now? (Press y|Y for Yes, any other key for No) : y
Success.

All done!
root@132f793ac7df:/var/www/html#
```

Now that MySQL server is installed and configured let's install phpMyAdmin which is a web application that will allow you to manage the databases.

```
root@132f793ac7df:/var/www/html# apt install phpmyadmin -y
```

The installation will ask for some configuration parameters

```
Configuring phpmyadmin
-----

The phpmyadmin package must have a database installed and configured
before it can be used. This can be optionally handled with dbconfig-
common.

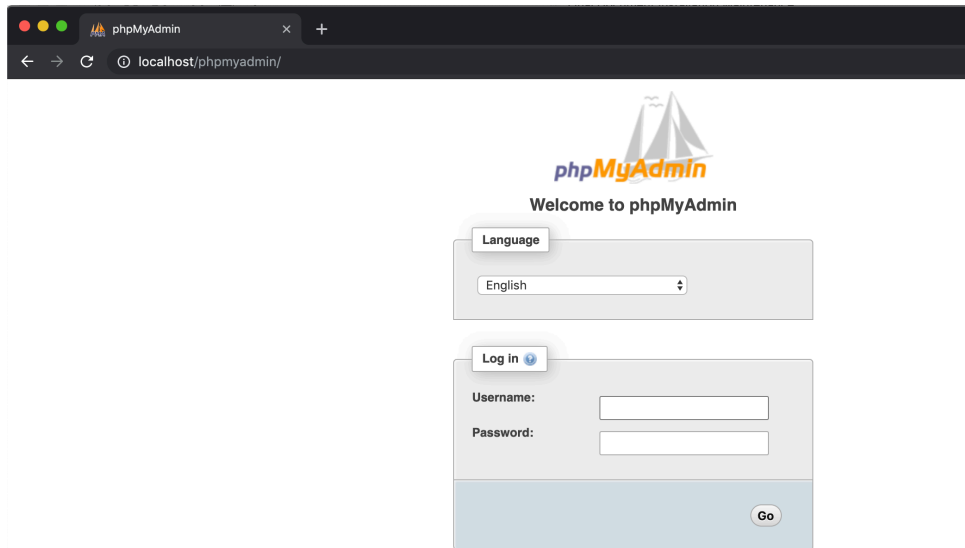
If you are an advanced database administrator and know that you want to
perform this configuration manually, or if your database has already been
installed and configured, you
should refuse this option. Details on what needs to be done should most
likely be provided in /usr/share/doc/phpmyadmin.
```

```
Otherwise, you should probably choose this option.
Configure database for phpmyadmin with dbconfig-common? [yes/no] yes
Please provide a password for phpmyadmin to register with the database
server. If left blank, a random password will be generated.
MySQL application password for phpmyadmin:
Password confirmation:
Determining localhost credentials from /etc/mysql/debian.cnf: succeeded.
Please choose the web server that should be automatically configured to
run phpMyAdmin.
    1. apache2  2. lighttpd
(Enter the items you want to select, separated by spaces.)
Web server to reconfigure automatically: 1
```

Make sure you select apache2 as the web server. When it asks for the password type test1234
In order for the new configuration to take effect we must restart the Apache2 webserver

```
root@132f793ac7df:/var/www/html# service apache2 restart
* Restarting Apache httpd web server apache2
```

After restarting is complete open your web browser and type <http://localhost/phpMyAdmin>
you should see the following



You can log in by using username: phpmyadmin and password: test1234
But we are going to create a new username for the project database which we will create as well.

Go into the terminal and type

```
root@132f793ac7df:/var/www/html# mysql -h localhost -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 36
Server version: 5.7.25-0ubuntu0.18.04.2 (Ubuntu)

Copyright (c) 2000, 2019, Oracle and/or its affiliates. All rights reserved.

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Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```

Issue the following MySQL command to create the project database

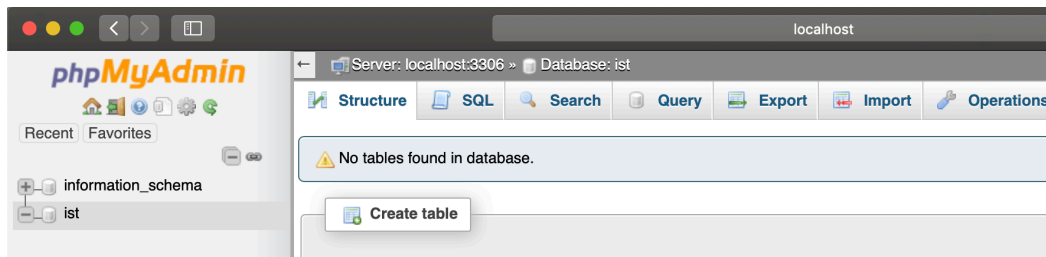
```
mysql> create database ist;
Query OK, 1 row affected (0.00 sec)

mysql>
```

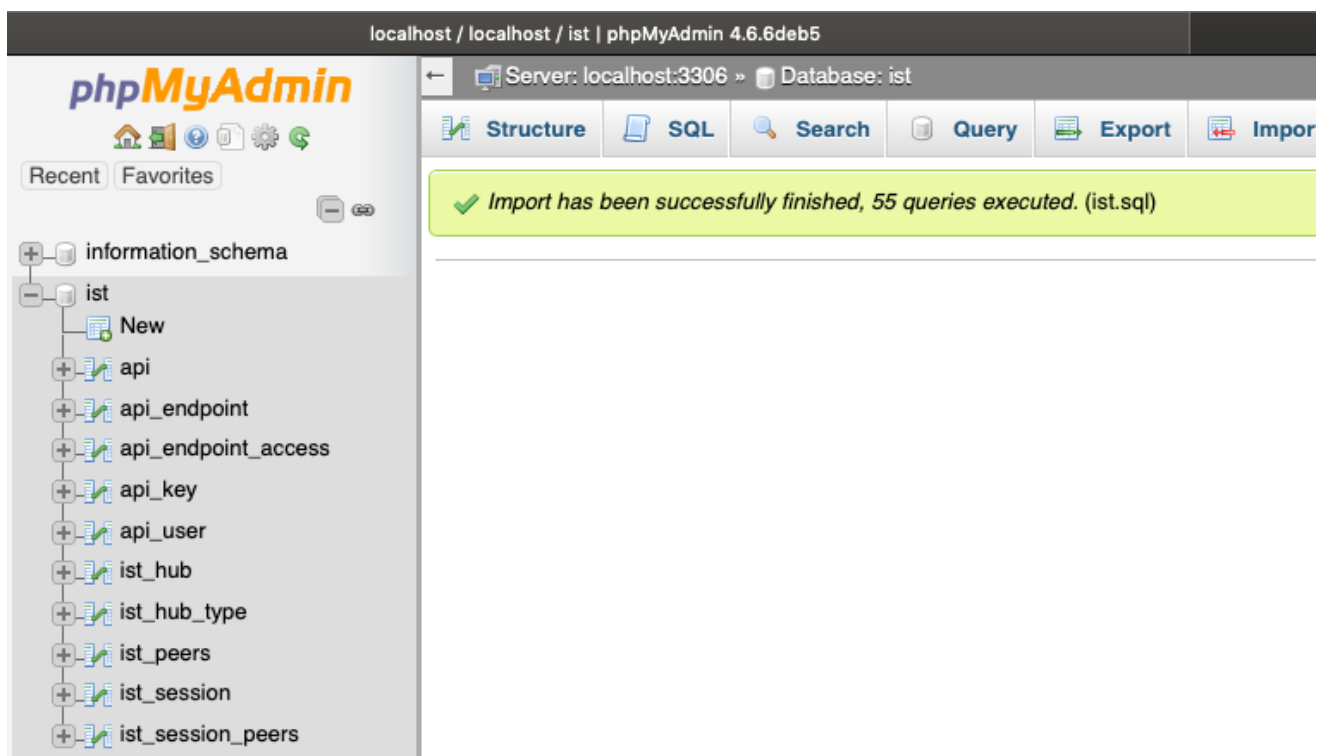
Now we are going to create the user for that database. This user will only have access to the 'ist' database and can be used to manage it through phpmyadmin

```
mysql> grant all privileges on ist.* to 'ist'@'%' identified by
'test1234';
Query OK, 0 rows affected, 1 warning (0.00 sec)
```

Go back to the browser and login into phpMyAdmin with username: ist and password: test1234
Once logged in you should see the database to the left



We are now going to populate the database with tables and testing data to be able to run the project. Click on the database 'ist' and then 'import' on the right, click where it says 'Choose File' and look for the file called 'ist.sql' in the project folder



The tables and the data are now imported. Next we are going to install the source code of the project. Go to the folder where apache looks for files

```
root@132f793ac7df:~# cd /var/www/html
root@132f793ac7df:/var/www/html#
```

If we are getting the source code from JIRA we can go ahead and do git clone from bitbucket

```
root@132f793ac7df:/var/www/html# git clone https://sp-jira.cis.fiu.edu:7443/scm/intr/ist-backend.git
Cloning into 'ist-backend'...
```

```
root@132f793ac7df:/var/www/html# ls
index.html  info.php  ist-backend
root@132f793ac7df:/var/www/html# cd ist-backend/
root@132f793ac7df:/var/www/html/ist-backend# ls -l
total 184
drwxr-xr-x 2 root root 4096 Apr 27 00:07 assets
-rw-r--r-- 1 root root 773 Apr 27 00:07 codeception.yml
drwxr-xr-x 2 root root 4096 Apr 27 00:07 commands
drwxr-xr-x 2 root root 4096 Apr 27 00:07 components
-rw-r--r-- 1 root root 2116 Apr 27 00:07 composer.json
-rw-r--r-- 1 root root 121328 Apr 27 00:07 composer.lock
drwxr-xr-x 2 root root 4096 Apr 27 00:07 config
drwxr-xr-x 2 root root 4096 Apr 27 00:07 controllers
drwxr-xr-x 3 root root 4096 Apr 27 00:07 mail
drwxr-xr-x 4 root root 4096 Apr 27 00:07 modules
drwxr-xr-x 2 root root 4096 Apr 27 00:07 runtime
drwxr-xr-x 9 root root 4096 Apr 27 00:07 tests
drwxr-xr-x 4 root root 4096 Apr 27 00:07 views
drwxr-xr-x 5 root root 4096 Apr 27 00:07 web
drwxr-xr-x 2 root root 4096 Apr 27 00:07 widgets
-rwxr-xr-x 1 root root 553 Apr 27 00:07 yii
-rw-r--r-- 1 root root 515 Apr 27 00:07 yii.bat
root@132f793ac7df:/var/www/html/ist-backend#
```

Now we have to reconfigure apache2 in order to change the directory in which it looks for files to

/var/www/html/ist-backend/web

So let's edit the configuration file. Any editor would work, I am using vim in this instance

```
root@132f793ac7df:/var/www/html/ist-backend# vim /etc/apache2/sites-enabled/000-default.conf
```

Change the line

```
12      DocumentRoot /var/www/html
```

to

```
12      DocumentRoot /var/www/html/ist-backend/web
```

Save and exit. We now have to restart the apache web server for the changes to take effect.

```
root@132f793ac7df:/var/www/html/ist-backend# service apache2 restart
* Restarting Apache httpd web server apache2
```

We are now going to work on configuring the application. We first need to install 'composer' which is package manager for PHP. This application is required to update the code base and install required packages.

```
root@132f793ac7df:/var/www/html/ist-backend# apt install composer -y
```

Now we need to update the current directory in order to download all dependencies required

```
root@132f793ac7df:/var/www/html/ist-backend# composer update
```

A long list should start installing. Once it finishes with no error all dependencies have been installed. Now we need to configure the database connection for the application by going into the config folder and editing db.php

Set username to 'ist' and password to 'test1234'

```
root@132f793ac7df:/var/www/html/ist-backend# cd config
root@132f793ac7df:/var/www/html/ist-backend/config# ls
console.php db.php params.php test.php test_db.php web.php
root@132f793ac7df:/var/www/html/ist-backend/config#
```

We need to grant access to the web server to some of the folders within the base code.

```
root@132f793ac7df:/var/www/html/ist-backend/config# cd ..
root@132f793ac7df:/var/www/html/ist-backend# chown www-data:www-data -R runtime
```

www-data is the user under which the Apache2 daemon is running.

Lastly we need enable the url rewrite module for apache so that the application can make use of pretty urls (/hub/session instead of index.php?r=hub/default/session)

```
root@132f793ac7df:/var/www/html/ist-backend# a2enmod
Which module(s) do you want to enable (wildcards ok)?
rewrite
Enabling module rewrite.
To activate the new configuration, you need to run:
    service apache2 restart
root@132f793ac7df:/var/www/html/ist-backend#
root@132f793ac7df:/var/www/html/ist-backend# service apache2 restart
* Restarting Apache httpd web server apache2
```

After restarting apache we must create a .htaccess file where apache looks for files.

```
root@132f793ac7df:/var/www/html/ist-backend# cd web
root@132f793ac7df:/var/www/html/ist-backend/web# touch .htaccess
root@132f793ac7df:/var/www/html/ist-backend/web# ls -la
total 36
drwxr-xr-x  5 root root 4096 Apr 27 00:29 .
drwxr-xr-x 16 root root 4096 Apr 27 00:17 ..
-rw-r--r--  1 root root   0 Apr 27 00:29 .htaccess
drwxr-xr-x  2 root root 4096 Apr 27 00:07 assets
drwxr-xr-x  2 root root 4096 Apr 27 00:07 css
-rw-r--r--  1 root root  318 Apr 27 00:07 favicon.ico
-rw-r--r--  1 root root  498 Apr 27 00:07 index-test.php
-rw-r--r--  1 root root  367 Apr 27 00:07 index.php
drwxr-xr-x  2 root root 4096 Apr 27 00:07 js
-rw-r--r--  1 root root   23 Apr 27 00:07 robots.txt
root@132f793ac7df:/var/www/html/ist-backend/web#
```

Edit the file and add the following lines

```
1 RewriteEngine On
2 RewriteBase /opt/ist/ist/
3
4 RewriteCond %{REQUEST_FILENAME} !-f
5 RewriteCond %{REQUEST_FILENAME} !-d
6 # Otherwise forward it to index.php
7 RewriteRule . /index.php
```

Save the changes. Now we need to add a <Directory> directive to the apache configuration to make the new .htaccess work.

Edit the file and add the lines below

```
root@132f793ac7df:/var/www/html/ist-backend/web# vim /etc/apache2/sites-enabled/000-default.conf
```

```
15      <Directory /var/www/html/ist-backend/web>
16          AllowOverride All
17      </Directory>
```

At this point the backend should be installed and fully configured.

APPLICATION

The application was written using the Electron JS framework so in order to get the application running we must install node JS and NPM. NPM is the package manager for node.

```
wbox:~ william$ brew install npm
```

Now we can download the source from the repository

```
wbox:guide william$ git clone https://sp-jira.cis.fiu.edu:7443/scm/intr/ist-electron.git
```

```
wbox:guide william$ cd ist-electron/
wbox:ist-electron william$
```

Now we need to run `npm update` in order to download the application dependencies

```
wbox:ist-electron william$ npm update
```

We are now ready to run the application

```
wbox:ist-electron william$ npm start

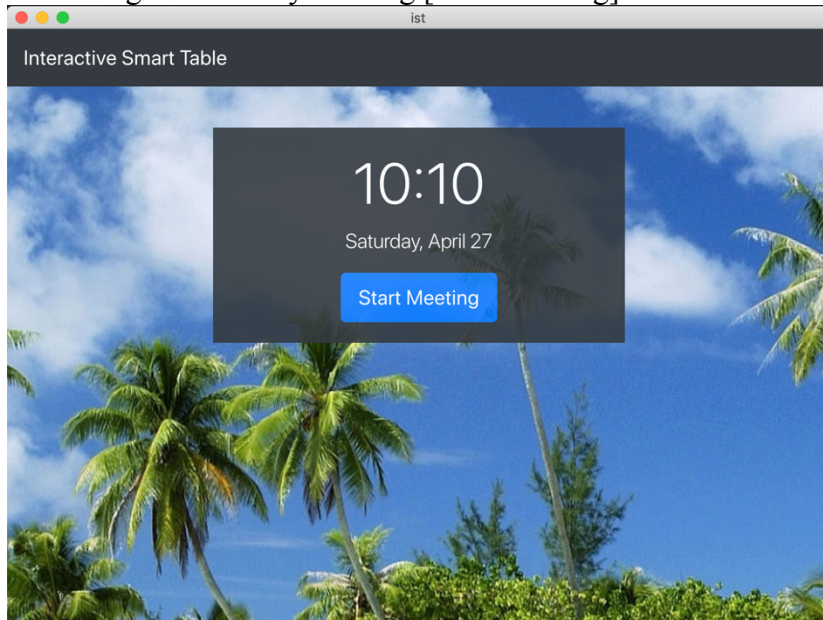
> ist@1.0.0 start /Users/william/guide/ist-electron
> electron .
```

At this point the application should be running and ready to be used.

USER GUIDE

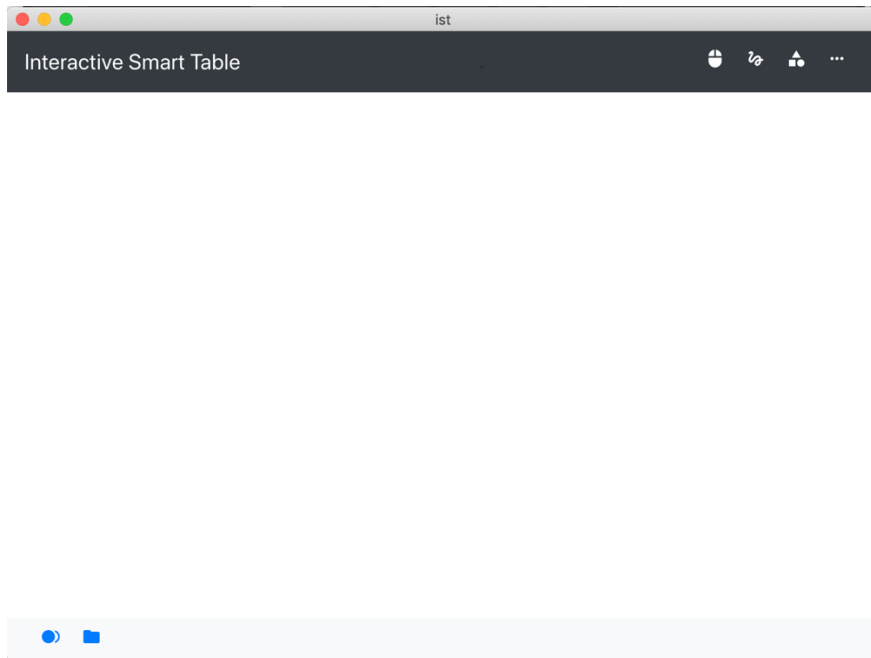
Because most of the work was done on the backend, networking and event features of this project, currently there aren't many things that can be used. Below is a step by step guide on how to use the Canvas component and its toolset.

A meeting is started by clicking [Start Meeting] button.



Tools

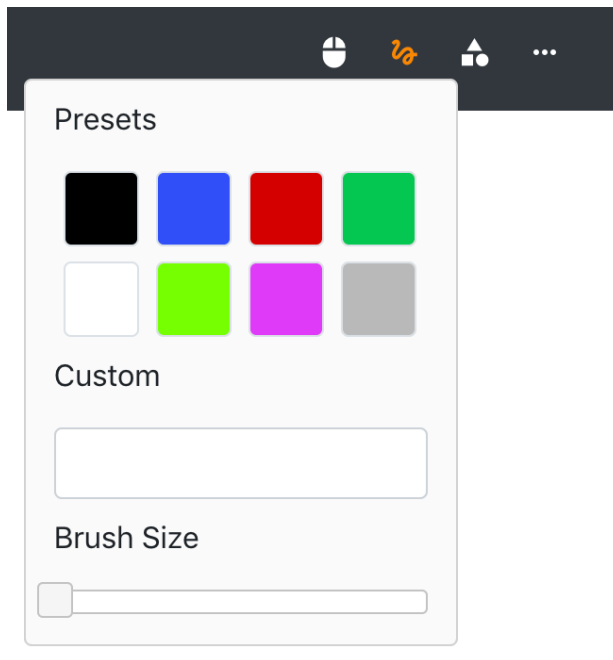
After the meeting is initiated the user is taken into the Canvas component



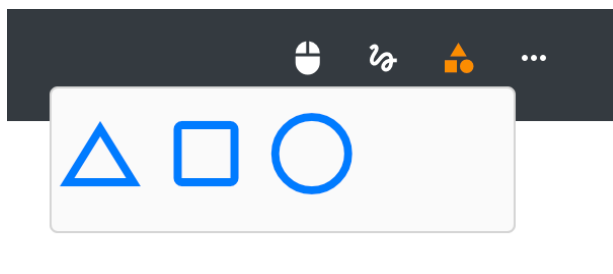
In the top right hand side the user can select tools to use on the canvas



The mouse icon disables freehand drawing move and selects the mouse cursor. This is done so that the user can select elements on the canvas



The freehand drawing tool when selected allows for the user to choose the color in which the line will be drawn. It also allows for setting the brush size so the lines can be thicker. The user can also select a custom color by click on custom.



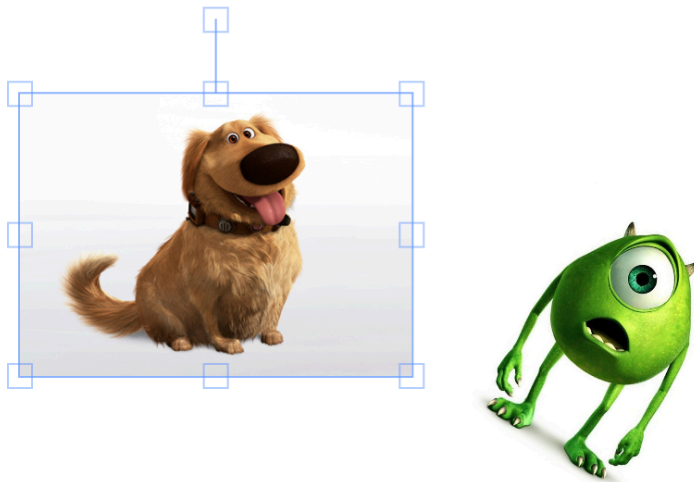
The basic shapes menu allows the user to select basic shapes and add them to the canvas.

Drag and Drop Media

The user can also drag and drop images and YouTube videos onto the canvas. To add an image to the canvas simply select the image and drag and drop it. In order to add YouTube videos the user must select the link and drag the link onto the canvas

Element Manipulation

To delete an element from the canvas simply select the element and press the delete key. Any element on the canvas can be resized and moved around. When the user clicks on an element controls show around the element that allow them to do just that



For further details please refer to the User Guide Video.

REFERENCES

1. Electron JS Documentation - <https://electronjs.org/docs>
2. Node JS Documentation - <https://nodejs.org/dist/latest-v10.x/docs/api>
3. Fabric JS Documentation - <http://fabricjs.com/docs/>
4. Yii2 Framework Documentation - <https://www.yiiframework.com/doc/api/2.0>