Missouri State University

Department computer Science

Family Organization

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May 12, 2022

Contents

1 Family Organization

1.1 Software Description

Our project is a family organization and interaction application. It is a web application meant to keep track of different kinds of applications a family would need to stay organized, whether that be meal planning, creating a shopping list, or just keeping track of family events. Each functionality is meant to be customized to fit the users' needs. The app will have to add "authorization" to offer security to the users, ensuring that important knowledge and data stays within the family. The application will be able to be scaled through additional modules with different functionalities, as we don't yet know how big the project will become. Modules are listed and explained below, with modules we believe we can feasibly implement in the allotted time under section 2 and any additional proposed modules listed under section 3.

2 Functions

2.1 Basic Functionality

- Basic authentication with email and password
- User will be able to create a family entity
- User will be able to add other users to their family
- User will be able to assign family roles to members of their family
- Users will only be able to access data for their own family

2.2 Proposed Modules

- To-Do List: A To-Do list for each person in the family, to-dos will be colored to represent the different family members. Ability to create, read, update, and delete tasks will be included. Proposed module would have filters for viewing specific tasks or viewing other family member's tasks.
- Calendar: A calendar of all family events and individual events. We picture this module being particularly helpful in keeping track of the extra curricular activities that children have as well as planning family meetings, etc. Like the to-do list, the calendar events should be color coded per family member for a better user experience

when viewing the calendar and filters should be included. The Calendar should have the ability to create, read, update, and delete calendar events.

- Polling App: Members of a family can create polls for other family members to participate in. We see this being used for things like planning family events, picking a movie for a family night, picking out meals to eat for the week from a list of possibilities, etc.
- Shopping List: A simple list of items to get while at the store. Members of the family should be able to add to the list, remove items from the list, and update items. This should be a list of items with the corresponding quantities.

3 Extra Functions (if we have extra time)

3.1 Proposed Modules

- Meal Planner: For the Meal Planner module, the user would be presented with a 7 day calendar view where they can plan meals for the week. This could work with the shopping list with the ability to export the ingredients needed for each meal to the shopping list with appropriate quantities. We see users having the ability to add their own recipes as well as publish them to be used by other families.
- Family Chat: The Family Chat module would be a simple group chat feature, where families can have a conversation that doesn't clog up their SMS inboxes as well as be available to family members without phone access.
- Shared File Uploads: With this module, family members would have the ability to upload files that others in the family would be able to access. It could be anything from a shared photo album to a vacation itinerary.

4 Functional Requirements

FR.1

Function	The system must provide user registration
Description	User should be able to sign up with a username, password and app pertinent data.
Inputs	Username, password, email, name
Source	Form fields populated by user
Outputs	None
Action	User is presented with a form to register with the application. Data is submitted to the server to create a user record in the database.
Error Handling	If a record exists with the username or email, an exception will be thrown. The error should be displayed to the user asking for a different value.
Precondition	User does not exist with identifying information
Postcondition	User is created with information provided
Side Effects	None
Related Requirements	FR.2, FR.3

FR.2

Function	The system must provide user authentication
Description	User should be able to sign in with username and password.
Inputs	Username, password
Source	Form fields populated by user
Outputs	A session with a session ID granting access to authenticated users.
Action	User is presented with a form to sign in. Data is submitted to the server to login the user. Upon successful authentication, a session is created and stored in the database.
Error Handling	If the user provided credentials are incorrect a 401 http code will be returned. User should be notified credentials were incorrect.
Precondition	Unauthenticated user. Access to application prevented
Postcondition	User authenticated, session created, and access allowed
Side Effects	None
Related Requirements	FR.1, FR.3

FR.3

Function	The system must allow a user to delete their data.
Description	Users should be able to delete their account and any related data. This action should be authenticated to ensure only the user requesting can delete their user.
Inputs	username, password
Source	Form fields populated by user
Outputs	None
Action	User is prompted to re-authenticate. Request is sent to server with credentials to delete the user. Upon successful authentication, the user is deleted from the database and is removed from any families.
Error Handling	If authentication fails, server will return a 401 http status, and an appropriate message should be presented to the user.
Precondition	User exists in the database and has access to resources
Postcondition	User and all related data no longer exists and access is removed
Side Effects	Families the user is owner of will be deleted. (To prevent, ownership should be transferred before account deletion)
Related Requirements	FR.2, FR.1

FR.4

Function	The system must allow creation of a family
Description	Users should be able to create a family entity
Inputs	Family name, timezone, all member event color
Source	Form fields populated by user
Outputs	A family entity with appropriate modules created
Action	User is presented with a form to choose a name, timezone, and color picker. Data is submitted to the server to create a family.
Error Handling	If there is an error creating the family record in the database a 500 error will be thrown from the server. UI should present an appropriate message and ask user to resubmit.
Precondition	Family entity does not exist
Postcondition	Family entity has been created
Side Effects	None
Related Requirements	FR.5

FR.5

Function	The system must allow addition of family members
Description	Users should be able to invite other users to become part of their family
Inputs	Username/email of user to invite, and family id to add user to
Source	Username/email supplied through form by user, family id provided from vue store
Outputs	Email to user invited if they exist, nothing if user does not exist
Action	User asked to supply email or username for user to invite. Email sent with active family id to server. If username is provided, a lookup to get email will be done. Email will be sent to user with invite code. No indication of user existing will be returned to requesting user. Alternative to email invite is through unique family invite code that user can share. Invited user inputs invite code into form and is added to family with invite code.
Error Handling	Errors will not be presented to requesting user. If invited user uses an invalid invite code, a 400 http code will be returned from the server, and an appropriate message should be presented to user
Precondition	User is not part of the family
Postcondition	User is invited to family. If join is requested, user is added to family.
Side Effects	
Related Requirements	FR.4, FR.6

FR.6

Function	The system must be able to send invites via email
Description	Upon receipt of an invite request from a user, the system should send an email inviting another user to join a family with a unique invite code. If the user is not already a member, the user will be asked to create an account before joining the family.
Inputs	Email address of user, invite code
Source	Email address will provided by inviting user or will be retrieved from database based on username provided by requesting user. Invite code will be generated on the server side.
Outputs	Email to invited user.
Action	Invite request is received. Invite code is generated. Email is sent to invited user with invite code.
Error Handling	If an invalid email is sent, the server will respond with 400 http status.
Precondition	The invite code does not exist
Postcondition	An invite code is generated and sent to the user.
Side Effects	None
Related Requirements	FR.5, FR.7

FR.7

Function	The system must accept an invite code to join a family
Description	A user should be able to enter an invite code received either via email or from the owner of a family and join a family.
Inputs	Username, invite code, and event color
Source	Username will come from the vue store after the user has logged in, the invite code and user event color will be submitted through a form field
Outputs	None
Action	User is presented with a form to enter the invite code and a color picker to pick an event color for their events in the family. Data is submitted to the server and an entry is created linking the user to the family.
Error Handling	If an invite code that is not valid is received by the server, the server should return a 400 http response. An appropriate error message should be displayed to the user.
Precondition	The invited user is not linked to the family
Postcondition	The invited user has been linked to the family
Side Effects	None
Related Requirements	FR.6, FR.5, FR.4

FR.8

Function	The system must allow family role assignment
Description	A family admin should be able to assign roles to members after they have joined the family. Family roles should be one of: FAMILY_ADMIN, ADULT, CHILD. FAMILY_ADMIN should have the highest authority and should be authorized to perform all tasks excluding family setting management. ADULT role should be authorized to edit all events created in the family, including removing them. CHILD role should be able to edit only events they create and items added to lists should require approval by a user with ADULT or higher privileges.
Inputs	Username, role
Source	Form field values from user requesting change
Outputs	None
Action	User will be presented with a list of users and their current roles in the family. User edits role and saves changes. Changes are received on the server and roles updated in the database.
Error Handling	If there is an error processing the request a 500 http respsonse will be sent from the server. An appropriate message should display to the user.
Precondition	User with prechange role
Postcondition	User with edited role is saved to database
Side Effects	Privileges will either be added or removed depending on edited role
Related Requirements	FR.4, FR.5

FR.9

Function	The system must allow ownership transfer of family
Description	User should be able to transfer ownership to another user in the family. This request should be authenticated to ensure only the current family owner can perform this task.
Inputs	Authenticated user, family id, username to transfer to
Source	Form fields populated by user
Outputs	None
Action	User selects user to transfer to, family id is added to request from vue store, and user authenticates via username and password. Data is submitted to the server where the transfer of ownership occurs.
Error Handling	If there is an error authenticating, a 401 response is returned. If there is an error processing the request, a 500 response is returned. An appropriate message should be displayed to the user.
Precondition	Ownership of family belongs to current owner.
Postcondition	Ownership of family is transferred to requested user.
Side Effects	Original owner of family will change to FAMILY_ADMIN role without ownership privileges.
Related Requirements	FR.3, FR.5, FR.8

FR.10

Function	The system should allow users to belong to multiple families
Description	Users should be able to create and join as many families as they would like.
Inputs	
Source	
Outputs	
Action	If creating, same as FR.4. If joining, same as FR.7
Error Handling	
Precondition	
Postcondition	
Side Effects	
Related Requirements	FR.4, FR.7

FR.11

Function	The system should allow "CRUD" features of to-do items
Description	Users should be able to create, read, update, and delete to-dos. The to-do should be added to the family to-do list in the case of creation and removed in the case of deletion.
Inputs	Data to create/update a new to-do. Id of to-do if request is to delete.
Source	Form fields populated by user.
Outputs	Updated list of to-dos.
Action	User is presented with a form to create or update a to-do. User fills out fields and data is submitted to the server. Server creates or updates the to-do, and an updated list of to-dos is returned. If delete request is sent, to-do is deleted and update list returned.
Error Handling	If an error occurs while processing a to-do operation request, a 500 response is returned. If the user is not authorized to update/delete the to-do, a 401 status will be returned. An appropriate message should be displayed to the user.
Side Effects	Any user with a list of data from before changes will have stale data.
Related Requirements	None.

FR.12

Function	The system should allow CRUD features of calendar events
Description	Users should be able to create, read, update, and delete a calendar event. The event should be added to the family calendar in the case of creation and removed in the case of deletion.
Inputs	Data to create/update a new calendar event. Id of calendar event if request is to delete.
Source	Form fields populated by user.
Outputs	Updated list of calendar events.
Action	User is presented with a form to create or update a calendar event. User fills out fields and data is submitted to the server. Server creates or updates the calendar event, and an updated list of events is returned. If delete request is sent, event is deleted and update list returned.
Error Handling	If an error occurs while processing a calendar event operation request, a 500 response is returned. If the user is not authorized to update/delete the event, a 401 status will be returned. An appropriate message should be displayed to the user.
Side Effects	Any user with a list of data from before changes will have stale data.
Related Requirements	None.

FR.13

Function	The system should allow assignment of to-dos and calendar events to multiple users.
Description	Users should be able to assign multiple users to a calendar event and to-do list items. If multiple users are assigned, the visual color indicator should reflect multiple assignees. If the entire family is assigned, family color should be used.
Inputs	Id of event/to-do, usernames to assign
Source	Form field data supplied by user.
Outputs	Updated list of calendar events/to-dos.
Action	User edits a calendar event/to-do and adds/removes one or more users as assignees. User saves changes and data is submitted to server. Server updates database to reflect changes and returns updated list.
Error Handling	If an error occurs while processing a calendar event/to-do operation request, a 500 response is returned. If the user is not authorized to update/delete the event, a 401 status will be returned. An appropriate message should be displayed to the user.
Precondition	Zero or more assigned people exist on the calendar event/to-do
Postcondition	A different list of assigned people exist on the calendar event/to-do
Side Effects	Any user with a list of data from before changes will have stale data.
Related Requirements	FR.11, FR.12

FR.14

Function	The system should allow filter of calendar events/to-dos.
Description	User should have the ability to filter calendar events/to-dos by user
Inputs	Usernames to include, family id
Source	Usernames received from dropdown selections, family id sent with request from vue store.
Outputs	A list of filtered calendar events/to-dos.
Action	User selects one or more users to filter. Upon focus lost from dropdown, request sent to server. Server processes request and returns list of calendar events/to-dos.
Error Handling	If an error is encountered when processing request, a 500 error response will be returned. An appropriate message should be displayed to the user and current displayed events should remain.
Precondition	Unfiltered events are shown.
Postcondition	Filtered events are shown.
Side Effects	None.
Related Requirements	FR.11, FR.12, FR.13

FR.15

Function	The system should provide CRUD operations for polls.
Description	Users should be able to create a family poll with up to four options. The poll should be sent to all users in the family to vote. Only one vote should be recorded for every user. Poll should not allow updates after any votes are received.
Inputs	Data to create/update a poll. Id of poll if request is to delete.
Source	Form data submitted by user.
Outputs	Updated list of open polls.
Action	User is presented with a form to create or update a poll. User fills out fields and data is submitted to the server. Server creates or updates the poll, and an updated list of poll is returned. If delete request is sent, poll is deleted and update list returned.
Error Handling	If an error occurs while processing a poll operation request, a 500 response is returned. If the user is not authorized to update/delete the poll, a 401 status will be returned. An appropriate message should be displayed to the user.
Side Effects	Any user with a list of data from before changes will have stale data.
Related Requirements	None.

FR.16

Function	The system should allow users of a family to vote in a poll
Description	Users should be able to vote in family polls. Users should be able to update their choice until the poll closes. The user should only record one choice per poll.
Inputs	Poll id, username of voting user, id of choice.
Source	Form fields submitted by the user.
Outputs	Updated poll list.
Action	User opens a poll, chooses an option and submits their choice. Data is submitted to the server and the user's response is recorded. An updated list of polls still open is returned to the user.
Error Handling	If an error occurs while processing a poll operation request, a 500 response is returned. An appropriate message should be displayed to the user.
Side Effects	None.
Related Requirements	FR.15

FR.17

Function	The system should allow users to filter polls.
Description	Users should be able to filter polls by their vote status and poll status. In this instance vote status is defined as whether or not the user has voted on the poll yet. Poll status will either be open or closed. Default view should be polls that are still open with polls not voted on at the top.
Inputs	Poll status, vote status, username, family id.
Source	Poll status and vote status provided through drop down selection. Username and family id provided from vue store.
Outputs	Filtered list of polls.
Action	User selects one or more statuses to filter. Upon focus lost from dropdown, request sent to server. Server processes request and returns list of polls.
Error Handling	If an error occurs while processing a poll filter operation request, a 500 response is returned. An appropriate message should be displayed to the user.
Precondition	Unfiltered polls are shown.
Postcondition	Filtered polls are shown.
Side Effects	None.
Related Requirements	FR.15, FR.16

FR.18

Function	The system should provide CRUD operations for shopping lists
Description	Users should be able to create a shopping list and add/remove items. Items should contain both a description and a quantity needed.
Inputs	Data to create a shopping list item. Id of item and id of list if request is to delete.
Source	Form fields populated by user
Outputs	Updated list of items.
Action	User is presented with a form to add a shopping list item. User fills out fields and data is submitted to the server. Server creates an item and sends back an updated list. If update, user edits the data or increments/decrements the quantity needed and a request is sent to the server. Server updates the items data and sends back an updated list. If delete, user clicks the delete option of the item. A request is sent to the server, the item is removed from the database, and an updated list is returned.
Error Handling	If an error occurs while processing, a 500 response is returned. If the user is not authorized to add/remove an item, a 401 status will be returned. If the family is not found a 404 response will be returned. An appropriate message should be displayed to the user.
Side Effects	Any user with a list of data from before changes will have stale data.
Related Requirements	None.

FR.19

Function	The system should allow multiple lists per family.
Description	Users should be able to create multiple shopping lists and label them. A default shopping list should be created with the label "Family Shopping List." This list should not be delete-able.
Inputs	A label for the shopping list, and a minimum security level to add/remove/view items from the list.
Source	Form field data supplied by a user.
Outputs	A list of shopping lists.
Action	User fills out a form with the necessary data to create a new shopping list and a request is sent to the server. The server processes the request and sends back the new list of shopping lists.
Error Handling	If an error occurs while processing, a 500 response is returned. If the user is not authorized to add/remove a list, a 401 status will be returned. If the family is not found a 404 response will be returned. An appropriate message should be displayed to the user.
Side Effects	Any user with a list of data from before changes will have stale data.
Related Requirements	FR.18

5 Non-Functional Requirements

NFR.1

Function	The system should return responses in less than 0.1 seconds
Description	After the user has submitted any request to the server, a response should be returned in less than 0.1 seconds, based on current Web App response time trends.
Inputs	User request data.
Outputs	Response data.
Action	User request is received. Work is completed on the server and a response is returned.
Error Handling	If an error is encountered while processing, an appropriate http error response will be returned from the server. An appropriate error message should be returned.
Related Requirements	FR.1 - FR.17

NFR.2

Function	The system should have a 0% failure rate with 500 error code
Description	The server should respond with a 500 error code 0% of the time. Exceptions should be caught and handled appropriately to prevent 500 error codes.
Inputs	N/A
Outputs	N/A
Action	N/A
Error Handling	Server errors should be caught and dealt with appropriately to prevent server from crashing and returning error code 500.
Related Requirements	FR.1 - FR.17

NFR.3

Function	The system should have a 0% data corruption rate upon operation failure.
Description	When an error is encountered while processing a request, necessary steps should be taken to rollback the database commit to prevent data corruption. An appropriate error message should be returned and the user should be asked to resubmit.
Inputs	N/A
Outputs	N/A
Action	N/A
Error Handling	Exception should be caught, commit rolled back, and appropriate message sent to user.
Related Requirements	FR.1 - FR.17, NFR.2

NFR.4

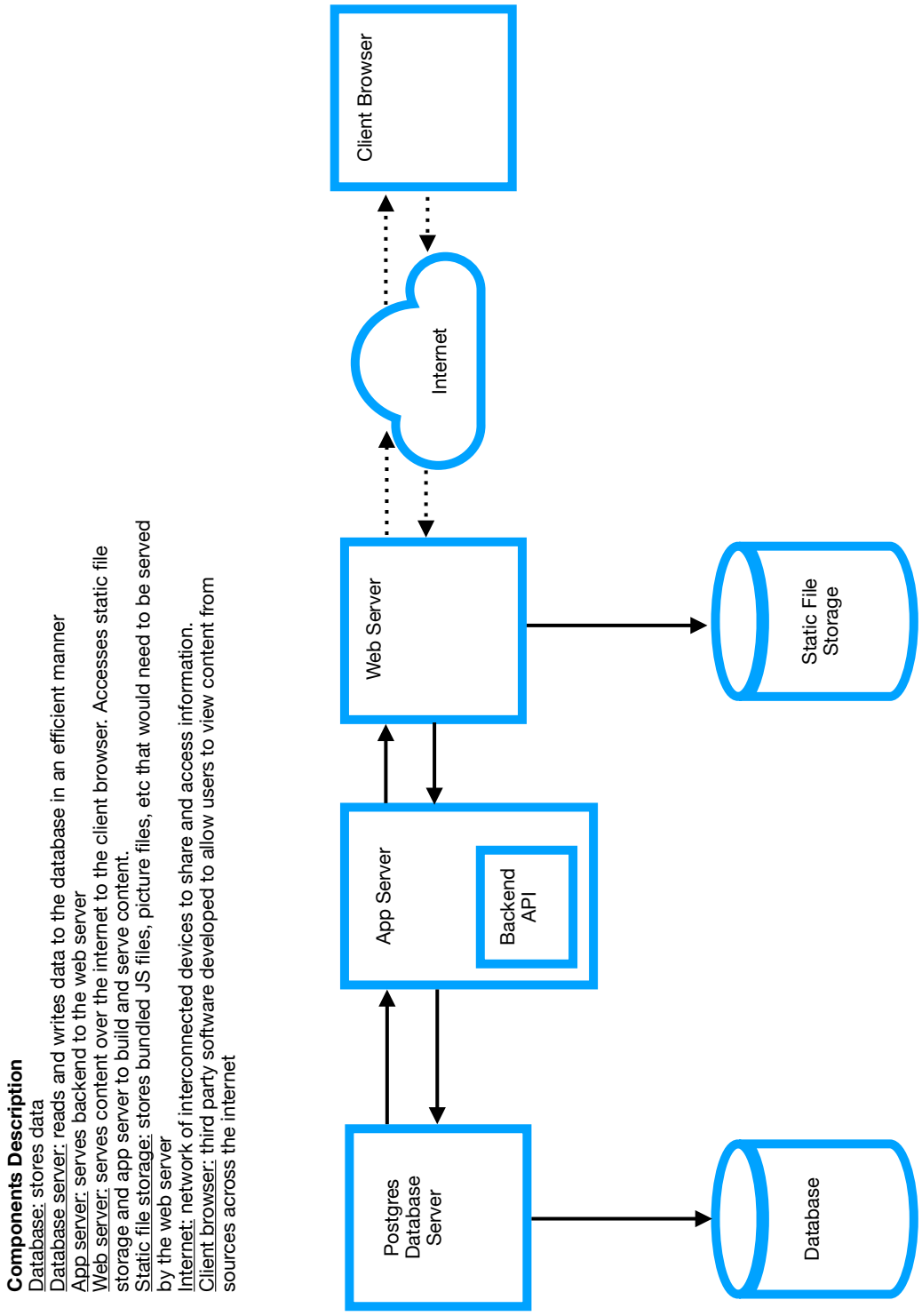
Function	The system should prevent access to family data to which they are not family members.
Description	Users should only be able to view family data from families they are linked to.
Inputs	User credentials
Outputs	Data requiring authentication
Action	If a user attempts to access data they should not, a 401 http response code should be returned and use should be routed to the previous page they were on or to the login page if not authenticated.
Error Handling	If an authorization issue occurs, a 401 error code should be returned.
Related Requirements	FR.3 - FR.17

NFR.5

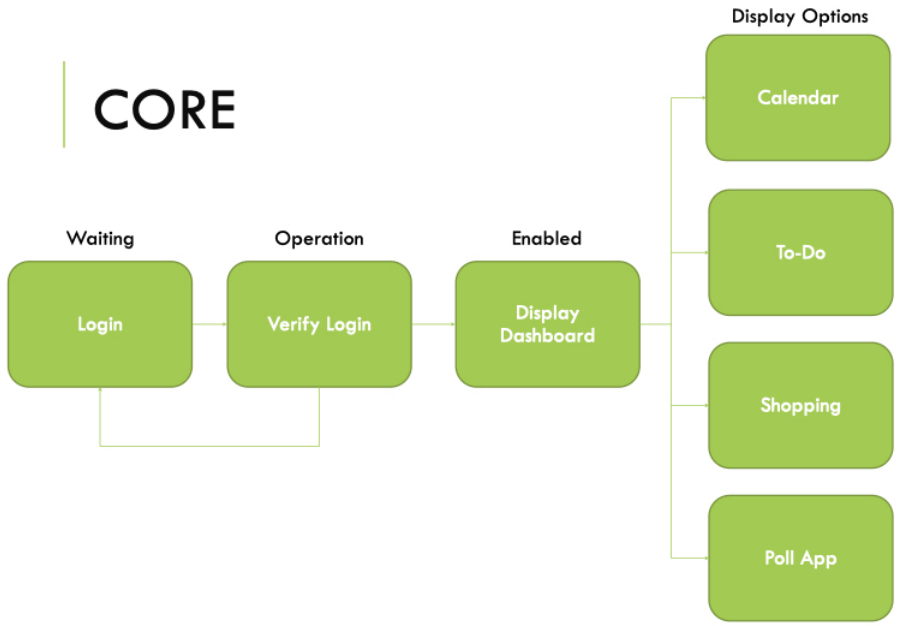
Function	The system should prevent users from accessing data and features their roles do not allow
Description	Users with CHILD access should only be able to create new events/to-dos/polls and edit/delete events/to-dos/polls they created. ADULT role users should be authorized to perform all tasks allowed by a CHILD in addition to editing/deleting events/to-dos/polls of other users in the family. Users with FAMILY_ADMIN should be authorized to perform all tasks afforded to ADULT role users, and should have the authority to assign roles to other users in the family. Family settings and deletion/transferal of a family should only be accessible by the family owner. Family owners should also have all privileges available to the FAMILY_ADMIN role.
Inputs	N/A
Outputs	N/A
Action	Appropriate data and features should be hidden from users without access.
Error Handling	If a user attempts to circumvent authorization blocks, a 401 response code should be returned and the request ignored.
Related Requirements	FR.8

6 Architectural Design

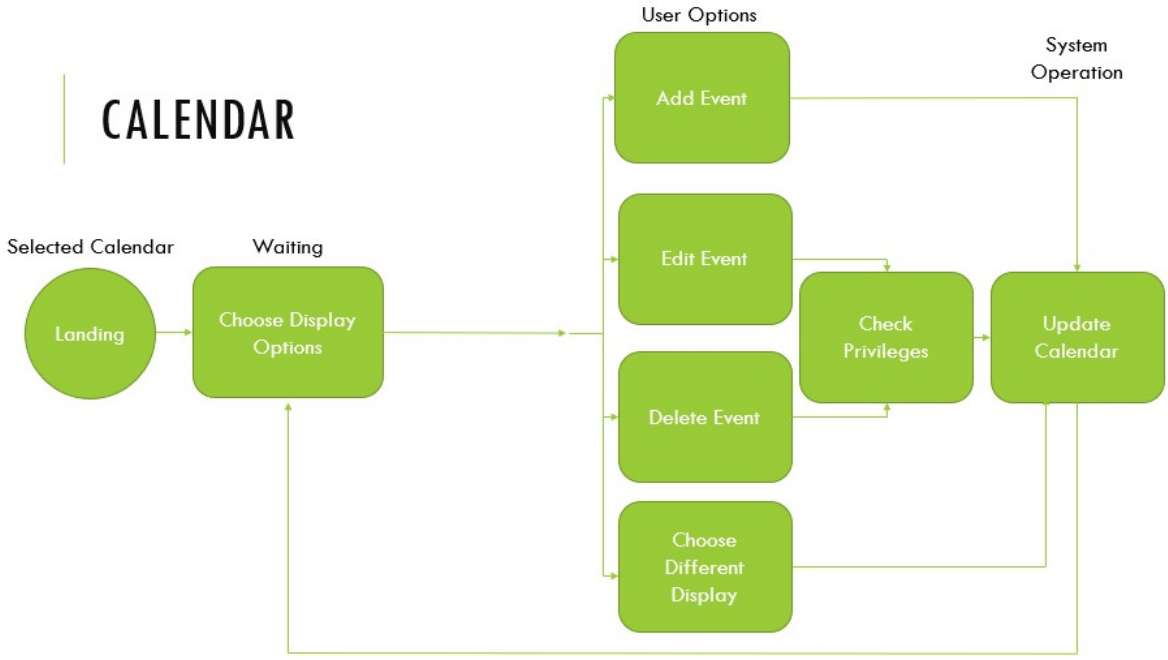
6.1 Server Architecture



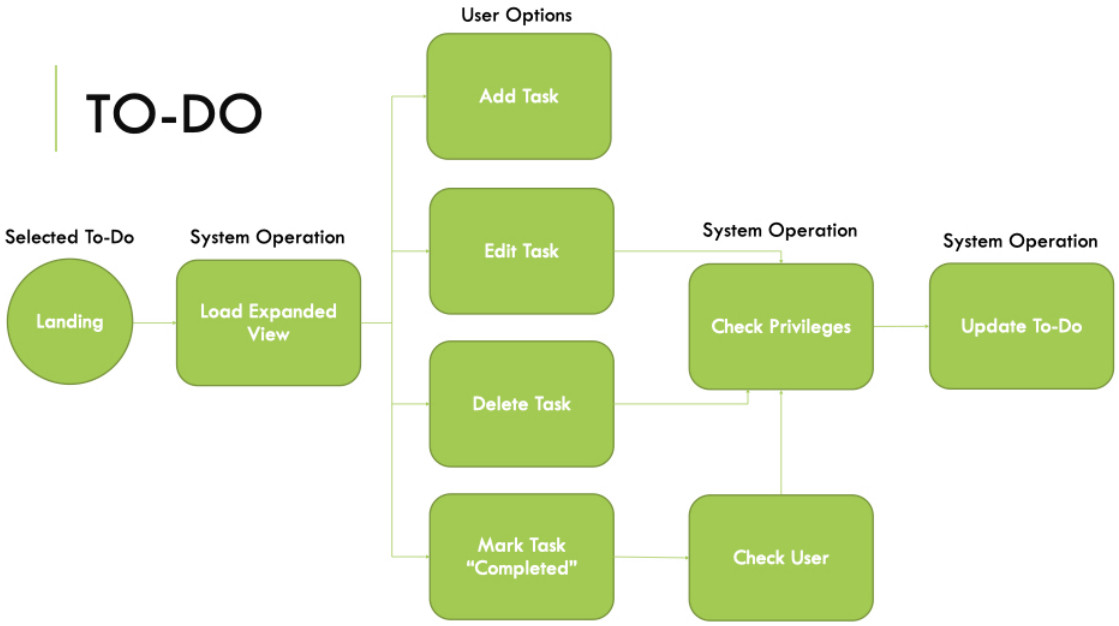
6.2 Core



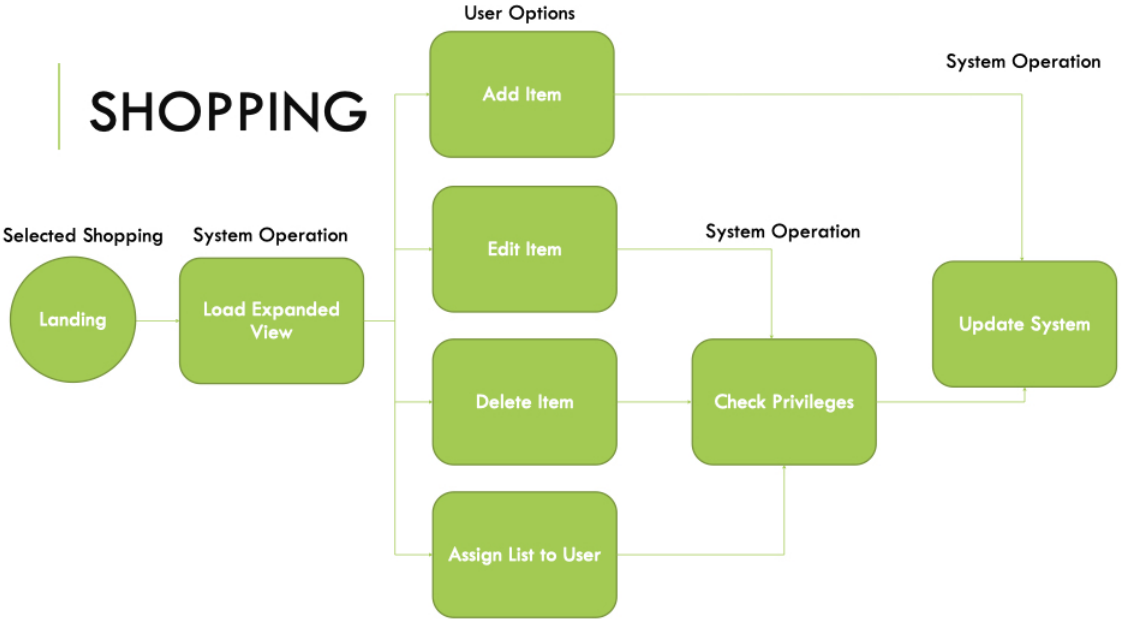
6.3 Calendar Module



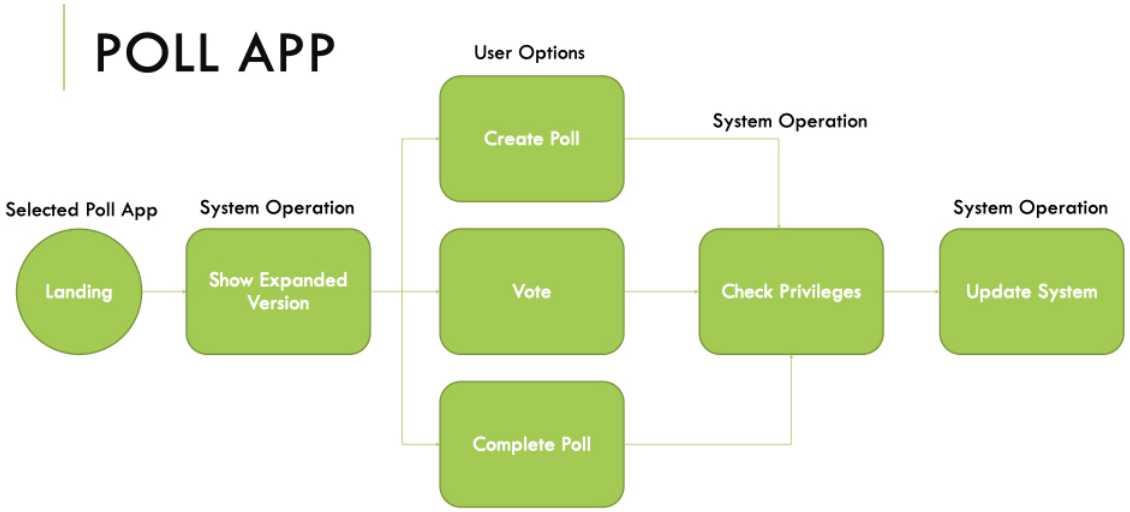
6.4 To-Do List Module



6.5 Shopping List Module



6.6 Polling Module



7 Implementation and testing

7.1 Development environment and tools

- Spring MVC(with Spring Boot): Assists interactions between Model, View, and Controller and their ability to mesh with Spring Boot.
- VueJS: Used to help the Javascript files integrate well with the user components written on the front-end.
- Vuetify: A library of User Interface components to create web applications more easily.
- Vuex: Works as a software library to be used by VueJS and aids in state management.
- Yarn: Package manager for version control between programmers.
- Maven: Build manager to simplify building and version control.
- Postgres: The database used to hold Family objects, user information, and data from all of the modules.

- Hibernate: Object–relational mapping tool used for the Java files to aid in object-oriented programming.
- Mockito: Used for mocking and testing purposes. Creates mock objects to test the Java files used by the back-end.
- Jest: Unit testing for use on Javascript programs, ensuring that they integrate with Vue and its related modules. Tests code as it is being written to ensure front-end programs run as intended.
- JUnit: Unit testing to test the functionality of the Java programs in our project as they are being written. Used in regards to programs written on the back-end.
- Cypress testing: Used for end-to-end testing to ensure front-end and back-end can interact as intended.

7.2 Algorithms used and their description

- BCryptPasswordEncoder: Adaptive hashing algorithm used to encode the password
- Built in collection algorithms: Used for sorting, filtering, mapping, etc.

7.3 Reused components

7.4 Methods being reused

- CheckPrivileges(): Check role of the user to determine if they have the access to perform a task.
- search(): Some modules that can end up being long and difficult to navigate (such as calendar) have a search() function to look for a specific object within the module.

Open source code being reused

- SpringMVC: Used to manage Model, View, Controller interactions to ensure it runs with SpringBoot.
- ChartJS: ChartJS is seen in places such as the polling app to visualize data being collected for the family object.
- Vuetify components: Vuetify is used for simple UI functions that we build off of.
- Axios: Used as an http client to interact with the web.
- Vuex Store: Used to manage application state to ensure it runs with the Vue framework.

8 Testing scenarios and results

8.1 Unit Testing

We have hundreds of test cases and tests, but have only included a few of the key tests and related test cases to give a basic idea. There are currently plans to make more tests as each module such as shopping list, calendar, and polling.

- Sign up: Tested ability to create a new account via the registration page. Sign up works for any user, regardless of whether or not they have a family invite code.

- Password validation: Checking the standards for the passwords of new users. Inserted several different inputs in the password field on the user registration page. Criterion we settled on for passwords is as follows:
  -Only accept the input if it had between 12-32 characters
  -At least one lowercase and uppercase letter
  -At least one number
  -At least one special character

- Password confirmation: Checking the ability to log in for an existing user. Attempted submitting the registration form with passwords that did not match. It did not allow submission and displayed an error

- Creation of a family object: Creating a family object makes you the admin of said family. It also allows you to generate an invite code which can be sent to new or existing users.

- Deleting an item from the shopping list: Removed an object from a shopping list by selecting the delete icon. The item the disappeared from the list.

- Account deletion: Wanted to check if the data for the account was properly deleted when done so in the user settings. We created and then deleted a user account. Accessed the database to confirm the account and the data associated with it was gone

- Child role privileges: Tests using a child account to ensure children do not have abilities to delete items such as tasks, events, or family objects. Checked to make sure the child role's restrictions worked as intended. Attempted several deletion events with an account that has a Child role in a family. Ability to delete a family, list, or event is not available for the child role.

- Adult role privileges: Adult role has more privileges than the Child role but does not have admin access to the family account. Tested with a mock adult account to ensure that users with the Adult role could interact with the modules and had the ability to create, edit and delete. Adults do not have the option to generate a registration code for the family object, nor do they have the ability to create polls.

- Admin role privileges: Admin role has the most privileges and is most likely the user who created the family object. Tested to ensure they have the ability to edit family objects. Also tested generation of registration codes by sending an invite to a different account, which allows the addition of a new user to the family object.

- Admin role privileges: Admin role has the most privileges and is most likely the user who created the family object. Tested to ensure they have the ability to create, edit, and delete family objects. Also tested generation of registration codes by sending an invite to a different account, which allows the addition of a new user to the family object.

- Creating a poll: Permissions are only granted to the owner of a family account to create a poll. Other users in that family, regardless of role, can interact and vote on that poll before the set end time of voting.

8.2 Integration Testing

Integration testing is handled via open source software we use. This ensures that code is always being tested as we are writing it. SpringMVC ensures that interactions run smoothly between the Model, View, and Controller. Jest and JUnit respectively are used to ensure Javascript and Java files can be tested before running them. Any of the software we use will throw errors if they did not integrate well with our current program.

8.3 Test Cases

- Email: dbiart.47@gmail.com
  Name: Jim ChildRole
  Role: Child
  Family: ChildRole Family
  The goal is of this role is to ensure that child role functions as intended.

- Email: beesdoingart01@gmail.com
  Name: Tim AdultRole
  Role: Adult
  Family: AdultRole Family
  The goal is of this role is to ensure that adult role functions as intended.

- Email: Biart23@live.MissouriState.edu
  Name: GimGam AdminRole
  Role: Admin
  Family: AdminRole Family
  The goal is of this role is to ensure that admin role functions as intended.

- Calendar event: Take Jim ChildRole to soccer practice
  Recurring: Yes
  Time: 4:30pm
  Date: Every Tuesday Thursday
  To ensure calendar can run recurring events.

- To do list: Mow the lawn
  Appears on the user: Tim AdultRole
  To test to do list's ability to create, edit and delete tasks.

- Shopping List: Buy milk, eggs, and butter
  To test shopping list's ability to create, edit, and delete.