An ecommerce web app where owners of antique furniture can list their items on the website for sale to including necessary information (dimensions, photos, etc). Once they register their item on the website, others will be able to see all the available items for sale.

* Users have to have an account (signup, login) to post the furniture they want to sell.
* The items can be categorized by furniture type (beds, tables, desks, chairs, chests, nightstands, cabinets, etc.)
* A search bar to search for items.
* A filter for furniture type, cost, year (period), etc.,
* Authenticated users can list their items for sale with pictures of their items, a detailed description of the item, cost, condition, and other sorts of information like the estimated year it was made, contact info for additional inquiries, material of the item (type of wood)
* Customers can add the items to their shopping cart, providing their shipping address, payment info, additional delivery instructions, and other necessary details so it can be delivered to the customer.

Summary of features

* Authentication (username, password, email)
* Search bar
* Filter
* Category for furniture type
* Shopping cart
* Item description, cost, condition, material
* Shipping address
* Purchase History
* Listing History
* Stripe integration for credit card processing (BACKEND)
* Customers can be notified of new furniture available that has been posted

Technology:

* Frontend: React
* Backend: Go with MongoDB

**Backend**

In the first phase of my project, I created high level outlines and diagrams to visualize how my web app would work. I needed to make sure I had my scope in front of my eyes, all the features and processes drawn out, so that when I went to implementing it, I wouldn't be stuck deciding what to do next and ending up failing because of scope creep.

So, in my User Activity Diagram, I outlined the general flow of processes for an authenticated user and a guest visiting site. Nothing too detailed yet, but just enough information to understand how the web app works.

I wanted to implement the backend first and the login and signup part seemed the most fundamental to tackle first, so I thought about what the form data would look like in the request. I create a very basic visual, not including the extra features.

A diagram of a company

Description automatically generated

I started implementing my project by organizing my project and its directories. I have two main folders: backend and frontend. I create a new Go project in my backend and set up necessary folders for organization.

**File Structure**

|--backend/

|--api/

|--db/

|--tests/

|--types/

|--util/

|--main.go

**List of endpoints**

* POST /login
* POST /signup
* POST /logout
* POST /list\_furniture
* GET /get\_furnitures
* GET /get\_furniture/{listingID}
* GET /account
* PUT /account
* POST /checkout (with POST /checkout\_webhook for Stripe API)
* GET /account/address
* POST /account/address
* PUT /account/address
* DELETE /account/address/{addressID}
* GET /account/purchase\_history
* GET /account/purchase\_history/{orderID}
* GET /account/furniture\_listings
* POST /subscribe
* POST /unsubscribe
* GET /recent\_listing

From these list of endpoints, I tackled /login, /signup/ and /logout first, since it is the most fundamental, as most of the app’s features can only be used when authorized; it makes the most sense.

Inputs for /login and /signup should be a JSON encoded string of the user’s login and signup information, and the output should return “success” as a string, if the input is valid, or return an error for the invalid cases

A screenshot of a login form

Description automatically generatedA screenshot of a login form

Description automatically generated

The test plan for /login and /signup is to run each test case, where the payload is a single string, formatted in JSON containing the credentials and to ensure each case gets the expected result. If the credentials are valid, a “success” should be returned with a 200 code. If the payload is invalidly formatted, or fields are missing, or the credentials are invalid, it should return one of the 400 codes with an error message as a plain string.

And once the user has logged in, they also need to log out. When they’re logged in, they will have a session stored in memory, which can be retrieved from the client’s session cookie and used to index the map storing the client’s session and then be deleted, essentially logging them out.

After that, I began working on /list\_furniture. When a user creates a new furniture listing, they need to provide a bunch of information on their furniture. Here is the struct in Go.

A screen shot of a computer code

Description automatically generated

ListingID, UserID, and Bought, are the only fields that are set in the backend and which the user doesn’t have to provide

Upon a successful furniture listing creation, the listingID of the new inserted listing should be returned. ObjectIDs in Mongo are hex values and they get generated automatically for each document.

So, in the test, it checks that a string was returned. A valid test case returns a hex ID and a 200 code. Using that hex ID, we compare it against the database by searching for the document in the collection using the returned ID from the test request. The test also checks for validation of the form input and returns an error message if one or more fields is missing.

GET /get\_furnitures & GET /get\_furniture/{listingID}

Next, was writing the tests for /get\_furnitures and /get\_furniture/{listingID}. The tests for these were not complicated at all. For /get\_furnitures, the handler function queries the database listings collection to retrieve all the documents and puts them into an array and returns it in JSON. For /get\_furniture/{listingID}, it does the same thing, but only looks for one document with the listingID and returns the one object in JSON. Errors occurring during the database operation or the encoding into JSON are returned in the response with an error message and the appropriate status code.

For valid test cases, we should expect to see a 200 with the appropriate data. Invalid test cases for /get\_furniture/{listingID} really much only includes the case where the client provides an invalid listingID, in which case a status code of 400 for bad request is returned to the client. The other possible case is an HTTP method that is not GET.

Implementing the handler function includes getting the query param (for /get\_furniture/{listingID}, querying the database, storing the data in an appropriate data structure, encoding that structure into JSON, and then returning that in the response, stopping and returning any errors occurred along the way.

GET /account & PUT /account

The only data related to /account is the user’s password, phone, and email, which the user can see and update.

Writing tests for these were a bit more tedious. For GET /account, it included simulating a logged in session, retrieving the data of the test account, and then running the test case where the response from the request is then compared with the data retrieved prior to check for a match. For PUT /account, the updated data in the database is compared with the input, which is the changes the user has made to their password, phone, and/or email. Writing the implementation for GET /account was simple. For PUT /account, if a user changes their password, that new password also needs to be hashed, which I almost forgot to do. If users didn’t make any change to their information, then the input fields will be empty or nil, which means the Mongo database will not update anything.

POST /checkout & POST /checkout\_webhook

The logic for the checkout processing was complicated enough that I couldn’t write the test first because I did not know what to expect from the Stripe API, which means I didn’t know what the input and output would be for the tests initially. So, writing the implementation is what I did first.

All I knew was the user’s shopping cart would be needed to process the payment. The Stripe API has two kinds of checkout system you can use: an embedded checkout form on your website or a link to a stripe-hosted checkout page. I chose the latter since it seemed the simplest after viewing the examples on their website. In order to do use this API, information needs to be provided so that it can be displayed on the page. This means I need to retrieve all the details about each furniture listing that the user has purchased and is checking out.

The shopping is a string array of listingIDs, which then gets iterated to query the database and insert the resulting document, after being parsed, into an array of FurnitureListing, which is the same type used for listing a furniture. Now, I can access its properties and create the Stripe checkout session.

A screen shot of a computer code

Description automatically generated

When using the Stripe API, you also need to create a test account on their website to get the API key. Below is a snippet of the logic for creating a checkout session using the Stripe API.

A screen shot of a computer code

Description automatically generated

After defining the arguments for creating a checkout session, you then get a URL to the Stripe-hosted page with everything set up, which gets returned in the response to be used in the frontend.

A screen shot of a computer program

Description automatically generated

After all that, you get a page that looks like this:

A screenshot of a computer

Description automatically generated

When the user finishes and clicks the “Pay” button, the Stripe server sends a request to another endpoint, one in which you define in your Stripe dashboard on the website. I called mine /checkout\_webhook.

Because cookies aren’t sent with this request, you have to send the user’s authentication information through the Metadata property when creating the checkout session parameters.

A screenshot of a computer program

Description automatically generated

Then, you will be able to access all the authentication information in the handler function for /checkout\_webhook

A screen shot of a computer

Description automatically generated

Using this, you will be able to finalize the checkout, such as updating the furniture listing, creating a receipt stored in the database, and adding the purchase to the user’s purchase history.

When writing the test for this, my goal was to check if the /checkout endpoint would return the proper response, which is the link to the Stripe-hosted checkout page. I think it’s almost impossible to actually test, besides doing it manually, because each time a different link is returned. So, instead, I just made sure to check my API responded appropriately to invalid inputs for /checkout.

GET /account/address, POST /account/address, PUT /account/address, & DELETE /account/address/{addressID}

The /address endpoint handles the user’s addresses, which I thought I would be able to use to autofill the Stripe checkout form shipping address field, but apparently, after I found out too late, it is impossible to prefill it. So, this feature was kind of pointless. I left the code for it, though, as it still works as expected, excluding the shipping address field autofill.

Users can create shipping addresses, have at most one default address (to be used for the autofill), and can edit and remove addresses, as well as change their default address.

Writing tests for these were not complicated. For GET, I compare the result returned by the server to the data held in the database. For POST, I check to make sure a 200 and “success” was returned, which means the new address was inserted correctly into the database. For PUT, I compare the input to the new data in the database to ensure that data in the database reflected the changes in the input. And for DELETE, I check to make sure I get a 200 and a “success” for the delete operation, and then use the addressID that was given as input to query the database and check that I get no documents returned when filtering by the ID; that means it was deleted successfully.

Implementation was straightforward, based on the tests. PUT /account involved a bit more work than the others because the input validation required more logic to consider. If the input was empty, then that means no changes were given, so an error must be returned. If the changes included setting a new default address, then I’d have to mark the old default address as invalid and set the provided address as the new default address.

GET /account/purchase\_history, GET /account/purchase\_history/{orderID}, & GET /account/furniture\_listings

These endpoints handle the user’s history of all the furniture they’ve purchased and have listed.

When a purchase order is finalized in /checkout\_webhook, a receipt is created with a reference to the buyer’s userID, which is just called userID in the database, and a reference to the seller’s ID, sellerID. Then, it gets stored in the receipts collection in the Mongo database. From the database, we can retrieve a user’s purchase history by filtering with their userID and see all the documents returned. That is for GET /account/purchase\_history.

GET /account/purchase\_history/{orderID} has the same logic, except it filters with the orderID and the ID of the receipt to return one document.

GET /account/furniture\_listings has the same logic as well, but this time is queries the listings collection in the database and filters it using the user’s ID because the listing has a reference to the user who posted the listing, and then all of their furniture listings are returned.

I wrote tests for GET /account/purchase\_history and GET /account/furniture\_listings, but not for GET /account/purchase\_history/{orderID} because the code was very basic and I was confident that it wouldn’t bug out. It works.

The tests were a simple checking to make sure a 200 was returned because that means the data was retrieved and returned, encoded into JSON, without any errors.

POST /subscribe & POST /unsubscribe

These two endpoints deal with subscribing/unsubscribing the user to receive/stop receiving email notifications of each new listing. It sets the state of the subscription status.

I didn’t write any tests for either of them. The implementation for both was like 20 lines of code. The logic was very simple. Actually, they both have the same code, except it differs in one word, which is the state: true or false. Perhaps creating two different endpoints with the same repeating same code was not necessary.

A screen shot of a computer program

Description automatically generated

The code for HandleUnsubscribe is literally line 12, but instead of “true”, it’s “false.”

The actual logic for sending the emails runs during POST /list\_furniture in a separate thread, or goroutine, so that it doesn’t yield and delay the response for /list\_furniture.

Using the built-in Go net/smtp package, sending an email involves authenticating by logging into the email you’re going to use to send.

A screen shot of a computer

Description automatically generated

My password is stored as an environment variable on my system and the host is smtp.gmail.com. Once authenticated, you create the message you want to send.



Now, because I ran the function for sending emails in another goroutine, handling errors would be a bit wonky as it’s not synchronous. Because this feature of the web app – sending emails to subscribers – is not, at least I think, that important, I figured that if there is an error sending an email, then what’s the big email if the subscribers misses a notification for one furniture listing. They’ll probably just get the next one. So, I didn’t bother handling the “err” variable.

I did have the option of retrying sending the emails if an error occurred, but I don’t think it was worth it.

I didn’t write an automated test for this because I have no idea how I would write it. Instead, I just did it manually by listing a furniture on another test account and then I watched as I received the email update for the furniture listing.

GET /recent\_listing

This endpoint fetches the most recently posted furniture listing and returns it in the response. In MongoDB, the ObjectID of documents include a timestamp referring to the insertion of the document. So, by sorting the collection by \_id (ObjectID) as -1 and limiting it to return one document, it will give us the most recently added document. Below is a snippet of the code.

A screenshot of a computer program

Description automatically generated

I also did not write an automated test for this because I was confident. Besides, I would just be using the same code to retrieve the value from the database to compare with the result from the endpoint handler, and that seems redundant. I’ll see if it works, if it all works, when I make a request to the it from my frontend.

**Frontend**

To start the frontend, I created designs for how the layout for some of the more complex pages would look