CS-499 Computer Science Capstone

Module 5-2 Milestone Three: Enhancement Three: Databases

Southern New Hampshire University

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April 07, 2024

Purpose

This narrative provides a rationale for the selection of the artifact in my ePortfolio and goes along with the artifact under the Databases category. It considers the methodology employed in the creation of the artifact and emphasizes the learning process I used in the creation of the artifact.

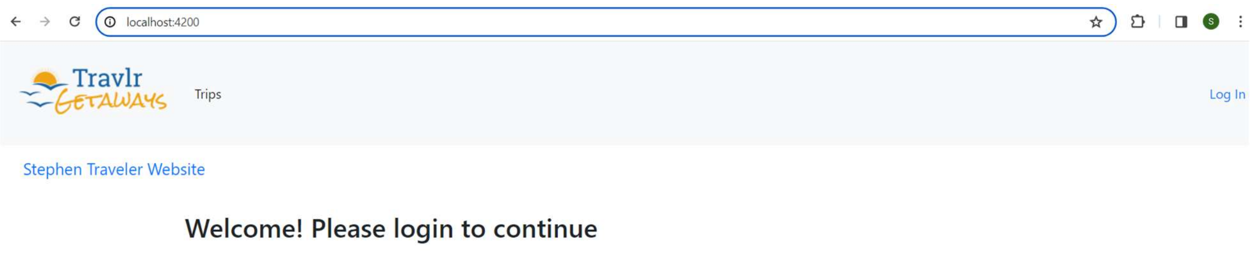
Prompt

The artifact selected for the databases is the **Traveler Website.** This traveler website was created during my computer science course, CS-465: Full Stack Development I. I took this course in the year 2023. We used an existing travel site and created a website from it. The website was developed using the JavaScript application, which uses the Node.js runtime environment with the Express framework for the back-end and the Angular framework for the front-end. I also used HTML and CSS to structure the content on the travel website pages. The application combines both Node.js (for the backend) and Angular (for the frontend), making it a MEAN (MongoDB, Express.js, Angular, Node.js) stack application. It also integrates with MongoDB using Mongoose for database operations.

I added the **traveler website** artifact to my ePortfolio because it demonstrates several valuable skills and competencies in databases to potential employers, recruiters, or educational institutions. Also, I added this artifact to my ePortfolio because I would like to effectively showcase my technical skills, problem-solving abilities, and creativity to potential employers to increase my chances of hiring. The integrated authentication mechanisms, RESTful API consumption, and dynamic content rendering, demonstrates my ability to create functional and secure web applications tailored for real-world scenarios, which employers always want to see from their employees.

Upon running the travel website, the Angular Live Development Server initiates and starts listening on localhost:4200, prompting users to open their browser and navigate to http://localhost:4200/. The server compiles successfully, generating the necessary files for the web application to function correctly. Meanwhile, in the terminal, nodemon starts monitoring changes and restarts the server accordingly. As the server runs, the application fetches data from the MongoDB database, triggering HTTP GET requests to retrieve trip information. Each request is processed, and the corresponding trips are fetched and displayed on the website.

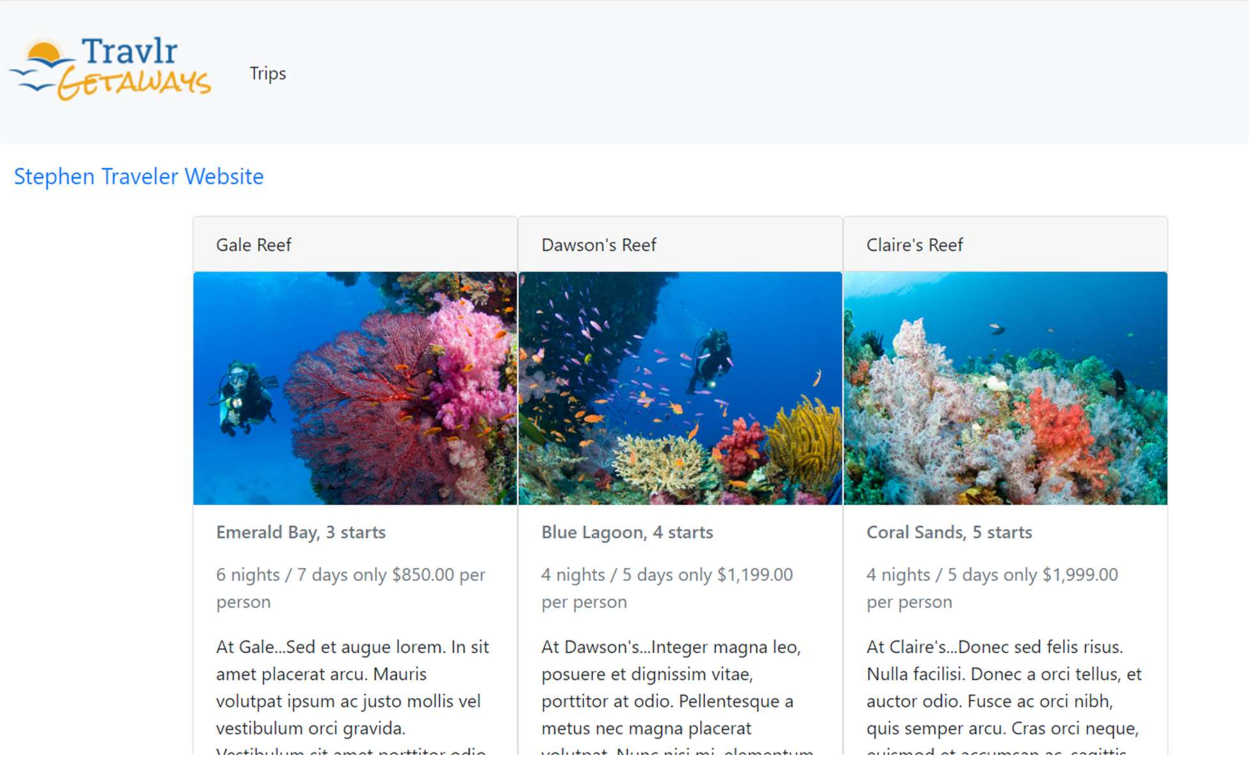
The terminal logs each request made to the API endpoint, indicating the successful retrieval of trip data with HTTP status code 304 (Not Modified). Throughout the execution, the terminal displays various warnings related to deprecated features, such as process.binding('http_parser') and the current URL string parser. These warnings are notifications for future updates or changes in the codebase to ensure compatibility and best practices. Despite these warnings, the travel website continues functioning smoothly, providing users an intuitive interface to explore different travel options.



Stephen Traveler Website

Welcome! Please login to continue

Figure 1: ***Website Welcome Page***



Stephen Traveler Website

Gale Reef

Emerald Bay, 3 starts

6 nights / 7 days only $850.00 per person

At Gale...Sed et augue lorem. In sit amet placerat arcu. Mauris volutpat ipsum ac justo mollis vel vestibulum orci gravida. Vestibulum sit amet porttitor odio

Dawson's Reef

Blue Lagoon, 4 starts

4 nights / 5 days only $1,199.00 per person

At Dawson's...Integer magna leo, posuere et dignissim vitae, porttitor at odio. Pellentesque a metus nec magna placerat volutpat. Nunc nisi mi, elementum

Claire's Reef

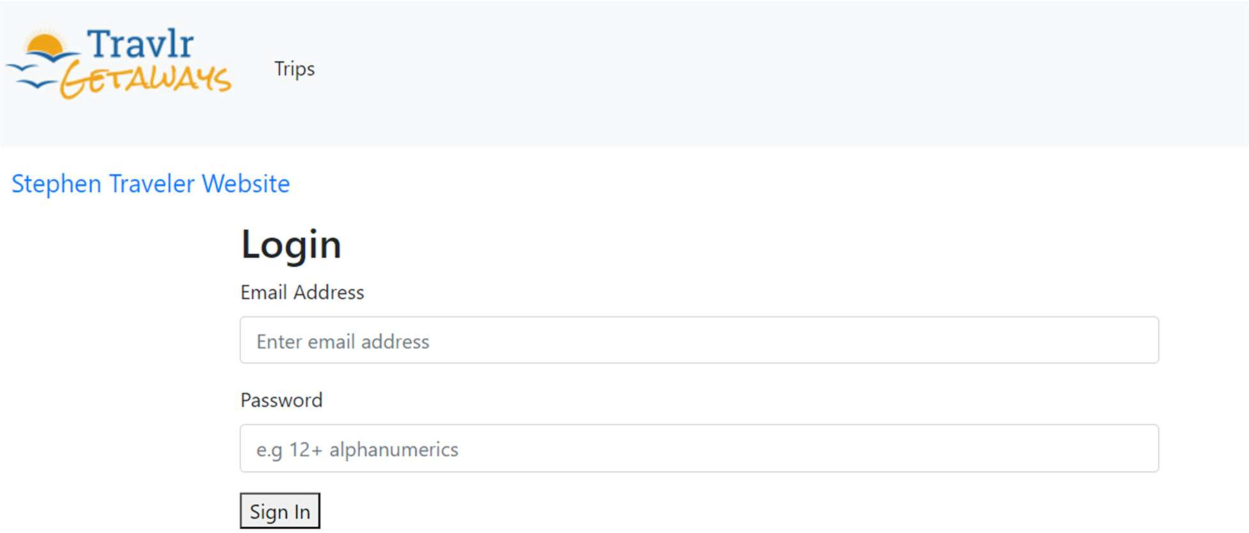
Coral Sands, 5 starts

4 nights / 5 days only $1,999.00 per person

At Claire's...Donec sed felis risus. Nulla facilisi. Donec a orci tellus, et auctor odio. Fusce ac orci nibh, quis semper arcu. Cras orci neque, euismod et accumsan ac, sagittis

Figure 2: ***Website Homepage***

You can navigate the website as a guest by clicking on the "Trips" button, which will take you to the above page. However, users cannot add or edit trips except those with an account. If a user already has an account, you can click the login button and sign in with your email and password, as shown in the screenshot below.



Stephen Traveler Website

Login

Email Address

Enter email address

Password

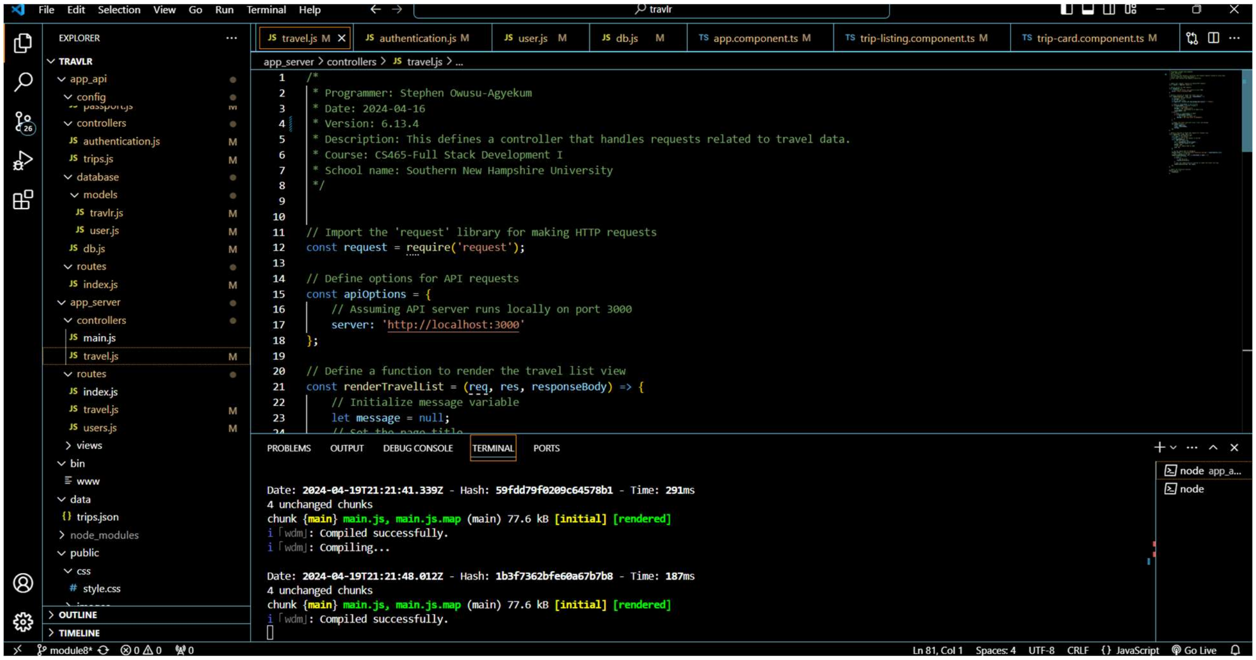
e.g 12+ alphanumerics

Figure 3: ***Website Login Page***

There are several components in the artifact that demonstrate my skills and abilities in software development. One example is implementing controller functions for CRUD operations on trips and user authentication highlights server-side logic and API development competence, including error handling, data validation, and business logic implementation.

Also, I demonstrated the skills of modularizing code into separate files for models, controllers, and middleware, along with proper organization and structuring of code. This demonstrates adherence to software engineering principles, such as separation of concerns and code maintainability.

We can also discuss the definition of schemas for trips and users, which demonstrates my skills in database schema design, and the interaction with MongoDB using Mongoose, which also showcases my knowledge of data modeling and persistency. The travel website artifact demonstrates proficiency in implementing robust input validation practices and prioritizing security measures when accessing database records. This skill reflects a security-oriented mindset, aiming to preemptively address potential exploits and safeguard sensitive data within the software architecture.



```javascript
/*
 * Programmer: Stephen Owusu-Agyekum
 * Date: 2024-04-16
 * Version: 6.13.4
 * Description: This defines a controller that handles requests related to travel data.
 * Course: CS465-Full Stack Development I
 * School name: Southern New Hampshire University
 */


// Import the 'request' library for making HTTP requests
const request = require('request');

// Define options for API requests
const apiOptions = {
    // Assuming API server runs locally on port 3000
    server: 'http://localhost:3000'
};

// Define a function to render the travel list view
const renderTravelList = (req, res, responseBody) => {
    // Initialize message variable
    let message = null;
    // Set the page title
```

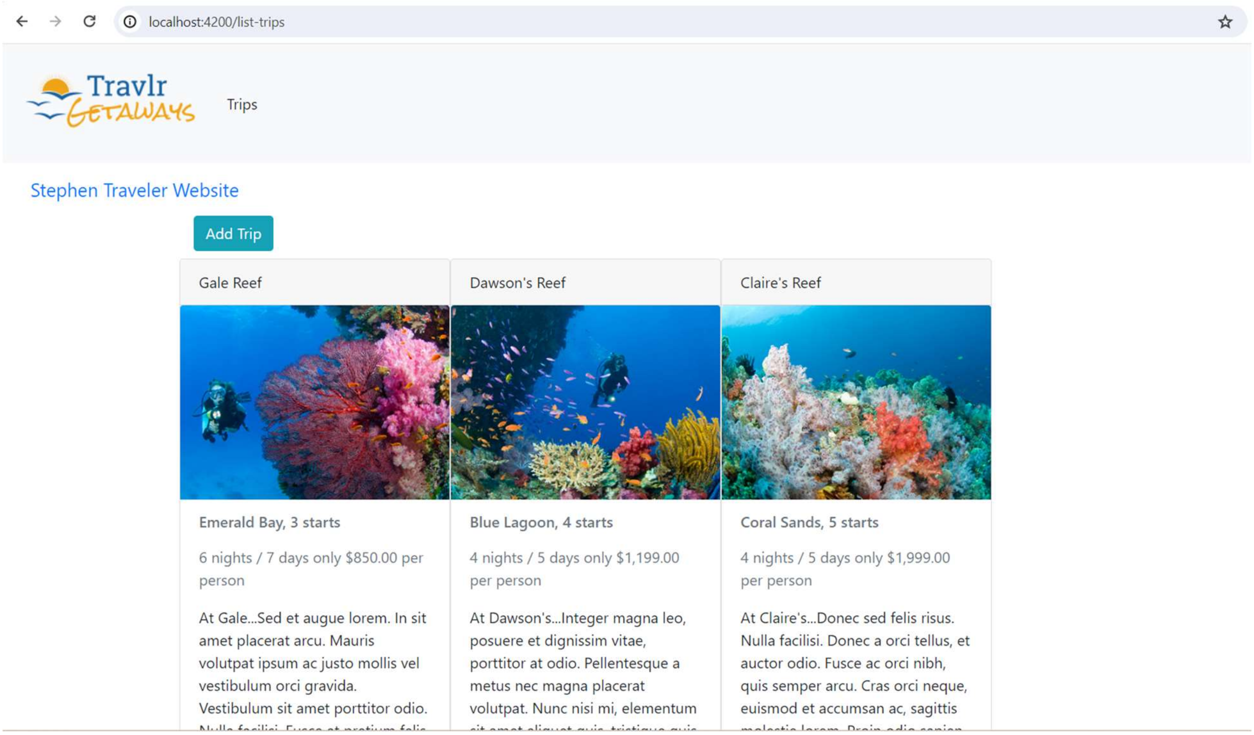
```
Date: 2024-04-19T21:21:41.339Z - Hash: 59fdd79f0209c64578b1 - Time: 291ms
4 unchanged chunks
chunk {main} main.js, main.js.map (main) 77.6 kB [initial] [rendered]
i ｢wdm｣: Compiled successfully.
i ｢wdm｣: Compiling...

Date: 2024-04-19T21:21:48.012Z - Hash: 1b3f7362bfe60a67b7b8 - Time: 187ms
4 unchanged chunks
chunk {main} main.js, main.js.map (main) 77.6 kB [initial] [rendered]
i ｢wdm｣: Compiled successfully.
```

Figure 4: ***Enhanced source code***

Several areas in the original artifact were enhanced. These include the following.

- The original artifact folders and files were not properly organized. I improved the artifact by thoroughly restructuring the folder hierarchy and file organization, introducing a more coherent and logically arranged framework for development.
- I implemented the Angular framework, which includes the addition of Angular-specific files like **'app-router.module.ts,' 'app.component.html,' 'app.component.ts,' and 'app.module.ts,'** which are ushered in modern web development practices for enhanced functionality and scalability. Additionally, I implemented a component-based architecture featuring various UI components such **as 'add-trip,' 'edit-trip,' 'home,' 'login,' 'navbar,' 'trip-card,' and 'trip-listing.'**
- I incorporated modern development tools and configurations such as **'angular.json,' 'main.ts,'** and **'test.ts.'** These tools enable efficient web application development, testing, and deployment, adhering to industry standards and best practices.

- I improved the website functionality by implementing new components and services to extend the application's functionality. For example, from the enhanced website code, I introduced components **like 'add-trip' and 'edit-trip'**, which enable users to create and modify trip entries, enhancing the application's utility for managing travel plans.
- I integrated external APIs or backend services to provide additional functionality and access to external resources.
- I improved the website authentication system by integrating Passport.js middleware for handling authentication strategies, specifically utilizing the LocalStrategy to authenticate users based on their email and password credentials that are securely stored in the database.



Stephen Traveler Website

Gale Reef

Emerald Bay, 3 starts

6 nights / 7 days only $850.00 per person

At Gale...Sed et augue lorem. In sit amet placerat arcu. Mauris volutpat ipsum ac justo mollis vel vestibulum orci gravida. Vestibulum sit amet porttitor odio. Nulla facilisi. Fusce at pretium felis

Dawson's Reef

Blue Lagoon, 4 starts

4 nights / 5 days only $1,199.00 per person

At Dawson's...Integer magna leo, posuere et dignissim vitae, porttitor at odio. Pellentesque a metus nec magna placerat volutpat. Nunc nisi mi, elementum sit amet aliquet quis, tristique quis

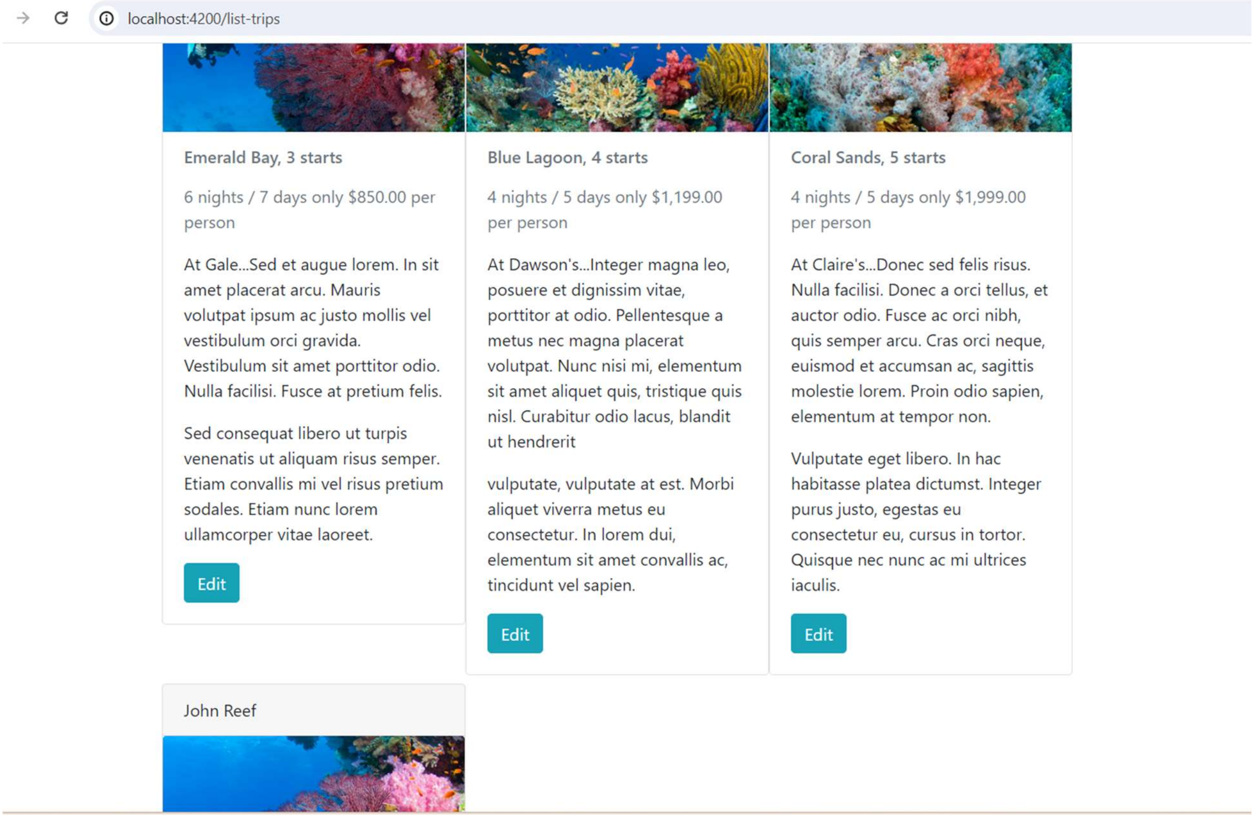
Claire's Reef

Coral Sands, 5 starts

4 nights / 5 days only $1,999.00 per person

At Claire's...Donec sed felis risus. Nulla facilisi. Donec a orci tellus, et auctor odio. Fusce ac orci nibh, quis semper arcu. Cras orci neque, euismod et accumsan ac, sagittis molestie lorem. Proin odio sapien

Figure 5: ***User Homepage of the Website***



Emerald Bay, 3 starts

6 nights / 7 days only $850.00 per person

At Gale...Sed et augue lorem. In sit amet placerat arcu. Mauris volutpat ipsum ac justo mollis vel vestibulum orci gravida. Vestibulum sit amet porttitor odio. Nulla facilisi. Fusce at pretium felis.

Sed consequat libero ut turpis venenatis ut aliquam risus semper. Etiam convallis mi vel risus pretium sodales. Etiam nunc lorem ullamcorper vitae laoreet.

Blue Lagoon, 4 starts

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vulputate, vulputate at est. Morbi aliquet viverra metus eu consectetur. In lorem dui, elementum sit amet convallis ac, tincidunt vel sapien.

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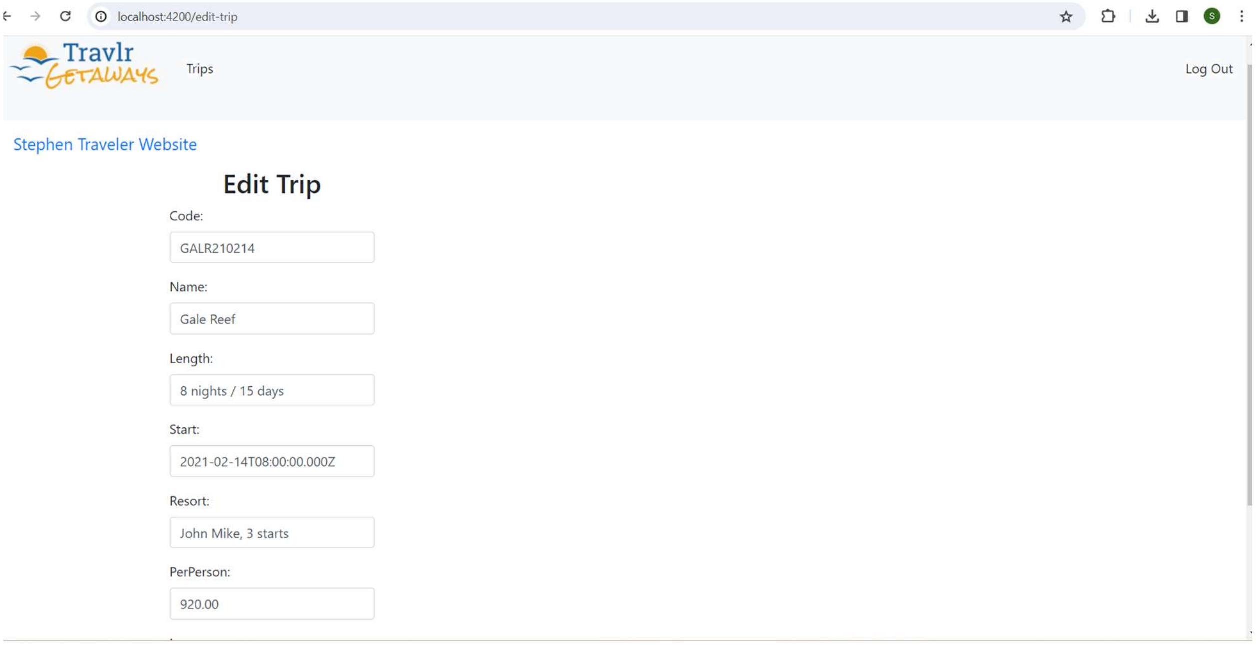
Vulputate eget libero. In hac habitasse platea dictumst. Integer purus justo, egestas eu consectetur eu, cursus in tortor. Quisque nec nunc ac mi ultrices iaculis.

John Reef

Figure 6: ***Website Edit icons.***



Stephen Traveler Website

Edit Trip

Code: GALR210214

Name: Gale Reef

Length: 8 nights / 15 days

Start: 2021-02-14T08:00:00.000Z

Resort: John Mike, 3 starts

PerPerson: 920.00

Figure 7: ***Edit Trip Page***

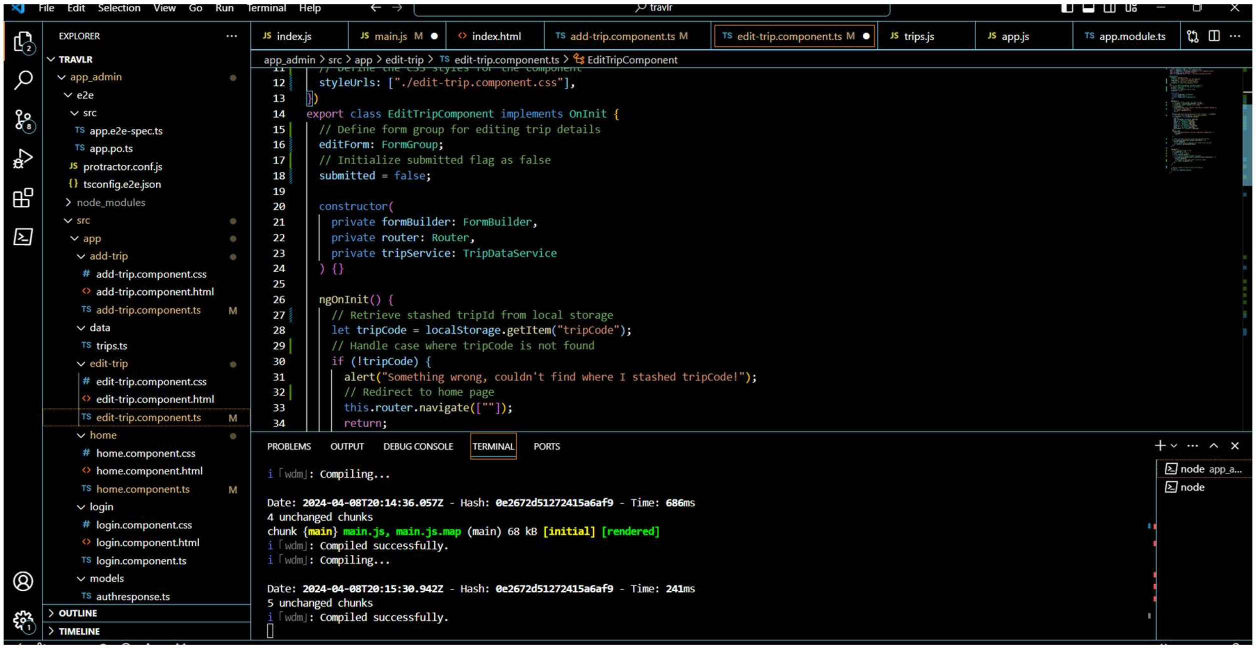
Course objectives

The enhancement of the artifact aligns closely with the course objective of developing a security mindset in software development, as it encompasses various security measures and considerations aimed at safeguarding data and resources against potential threats and exploits. This objective is achieved by implementing rigorous data validation, securing database access, promoting code reusability, and adapting security measures within the travel website, and enhancing data and resource security. For example, the website employs secure password storage techniques, such as hashing and salting, to protect user passwords stored in the database. By using these encryption methods, the website ensures that even if the database is compromised, the actual passwords remain secure and cannot be easily decrypted. Furthermore, the website follows industry best practices for user authentication, such as using JSON Web Tokens (JWT) for session management and implementing secure HTTP protocols like HTTPS to encrypt data transmitted between the client and server.

I also achieved the objective of designing and evaluating computing solutions by developing the CRUD module for handling database records. This required strategic decision-making and adherence to computer science practices and standards, demonstrating my ability to make informed choices and manage design trade-offs. I achieved this objective by carefully designing the Create, Read, Update, and Delete (CRUD) module to ensure that it efficiently handles database operations such as creating, reading, updating, and deleting records.

Another course outcome achieved is “designing, developing, and delivering professional-quality oral, written, and visual communications that are coherent, technically sound, and appropriately adapted to specific audiences and contexts.” This was accomplished by effectively documenting the development process of the travel website, including clear and concise explanations of the codebase, system architecture, and implementation details. For example, the README.md file in the repository for the traveler website provides comprehensive documentation that outlines the project's purpose, features, setup instructions, and usage guidelines. This documentation is written in a clear and concise manner, making it easy for stakeholders, collaborators, or future developers to understand the project and its components. Additionally, comments within the source code itself serve as documentation, explaining the purpose and functionality of specific functions, classes, or modules. These comments are written in a technically sound manner, using appropriate terminology and language conventions to ensure coherence and clarity.

The last objective I achieved is “demonstrating an ability to use well-founded and innovative techniques, skills, and tools in computing practices for the purpose of implementing computer solutions that deliver value and accomplish industry-specific goals.” This is achieved by leveraging specific modern web development tools and frameworks, such as Angular for the front-end and Node.js with Express for the backend. By incorporating industry-standard practices and innovative techniques, I was able to create a functional and user-friendly travel website that meets the specific goals of the travel industry, showcasing my mastery of these modern technologies.



```
  // Define the CSS styles for the component
  styleUrls: ["./edit-trip.component.css"],
})
export class EditTripComponent implements OnInit {
  // Define form group for editing trip details
  editForm: FormGroup;
  // Initialize submitted flag as false
  submitted = false;

  constructor(
    private formBuilder: FormBuilder,
    private router: Router,
    private tripService: TripDataService
  ) {}

  ngOnInit() {
    // Retrieve stashed tripId from local storage
    let tripCode = localStorage.getItem("tripCode");
    // Handle case where tripCode is not found
    if (!tripCode) {
      alert("Something wrong, couldn't find where I stashed tripCode!");
      // Redirect to home page
      this.router.navigate([""]);
      return;
```

```
i ｢wdm｣: Compiling...

Date: 2024-04-08T20:14:36.057Z - Hash: 0e2672d51272415a6af9 - Time: 686ms
4 unchanged chunks
chunk {main} main.js, main.js.map (main) 68 kB [initial] [rendered]
i ｢wdm｣: Compiled successfully.
i ｢wdm｣: Compiling...

Date: 2024-04-08T20:15:30.942Z - Hash: 0e2672d51272415a6af9 - Time: 241ms
5 unchanged chunks
i ｢wdm｣: Compiled successfully.
```

Figure 8: ***Running of Enhanced Source Code***

Reflection

Throughout the process of enhancing and modifying the travel website artifact, I encountered various challenges and learning opportunities. Unlike the original development environment, which was set up in a specific platform, I had to recreate the web app environment in my local setup. This involved setting up Angular CLI, Node.js, and other dependencies on my Windows Operating System, which required troubleshooting of any issues that arose. Additionally, I had to adapt the source code to accommodate changes in libraries and frameworks, such as updating dependencies like Angular and ensuring compatibility with newer versions of MongoDB. These challenges provided valuable learning experiences and enhanced my ability to employ well-founded techniques and tools in computing practices to achieve industry-specific goals. Overall, the process enabled me to develop a deeper understanding of web development practices and the importance of adapting to changing technologies and environments.

As I improved the artifact, I gained a deeper understanding of web development technologies such as Angular, Node.js, and MongoDB by working with them extensively during the project. Additionally, I learned the importance of thorough documentation and clear code commenting to facilitate future development and troubleshooting. I also honed my skills in debugging and problem-solving as I encountered and resolved various issues during the development process. Furthermore, I learned about the significance of user experience design and responsive web development practices to ensure the website's usability across different devices and screen sizes. Overall, the enhancement provided me with a comprehensive learning experience in various aspects of web development, from front-end design to backend implementation and database management.

One major challenge was managing dependencies and ensuring compatibility between different software components, especially when updating libraries or frameworks. Another challenge I encountered was optimizing performance and addressing scalability concerns, especially as the website's user base grew. Additionally, integrating front-end and back-end functionality posed challenges, particularly in handling asynchronous operations and data synchronization.

Overall, completing the enhancement of the traveler website artifact has provided me with invaluable experience in managing dependencies and ensuring compatibility among various software components. Additionally, it has equipped me with skills in optimizing performance and addressing scalability concerns as the user base expanded. Moreover, I gained proficiency in seamlessly integrating front-end and back-end functionality, especially in managing tasks that happen independently and keeping data consistent across different parts of the system.

References:

MongoDB. (n.d.). *MongoDB Atlas: Cloud Document Database*. https://www.mongodb.com/lp/cloud/atlas/try4?utm

CSS Design Awards. (n.d.). *CSS Design Awards - Website Awards - Best Web Design Inspiration - CSS Awards*. https://www.cssdesignawards.com/