Milestone Four Narrative

CS 499: Capstone

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The original artifact is an Android mobile app which has features to support a mobile inventory management system. This was the final project for CS 360 - Mobile Architecture and Programming and was written with Java and SQLite. The artifact that I will be submitting for my final ePortfolio is an adapted version of that original app that has been ported over to a completely new tech stack. The new app is built with the MERN stack, which leverages MongoDB, Express, React, and Node to create a full stack web application with dynamic features that expand upon the original functionality required in the mobile app.

I chose this artifact for the Databases enhancement because I thought there was a lot of room to add complexity and realism to the original project. The mobile app has fairly simple database interactions. There is a table for users and a table for inventory items, but there are no relationships between the tables. Also, because it uses the phone’s local SQLite database, the configuration overhead on the original mobile app was very low. With this enhancement, I wanted to configure the database from scratch and challenge myself to use MongoDB, which I’ve only used once in an earlier computer science course and is very different from the SQL-based databases I’m used to. I hope that this will show my adaptability as a web developer and my capacity to push outside of my comfort zone with unfamiliar technologies. In addition to porting the old project over to a new database type, I also added some features that help show my ability to develop web applications that are ready for production environments. The first is adding relationships to the database. I’ve added collections for inventory items, users, and companies so that users and inventory items are both associated with a single company. This way, a user can only see and manipulate the inventory for their company. I also added a role attribute to each user that differentiates between an admin user and a standard user. Admin users have full permissions to add, edit, and remove inventory, whereas standard users can only update existing inventory items. There were also several opportunities for security enhancements. In the new MERN project, I used industry-standard one-way encryption for storing and comparing user passwords, and I also added user authentication using JSON Web Tokens for authorizing access to frontend and backend routes.

I believe I met all three of the outcomes that I set out to cover with this enhancement. I met outcome #3 through the process of setting up the architecture of my backend and database interaction by making choices about design, configuration, and development tools based on researching the tradeoffs associated with each. I met outcome #5 through my security-based enhancements, such as employing the principle of least privilege with role-based permissions, obscuring sensitive user information in storage, and authenticating users securely with JSON Web Tokens. Finally, I met outcome #4 by showing my ability to port a database from SQLite to MongoDB, taking what I’ve learned in this program and applying it in a new way for a new use case. I don’t have any updates to my outcome-coverage plan.

This was by far the most challenging enhancement of the project. I think it highlighted the stark difference between building something for fun that looks good and building something that’s ready for deployment. I learned a ton with this one because there were a lot of firsts for me. I’ve never had to work with JSON Web Tokens, so that required a huge amount of research. Even after the research, I went through a long period of trial and error because there were so many very specific steps that needed to align to get the entire authentication system working. In retrospect, I think I would have been better off going through this process earlier on. Having an existing frontend and backend with a structure that didn’t account for authentication made the conversion more complex and error-prone than it otherwise could have been. I’ve also never had to implement a routing system from scratch, and this was my first time working with MongoDB without very explicit instructions. So there were a lot of great learning opportunities, and I gained a lot of context and confidence in areas that I think will be very directly applicable to my current job and future in web development.