CS 499 – Enhancement Two Narrative

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The artifact used for enhancement two is a contact service program similar to that of a contact list in a cellular device. This artifact was initially created in CS-320; Software Testing, Automation, and Quality Assurance, and was previously improved in enhancement one. Initially, this program was created to learn and understand the concept of white-box unit testing with JUnit. This program started with four classes; Contact, ContactService, ContactTest, and ContactServiceTest. The Contact class is a blueprint for a contact, the ContactService class is a blueprint for a contact service, while the final two classes were for testing respectively. This program was then expanded in enhancement one to include a GUI using Swing.

This artifact was chosen to be included in my ePortfolio as it portrays several aspects of both software engineering and design as well as data structures and algorithms. The aspects of JUnit testing and the hash map implementations both serve as strong foundations for this project and the skills it can showcase. The newly implemented secondary indices (hash maps storing strings to sets of strings) as well as the refactoring of their associated addition, deletion, and update methods are all essential components that showcase versatility and competence in the realm of data structures and algorithms. With the newly implemented secondary indices, users are now able to query contacts through any desired attribute. Furthermore, these queries are through secondary indices providing an O(1) lookup time as opposed to an O(n) lookup time. This maintains efficiency as the program and amount of contacts scales. Lastly, the “Search By” GUI screen now allows users to physically interact with the newly implemented query functions in a non-technical, user-friendly manner.

I did meet the desired course outcomes that I planned to achieve with this enhancement in Module One. I aimed to achieve course outcomes three and four. Outcome three was satisfied

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through the implementation of algorithmic searching showcasing the ability to evaluate the performance of various design choices depending on use-case. Outcome four was satisfied through the utilization of a well-founded data-structure to deliver real-world value to users. An unexpected addition to the course outcome coverage plan is the coverage of course outcome five with this enhancement. To ensure proper privacy and security of all data, every field is cleared upon leaving a screen. To mitigate potential vulnerabilities, existence checks and conditional querying were performed.

The process of enhancing the artifact was rather straightforward but also forced me to think more creatively and critically. This enhancement process was a great learning opportunity.

The first bit of critical thinking occurred in the process of creating the secondary indices. Initially, I was going to use the attribute and the contact as the key value pair. Not only would this be less efficient storage wise, but queries for contacts with shared attributes would also be less efficient. I then realized that the more efficient manner was to use the attribute and the id as the key value pair. The values would also be stored in sets in the case of contacts with duplicate attributes such as the same last name. This process allowed me to both learn and reinforce my knowledge of nested data structures. The real challenge for me arose in the refactoring of the query screen. The issue was that query by ID returned a Contact object whereas querying by any other attribute returned a set of IDs as strings. The challenge was figuring out the logic that would print the contact attributes formatted properly despite the return type. The solution was rather simple. First, I created null contact and set objects. Then, if the query was by ID, the contact object would be updated and no longer null. If the query was through any other attribute, the contact would remain null while the set would not. The following code was if-else

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statements which would execute the proper query function based on which field was occupied. If the Contact object was not null, those attributes would be displayed, otherwise if the set was not null and not empty, those values would be displayed. If nothing was output, the output area would state, “No contact found”.