

Project Completion report

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**Project Completion Report**

**Overview**

The present document summarizes the development of the Municipal Project in terms of challenges encountered in the course of Task 3, important takeaways, and new skills mastered. Different data structures including Trees heaps, and graphs, queues, sorted dictionaries among others were used in the project in order to control and handle data effectively. Challenges Faced During Task 3

1. Learning New Data Structures

Challenge:

· Although this was my first exposure to data structures, understanding trees, heaps and graphs, and implementing them was a great challenge.

Solution:

I allocated specific periods within my time to learn every structure, how it functions, and its possible use for my project. I mainly relied on youtube tutorials however when it came to c# implementation of graphs the videos were rather poor quality.

2. Selecting Correct Data Structures

Challenge:

· It was important to take into account the type of data structures appropriate for the project. I had to be sure that the searching and sorting tasks was optimized. And since I had not used any of the data structures in the past it was going to be tough.

Solution:

· After my research i realized there is no better way to store data than using binary search trees, which will facilitate the storage and retrieval of information; using heaps where sorting will be based on priorities and also employ graphs to show the relationship inter-service requests.

3. Designing Search and Recommendation Systems

Challenge:

· In Task 2, I had some difficulties with the queues as they made the program runslower when searching for items and making recommendations to users.

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Solution:

I wasn’t really sure how performance deteriorated because they had been working perfectly until I tried optimizing my project, so I just implemented asynchronous methods and that seemed to solve my problem.

Key Learnings and New Skills Acquired

1. Understanding and Implementing Data Structures

* **Binary Search Trees:** I learned how to implement binary search trees for efficient data storage and retrieval. This included understanding tree traversal methods such as in-order, pre-order, and post-order traversal.
* **Heaps:** I gained knowledge on implementing heaps for priority-based sorting. This involved understanding heap properties and operations like insertion and removal.
* **Graphs:** I learned how to represent and manipulate data using graphs. This included implementing graph traversal algorithms such as depth-first search (DFS) and breadth-first search (BFS).

2. Problem-Solving Approaches

* **Performance Optimization:** I learned to identify performance issues and overcome them
* **Algorithm Selection:** I gained experience in selecting appropriate algorithms for specific tasks, such as using DFS and BFS for graph traversal and heaps for priority-based sorting.

**3. Programming Techniques**

* **Asynchronous Programming:** I implemented asynchronous methods to improve the responsiveness of the application. This included using async and await keywords in C#.

**Conclusion**

Completing this project was a valuable learning experience. I faced several challenges, especially with understanding and implementing new data structures, but I overcame them through research, practice, and persistence. The project not only improved my problem-solving skills but also introduced me to new programming techniques and approaches. The knowledge and skills acquired during this project will be beneficial for future software development endeavors.