

Milestone Three Algorithms and Data Structure

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Artifact Overview

The artifact for this milestone is a system originally designed using linked lists in C++ to manage eBid auction data. The original system handled auction records using manual data structures, making queries and searches inefficient at scale.

To improve performance, this artifact was enhanced by migrating from a linked list structure to a PostgreSQL relational database. The new system leverages SQL tables, stored procedures, and functions for data retrieval, and organization.

Justification for Inclusion in ePortfolio

This artifact was chosen because it showcases data structure optimization and efficient database design in a real-world scenario. The transition from linked lists to an SQL database showcases skills in:

- Database design.
- Stored procedures and functions for optimized query performance.
- SQL query logic for retrieving, filtering, and analyzing data efficiently.
- Refactoring an existing data structure into a more scalable solution.
- The principle of refactoring

These improvements showcase practical software engineering skills, aligning with industry expectations for handling large datasets efficiently. This type of refactor is used daily in the real world and showcasing how logic from one language can be totally rethought and refactored is important. Sometimes the old way is not the best way, or adding something to the database is better for management purposes, or removing something from the database could improve performance and add it to an API, so many choices, and this type of refactor showcases this ability.

Enhancements & Improvements

Several changes were made to replace the inefficient LinkedList operations with database queries, ensuring a more structured and maintainable system. The previous system stored auction data in a linked list, which required manual parsing for each search. This was replaced with a PostgreSQL database, allowing for data lookups that significantly improved search performance.

Stored procedures were introduced to automate filtering operations, eliminating the need for manual inserting of the data. The ability to retrieve auction records by date range or bid amount now operates through optimized queries, reducing processing time.

Another major improvement was in the way auctions were queried. Previously, retrieving auctions above a certain bid amount required looping through a linked list. The new system uses a database function that quickly pulls down relevant records, improving both performance and readability.

These enhancements transformed the system into a scalable, well-structured database that is easier to maintain and significantly faster in operation. It allows for that data to grow and for someone to edit, add and pull needed reports on the data. At this point this data can be used in a much better way.

Alignment with Course Outcomes

The improvements & computer science competencies:

- **Optimized Data Structures:** Transitioning from a linked list to a relational database improved search complexity and data organization.
- **Database Management:** Created SQL tables, stored procedures, and queries to automate data retrieval.
- **Performance Optimization:** Introduced indexing to improve query efficiency.
- **Scalability:** The new approach supports larger datasets without performance loss.

No updates to the outcome plans are needed as this enhancement fully meets the planned goals.

Reflection on Enhancement Process

Enhancing this artifact showcases the power of databases over manual data structures. One of the main challenges was converting Excel serial dates into PostgreSQL date format. The fix involved a conversion function adjusting for the 1900-based date system in Excel. We could edit the data before it comes in, but a database should be able to accept any data and convert what is needed.

The enhancement transformed the artifact from a basic linked list storage system into a fully optimized relational database, making it more scalable, efficient, and professional.

Summary

The updated eBid Auction System now utilizes PostgreSQL, offering structured storage, faster queries, and scalable architecture. This project highlights expertise in data structures, and database engineering along with critical skills in software development.

The project prepares me for professional database engineering and software optimization roles, demonstrating the ability to transition legacy systems into modern, scalable solutions.