Request For Proposal

COSC 434 Database Administration

Okanagan College
Computer Science Department
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I. Project Overview

Description of the Opportunity

This project centers on the administration and management of a database designed for algorithmic trading data [2]. Using this real-world use case, the team will gain hands-on experience with essential Database Administration (DBA) activities, including database design, data import and export, security and auditing, maintenance, and backup and recovery. The project serves as a practical exploration of DBA principles applied within an industrial and data-intensive context.

Project Goals and Objectives

The primary goals are to implement a database for algorithmic trading data, and carry out all critical DBA functions, encompassing security, performance optimization, maintenance, and backup management. Through this process, the team aims to demonstrate a complete lifecycle of database administration in a high-performance environment.

Expected Outcomes and Deliverables

Outcomes and deliverables include three project hand-ins, including a hand in focused on project elaboration (design), another on project construction and delivery, and another focused on project transition and deployment. Additionally, a research paper may be written, and High Performance Computing (HPC) resources from Digital Research Alliance will be used. The team member roles are assigned as follows:

Team Member	**Roles**
Keona Gagnier	Security, Backup and Recovery
Cody Jorgenson	Scrum master, Product Owner
Alex Anthony	Backup and Recovery, Performance Manager
Emilio Iturbide Gonzalez	Performance Manager, User and Developer Support
Cade Dempsey	User and Developer Support, Security

II. Scope of Work

Tasks and Responsibilities Expected of the Team

The project team will be responsible for the implementation, and maintenance of a secure and reliable database system to support large-scale financial data operations. Key tasks include the development of core documentation such as the DBA Policy, Security Policy, Backup and Recovery Policy, and Operational Manual. The team will also design and implement automated jobs, scripts, and program code to support ongoing DBMS operations.

Testing activities will include unit and regression testing across the operational, production, and acceptance environments to ensure system reliability, recoverability, and performance. The team will leverage the Digital Research Alliance of Canada's high-performance computing resources for large-scale data collection and processing, while implementing robust data redundancy and backup strategies to protect against data loss.

Project phases

The project will be carried out in five key phases:

Assessment: Develop the RFP and define project requirements.

Design: Create the database schema, data collection methods, and security and backup strategies.

Implementation: Build and populate the database, and perform core DBA setup tasks.

Testing: Validate recovery procedures, security auditing, and access controls; conduct unit and regression testing.

Maintenance: Manage audit records, user accounts, and database growth to ensure continued stability and compliance.

Database platforms and technologies involved

The solution will be developed using Oracle Database as the primary platform, with GitHub for version control and collaborative development, and Digital Research Alliance of Canada resources for large-scale computation and storage.

III. Technical Requirements

Hardware/software environment

The database system will operate on Oracle Database 19c, deployed on a virtual machine hosted on the High Performance Computing (HPC) infrastructure provided by the Digital Research Alliance of Canada. Team members will be granted access to a shared database environment to support collaborative development, configuration, and testing activities. The storage requirements are not yet known but we know the DRI databases tend to be around 10GB for an individual person, more will be known about this in the design phase when we become more familiar with what DRI can offer us.

Backup, recovery, and monitoring expectations

The system will maintain regular backups on a daily or weekly schedule to ensure data integrity and enable rapid recovery in the event of system failure. Comprehensive auditing and monitoring will be implemented to track user actions, especially those involving privileged operations or data modifications. All DBAs will have their own accounts to follow the separation of responsibilities principle, however all DBAs will share responsibility over the health of the DB. These safeguards will help maintain system security, accountability, and operational continuity.

IV. Project Methodology

The project will make use of a database created with the Digital Research Alliance of Canada HPC resources. Our team will have its own schema within the database, and we will make use of the pre-existing db design provided in said database.

We will focus on topics related to course content such as:

- Security
- Backup Recovery
- Performance Management
- User and Developer Support

and modify them as needed to match the requirements of the algorithmic trading project, such as handling large volumes of data.

How we perform our DBA duties will be informed by the class lectures and the Oracle documentation.

The team will apply an Agile methodology with Scrum practices, using weekly stand-ups, sprint planning, and retrospectives to manage tasks and adapt to challenges.

Data will be sourced from Financial Modelling Prep API [1].

Risk Mitigation Strategies

Risk	**Likelihood**	**Impact**	**Mitigation Strategy**
API Downtime or Data Inconsistencies: The Financial Modeling Prep API may be unavailable, delaying data loading.	Medium	Moderate: Slows down database population and testing.	Download sample trading data in advance and store it locally as CSV files. Use these files to continue development if the API is down.

HPC Access Issues: Delays or failures in accessing the Digital Research Alliance's remote VM could disrupt development or testing.	Low	High: Prevents work on the database environment.	Contact the HPC provider and professor immediately to resolve access issues. Schedule critical tasks during stable access periods.
Oracle Learning Curve: Limited experience with Oracle Database 19c may cause setup or optimization errors.	High	Moderate: Leads to configuration mistakes or delays.	Rely on professor's guidance during office hours, use course materials, and consult Oracle documentation. Conduct peer reviews between those with roles that overlap.
Schedule Constraints: Other coursework may delay project milestones.	High	Moderate: Pushes back deliverables.	Discuss task priorities with the team during sprint planning to balance workloads. Use a project management board to track progress and adjust schedules as needed.
Team Coordination: Miscommunication between roles may cause inconsistencies.	Medium	Moderate: Results in mismatched database settings or documentation.	Hold weekly stand-ups and use project management board to ensure all roles align on tasks and deliverables.
Server Downtime: Outages on Okanagan College or HPC servers could block database access.	Low	High: Halts development or testing phases.	Schedule critical tasks (e.g, testing) during stable server periods. Keep offline copies of scripts and configurations. Notify the professor immediately if outages occur for potential solutions.

V. Project Timeline

Expected project duration

The project will last from late October 2025 to December 10 2025 (date of our final presentation during the final exam period).

The project should be majority completed by December 4th, giving us approximately a month and a half to complete the project.

Dependencies or Constraints

Constraints of the student schedule are expected - balancing other course loads along with this project will be a challenge, but not an unmanageable one.

We are constrained by being first time learners of DBA responsibilities and how to work with Oracle RDBMS to perform those responsibilities.

We depend upon proper functioning of, and the ability to connect to, the OC server, where our VMs are hosted. Additionally, we are dependent on the ability to access the HPC resources from Digital Research Alliance of Canada.

We depend on our professor Youry Khmelevsky to provide us with course materials that will help guide us through this project and ensure we have the tools and information necessary to complete our tasks.

Key milestones and deliverable dates:

October 29 - RFP

- A document outlining all details of the project plan and requirements

November 10 - Elaboration/design

- A document describing our design
- Control file layout
- Backup structure (how often, how many to keep etc.)

November 19 - Project Construction and Delivery

- Creation of the database
- Delivering database requirements

December 4 - Project Transition and Deployment

- A presentation showing the final product

December 10 - Final Presentation of the Project

Citations

[1] “Financial Modeling Prep - FinancialModelingPrep — FMP.” [Online]. Available: https://site.financialmodelingprep.com/

[2] N. Ebadifard, A. Parihar, Y. Khmelevsky, G. Hains, A. Wong, and F. Zhang, “Data Extraction, Transformation, and Loading Process Automation for Algorithmic Trading Machine Learning Modelling and Performance Optimization,” arXiv preprint arXiv:2312.12774, 2023. [Online]. Available: https://arxiv.org/abs/2312.12774