Museum Collection Centre Database System

An Advanced Oracle SQL Implementation

Background

Museums manage large and complex collections that include objects, loans, exhibitions, storage locations, and movement histories. Efficient database systems are essential to ensure data integrity, traceability of objects, and secure access to sensitive information. This project focuses on designing and implementing a relational database system to support the operational and management needs of a museum collection centre.

Database Design

The database was designed using a fully normalised relational schema to minimise redundancy and maintain data integrity. An Entity–Relationship Diagram (ERD) was developed to represent key entities such as museum objects, collections, exhibitions, loans, locations, and movements. The schema supports real-world museum workflows, including tracking object movements, managing exhibition history, and recording loan activity.

Implementation

The database was implemented using Oracle SQL. Core tables were created with appropriate primary keys, foreign keys, and constraints to enforce referential integrity. Sample data was inserted to simulate realistic museum operations and to allow meaningful query execution and testing.

Query Design

A set of SQL queries was developed to support common operational and analytical requirements, including:

- Identifying objects currently on loan
- Finding objects that have never been loaned or exhibited
- Tracking object movement history
- Retrieving exhibition and collection information

These queries demonstrate practical data retrieval skills and effective use of joins, filtering, and aggregation.

Performance Optimisation

Database performance was analysed using `EXPLAIN PLAN`. Indexes were created on key attributes to improve query efficiency. The impact of indexing was evaluated by comparing execution plans before and after optimisation, demonstrating an understanding of query performance tuning in Oracle databases.

Security and Access Control

Role-based access control was implemented to ensure secure database usage. Custom roles were created and privileges were granted according to user responsibilities. In addition, a restricted

view was designed to allow limited access to sensitive data, demonstrating best practices in database security and data protection.

Conclusion

This project demonstrates the complete lifecycle of relational database development, from conceptual design and normalisation to implementation, querying, optimisation, and security management. The use of Oracle SQL highlights practical skills in advanced database concepts and reflects real-world requirements for managing complex organisational data systems.