

SIT301: Database Administration

<https://sites.google.com/view/sit301>

Course Objectives:

By the end of this course unit, the student should be able to:

1. Recommend for adoption an appropriate DBMS for a specific context
2. Install and configure a database management system
3. Configure, administer and troubleshoot a client-server database management system
4. Perform other common database administration tasks

Course Topics

1. The Database Administration Environment

Review of Database Systems; Working with the command prompt; Selecting a DBMS Product; DBMS Installation & Configuration; Upgrading and Uninstalling a DBMS

2. The Database Administrator

Common Roles; Relationship with other IS Professions; Desirable Qualities

3. Accessing the DBMS

Command Line Tools; Graphical User Interfaces; Database Objects: Tables, Views, Functions, Procedures, Events, Triggers;

Creating, Finding & Dropping Database Objects;

4. Database Backup & Recovery

Uses for backups; Backup frequency; What to back up; Backup locations; Backup methods; Copying Databases to Another machine; Recovering from Crashes

5. Database Security & User Management

Access Control Lists; Wildcards; Privilege and privilege levels; Securing Backups and Logs; System tables; Managing User Accounts; GRANT and REVOKE commands; SHOW GRANTS; Resetting the Root Password; Debugging User Account Problems; Access issues; Creating Security Policies; Displaying Permissions;

6. Database Tuning and Performance Management

Performance Monitoring, Benchmarking, Profiling and Capacity Planning; Logging and Replication; Database Partitioning.

Texts and References

Ault, M. (2012). *Oracle DBA Made Simple: Oracle Database Administration Techniques*. Rampant TechPress.

Mullins, C S. (2012). *Database Administration: The Complete Guide to Practices and Procedures*. Addison Wesley. ISBN-10: 0321822943; ISBN-13: 978-0321822949

Cabral S K , Murphy K. [*MySQL@Administrator's Bible*](#). Wiley. ISBN-10: 0470416912 . ISBN-13: 978-0470416914;

Mehta C, Bhavsar A, Oza H, Shah S. 2018. [*MySQL 8 Administrator's Guide: Effective guide to administering high-performance MySQL 8 solutions*](#). Packt Publishing. ISBN-10: 1788395190, ISBN-13:

01. The Database Administration Environment

02. The Database Administrator

What is Database Administration?

- The management, maintenance, and optimization of databases to ensure they operate efficiently, securely, and reliably.
- A systems administrator who focuses on the database.
- **Watch this video:** [A day in the life of a DBA](#)

Common Aspects of Database Administration :

- Database Design:
- Database Installation and Configuration
- Security Management
- Data Backup and Recovery
- Performance Tuning
- Capacity Planning
- Data Migration and Integration
- Database Monitoring and Maintenance
- Disaster Recovery Planning
- Compliance and Governance
 - Development and enforcement of data policies, procedures, standards
- Arbitrating data disputes

Qualifications and Skills of a Database Administrator

Qualifications

- **Bachelor's Degree**
 - Computer science
 - Information technology
 - Mathematics
 - Engineering
 - Business with a focus on information systems
- **Master's Degree (Optional):**
 - Not always required
 - Master's degree in a relevant field would open up opportunities for advanced roles or research positions.

Certifications:

- **Database Vendor Certifications e.g.:**
 - Oracle Certified Professional (OCP)
 - Microsoft Certified: Azure Database Administrator Associate
 - IBM Certified Database Administrator
 - MongoDB Certified DBA Associate
- **General IT Certifications:** Certifications in IT fundamentals, networking, security, or cloud computing can also be beneficial e.g.
 - CompTIA IT Fundamentals (ITF+)
 - CompTIA Security+
 - AWS Certified Database - Specialty

Technical Skills Required of a Database Administrator

- Proficiency in Database Management Systems (DBMS): Strong knowledge and hands-on experience with one or more database platforms, such as Oracle, Microsoft SQL Server, MySQL, PostgreSQL, MongoDB, or IBM DB2.
- Database Design and Modeling: Ability to design and implement database schemas, tables, views, indexes, and relationships using appropriate database modeling techniques.
- SQL and Programming Languages: Proficient in SQL (Structured Query Language) for querying and manipulating data. Familiarity with programming languages like Python, Java, or PowerShell for scripting and automation tasks.
- Performance Tuning and Optimization: Skills in optimizing SQL queries, indexing strategies, and database configuration settings to improve performance and scalability.
- Backup and Recovery: Experience in designing and implementing backup and recovery strategies to protect data integrity and ensure business continuity.

Technical Skills Required of a Database Administrator

- **Security Management:** Understanding of database security principles and best practices, including access controls, encryption, and auditing mechanisms.
- **Troubleshooting and Problem-Solving:** Ability to diagnose and resolve complex database-related issues, including performance bottlenecks, data corruption, and security breaches.
- **Knowledge of Database Administration Tools:** Familiarity with database administration tools and utilities for managing, monitoring, and troubleshooting database systems.

Soft Skills Required of a Database Administrator

- **Communication:** Clear and effective communication skills, both verbal and written, to interact with team members, stakeholders, and end-users.
- **Collaboration:** Ability to work collaboratively with other IT professionals, departments, and external vendors to achieve common goals and solve problems.
- **Analytical Thinking:** Strong analytical and critical thinking skills to analyze complex problems, identify root causes, and develop innovative solutions.
- **Attention to Detail:** Thoroughness and attention to detail in database design, configuration, and documentation to ensure accuracy and reliability.
- **Time Management:** Effective time management and organizational skills to prioritize tasks, manage workload efficiently, and meet deadlines.
- **Adaptability:** Flexibility to adapt to changing technologies, business requirements, and organizational priorities in a dynamic IT environment.

Relationship of Database Administration with IS Management

- **IT Management:** The DBA typically reports to IT management, which may include roles such as the Chief Information Officer (CIO) or IT Director. They communicate regularly to align database initiatives with broader IT strategies and priorities. IT management provides guidance and support for database projects and resource allocation.
- **Systems Administrators:** Systems administrators are responsible for managing the organization's IT infrastructure, including servers, networks, and operating systems. The DBA works closely with systems administrators to ensure that database servers have the necessary resources, such as CPU, memory, and disk space, to operate efficiently. They may collaborate on server provisioning, configuration, and troubleshooting.
- **Network Administrators:** Network administrators manage the organization's network infrastructure, including routers, switches, firewalls, and network connectivity. The DBA works with network administrators to optimize network performance for database access, troubleshoot connectivity issues, and implement security measures to protect database traffic.
- **Application Developers:** Application developers design and develop software applications that interact with the database. The DBA collaborates with application developers to design database schemas, optimize SQL queries, and troubleshoot performance issues. They ensure that applications adhere to best practices for database access and data manipulation to maximize performance and maintain data integrity.

Relationship of Database Administration with IS Management

- **Security Analysts:** Security analysts focus on protecting the organization's information assets from security threats and breaches. The DBA works with security analysts to implement and enforce database security measures, such as user authentication, access controls, encryption, and auditing. They may collaborate on security assessments, vulnerability management, and incident response procedures.
- **Data Analysts:** Data analysts analyze and interpret data to derive insights and support decision-making within the organization. The DBA collaborates with data analysts to provide access to relevant data sets, optimize database queries for analytical processing, and ensure data quality and consistency. They may assist data analysts in designing and maintaining data warehouses, data marts, and other data repositories.
- **Project Managers:** Project managers oversee database projects from initiation to completion, ensuring that they are delivered on time, within budget, and according to specifications. The DBA works with project managers to define project requirements, develop project plans, and provide technical expertise and guidance throughout the project lifecycle. They communicate project status, risks, and issues to stakeholders and contribute to project prioritization and resource allocation decisions.

Overall, effective collaboration and communication between the DBA and other IT roles are essential for ensuring the successful operation and management of database systems within the broader information systems management framework. By working together, these roles can leverage their respective expertise to optimize database performance, enhance data security, and support the organization's strategic goals and objectives.

Why Learn Database Administration?

- **High Demand for DBAs ... Playing very critical roles:** Database administrators are in high demand across various industries to play the vital roles of designing, implementing, and maintaining database systems to support business
- **Lucrative Career Opportunities:** DBAs typically enjoy competitive salaries and attractive job prospects.
- **Opportunity to Work with Leading Technologies:** DBAs gain valuable hands-on experience with database management systems (DBMS) and variety of tools, enhancing their technical skill set and usefulness
- **Career Growth and Development:** Learning database administration opens doors to a range of career paths and advancement opportunities. DBAs can specialize in areas such as database architecture, data warehousing, cloud database management, or become database consultants or instructors.
- **Impactful Work:** DBAs play a crucial role in ensuring the availability, reliability, and security of organizational data. By effectively managing database systems, DBAs help organizations harness the power of data to drive innovation, improve efficiency, and achieve strategic objectives, making their work highly impactful and rewarding.

