

DATABASE MANAGEMENT SYSTEM

- Database Management System – is a system software that allows users to specify the structure of a database with a systematic way to create, query and update data in the database. For Example: Limiting of access to database for specific users.
- The database management system essentially serves as an interface between the database and end users or application programs, ensuring that data is consistently organized and remains easily accessible.
- The DBMS manages three important things: the data, the database engine that allows data to be accessed, locked and modified -- and the database schema, which defines the database's logical structure.

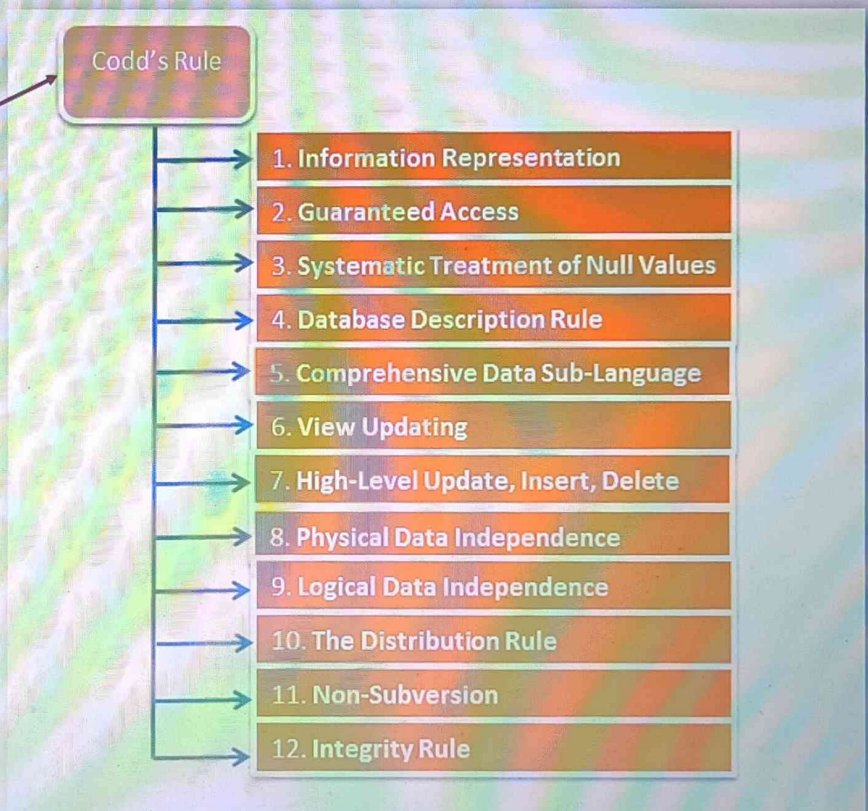
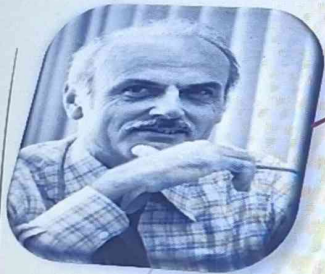
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DATA, SCHEMA, AND DATABASE

- **Data** – is numerical, character or other symbols which can be recorded in a form for processing by a computer. For Example: Names and Addresses of employees in a company.
- **Schema** – The schema is the structure of data, whereas the data are the facts. Schema basically indicates the rules which the data must obey. Such rules can be enforced by a database. For Example: Age limit of employees being hired in a company is between 18 – 90 years old.
- **Database** – A database is a collection of related data arranged for searching quickly and efficiently.

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WHAT IS RDBMS?

- RDBMS is a database management system based on relational model defined by E.F.Codd.
- Data is stored in the form of rows and columns. The relations among tables are also stored in the form of the table.
- RDBMS use the language known as SQL (Sequel)
- SQL is a simple programming language used for accessing and managing data in relational databases.
- Shares a common column in two or more tables (Primary Key and Foreign Key)

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FEATURES OF RDBMS

- Provides data to be stored in tables
- Persists data in the form of rows and columns
- Provides primary key to uniquely identify the rows in a table
- Provides a (view) virtual table creation in which sensitive data can be stored
- Provides multi user accessibility that can be controlled by individual users
- And it features four types of relationships in database

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DBMS VS RDBMS

DBMS

- Introduced in 1960s
- Followed navigational modes for data storage
- Data fetching is slower for large amount of data
- Data redundancy is common in this model leading to difficulty in maintaining data
- Examples are dBase, Microsoft Access, LibreOffice Base, FoxPro

RDBMS

- Introduced in 1970s
- Uses relationship between tables using primary keys, foreign keys and indexes
- Data fetching is faster because of its relational model
- Keys and indexes are used in the tables to avoid redundancy
- Example are SQL Server, Oracle, MySQL, MariaDB, SQLite

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↑ 22.8 Kbps

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RELATIONSHIPS IN DATABASE

- **One to One** – One entity is associated with another entity. For Example: Each employee belong to one department.
- **One to Many** – One entity is associated with many other entities. For Example: A company is associated with all working employees in one branch/office/country.
- **Many to One** – Many entities are associated with only one entity. For Example: Many employees have one manager.
- **Many to Many** – Many entities are associated with many other entities. For Example: Many employees associated with multiple assignments and multiple assignments are associated with multiple employees at the same time.

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ELEMENTS OF RDBMS

- There are four main database elements in a relational database:
- Tables – Data collection objects also known as relation.
- Tuple – Row of a relation which represents an instance of a relation
- Attribute – named column of a relation
- Queries – Inquiry about the stored data.
- Forms – A predefined format to display or enter data
- Reports – Printable version of database information

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Examples of Relational Database



DatabaseTown.com



	Microsoft SQL Server Developer: Microsoft Initial Release: 1989
	MySQL Developer: Oracle Corporation Initial Release: 23 May 1995
	PostgreSQL Developer: PostgreSQL Global Development Group Initial Release: 8 July 1996
	SQLite Developer: D. Richard Hipp Initial Release: 17 Aug. 2000
	Oracle Database Developer: Oracle Corporation Initial Release: 1979
	MariaDB Developer: MariaDB Corporation Ab Initial Release: 29 Oct. 2009

SQL COMMANDS

- There are various categories of sql commands that are used to handle the data.
 1. Data Definition Language (DDL) commands, are used to create, and modify database objects. For Example: CREATE, ALTER, DROP
 2. Data Manipulation Language (DML) commands are used to manipulate data. For Example: DELETE, INSERT, SELECT, UPDATE
 3. Data Control Language (DCL) commands are used to control privileges in database. For Example: GRANT, REVOKE

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COMMON SQL CONSTRAINTS

- **NOT NULL Constraint:** Ensures that a column cannot have NULL value.
- **DEFAULT Constraint:** Provides a default value for a column when none is specified.
- **UNIQUE Constraint:** Ensures that all values in a column are different.
- **PRIMARY Key:** Uniquely identified each rows/records in a database table.
- **FOREIGN Key:** Uniquely identified a rows/records in any another database table.
- **CHECK Constraint:** The CHECK constraint ensures that all values in a column satisfy certain conditions.
- **INDEX:** Use to create and retrieve data from the database very quickly.

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PRIMARY KEY, FOREIGN KEY

Primary Key

- Primary Key is used for unique identification of each row in a table. The rule for primary key is that values have to be unique and not null.

Foreign Key

- Foreign Key identifies a column with primary key column of another table for storing data. The values of foreign key are exactly same as the values of primary keys of other tables.

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EXAMPLE OF PRIMARY AND FOREIGN KEY

Patient Id	Name	D.o.B	Gender	Phone	Doctor Id
125	Clark	04-05-1979	Male	123-456-7890	10
149	Dave	06-21-1984	Male	444-555-6666	20
160	Lisa	11-13-1991	Female	777-888-9999	10
199	Joe	07-02-1993	Male	111-222-0000	10

Doctor Id	Doctor	Room
10	Dr. Wilson	08
20	Dr. Frank	02

Foreign Key

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ORACLE HISTORY



Developer

Larry Ellison and his two friends and former co-workers, **Bob Miner** and **Ed Oates**, started a consultancy called **Software Development Laboratories (SDL)** in 1977. **SDL** developed the original version of the Oracle software.

Usage

Oracle Database Architecture. An **Oracle database** is a collection of data treated as a unit. The purpose of a database is to store and retrieve related information. A database server is the key to solving the problems of information management.

Meaning of i & g in Oracle databases

The **i** in **oracle 8i** and **9i** stands for **INTERNET** and the **g** in **10g** and **11g** stands for **GRID**, because from 10g onwards **oracle** supports grid architecture.

Meaning of Oracle 12c

Oracle released **Oracle Database 12c** into general availability July 1, 2013. According to **Oracle**, this is "the first **database** designed for the cloud."

ORACLE FAMILY

- Personal Oracle- for single users. Used to develop systems
- Oracle Standard Edition- (Entry level Workgroup server)
- Oracle Enterprise edition- Extended functionality
- Oracle Lite- (Oracle mobile) single users using wireless devices.



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SOME DEVELOPER TOOLS

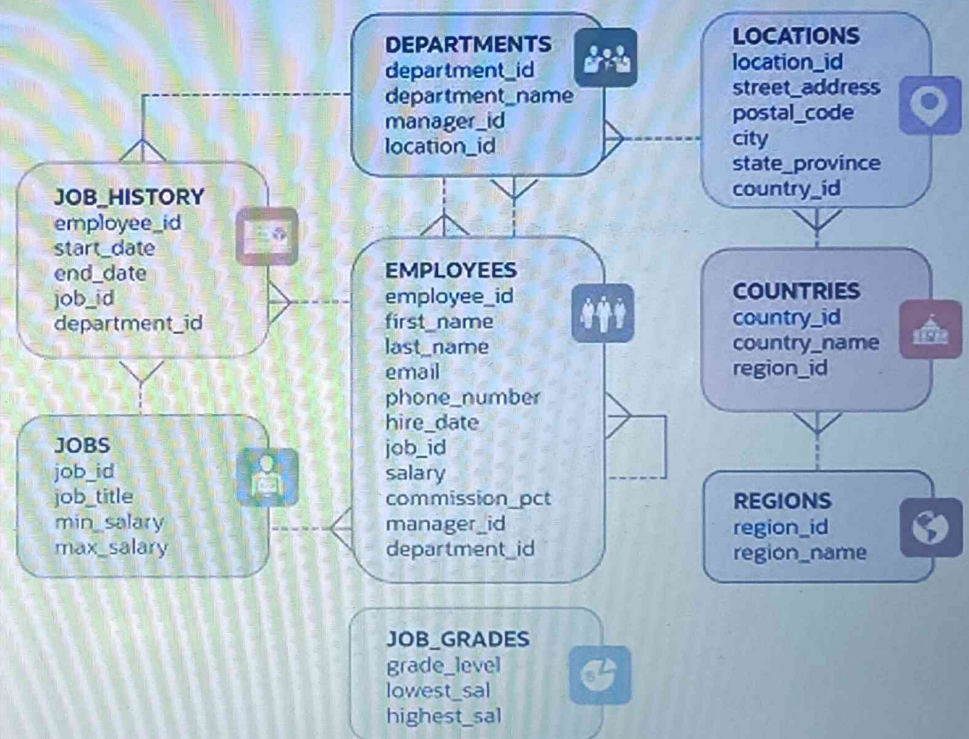
- Oracle Forms Developer
- Oracle Reports Developer
- Oracle Jdeveloper
- Oracle Designer



SCHEMAS AND SCHEMA OBJECTS

Collection of database objects

- Tables
- Views
- Sequences
- Indexes
- Procedures
- Functions
- Packages
- Triggers



Different Types of SQL JOINS

Here are the different types of the JOINS in SQL:

- **(INNER) JOIN**: Returns records that have matching values in both tables
- **LEFT (OUTER) JOIN**: Returns all records from the left table, and the matched records from the right table
- **RIGHT (OUTER) JOIN**: Returns all records from the right table, and the matched records from the left table
- **FULL (OUTER) JOIN**: Returns all records when there is a match in either left or right table



RDBMS NORMALIZATION

- Database normalization or simply normalization, is the process of organizing the data in a database
- There are two main goal of normalization process:
 1. Eliminating redundant data
 2. Ensuring of data dependence
- Both of these goals reduce the amount of space a database consumes and ensure that data is logically stored

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Informix SOFTWARE db dBASE™

Microsoft Visual FoxPro Database Development System

ORACLE MySQL

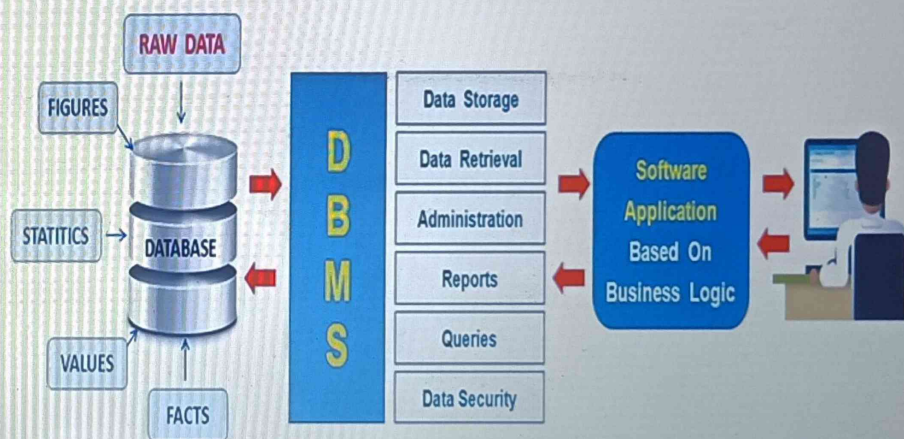
PostgreSQL



Microsoft SQL Server



RDBMS - What Is RDBMS ?



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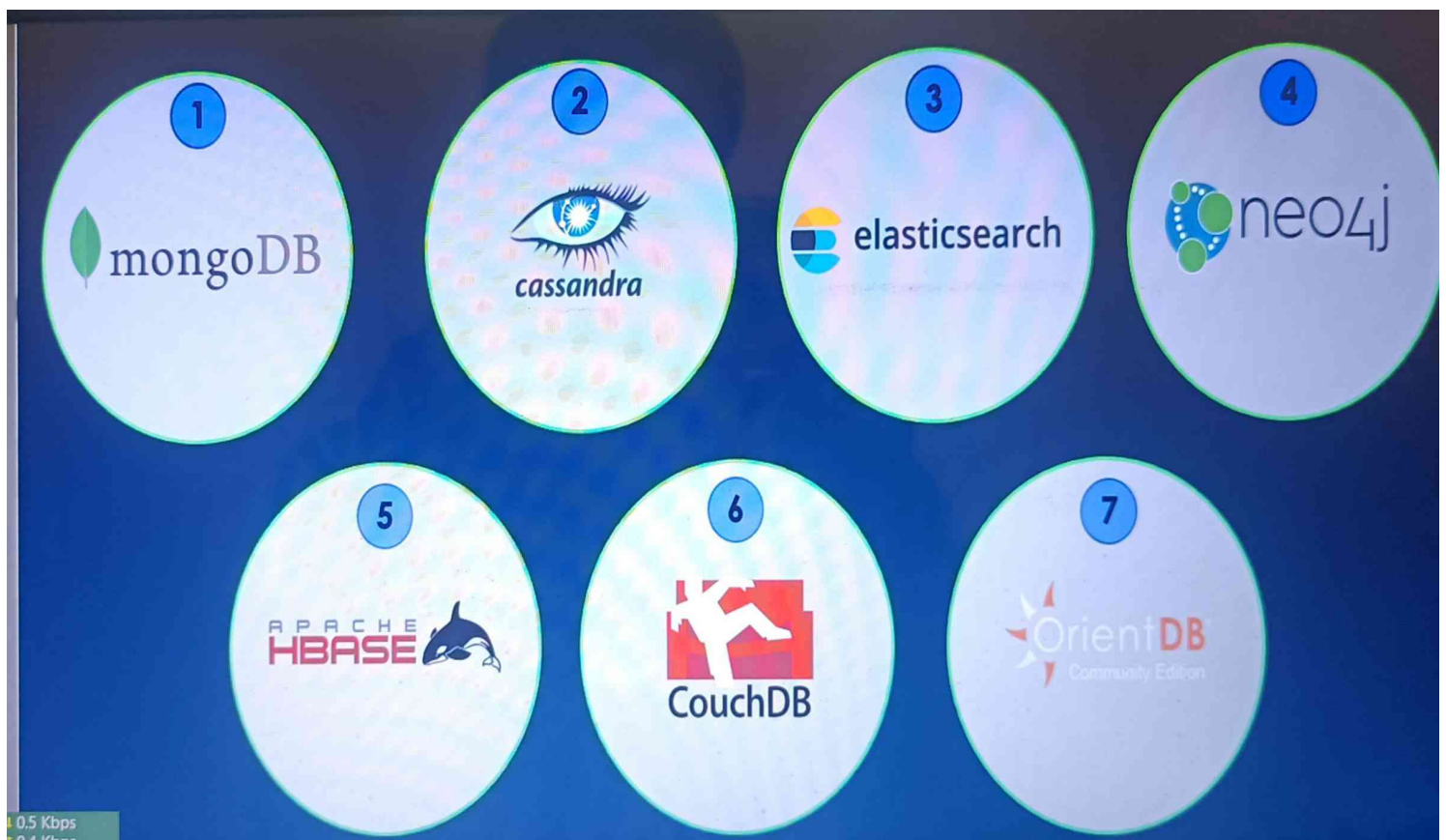
What is NoSQL

- Stands for Not Only SQL. Term was redefined by Eric Evans after Carlo Strozzi.
- Class of non-relational data storage systems.
- Do not require a fixed table schema nor do they use the concept of joins.
- Relaxation for one or more of the ACID properties (*Atomicity, Consistency, Isolation, Durability*) using CAP theorem.

Need of NoSQL

- Explosion of social media sites (Facebook, Twitter, Google etc.) with large data needs. (*Sharding is a problem*)
- Rise of cloud-based solutions such as Amazon S3 (simple storage solution).
- Just as moving to dynamically-typed languages (Ruby/Groovy), a shift to dynamically-typed data with frequent schema changes.
- Expansion of Open-source community.
- NoSQL solution is more acceptable to a client now than a year ago.

Aspect	SQL Databases	NoSQL Databases
Definition	Relational databases using Structured Query Language.	Non-relational databases with flexible schemas.
Structure	Tables with rows and columns.	Documents, key-value pairs, graphs, or wide columns.
Schema	Fixed, predefined schema.	Dynamic, flexible schema.
Query Language	SQL (Structured Query Language).	Various (e.g., JSON, XML, YAML).
Scalability	Vertical (adding more power to servers).	Horizontal (adding more servers).
Performance	Good for complex queries and transactions.	High performance for large-scale and unstructured data.
Security	Strong (access control, authentication, encryption).	Varies; some offer strong features (e.g., MongoDB).
Data Integrity	High data integrity with ACID properties.	Varies; often more relaxed.
Use Cases	Financial systems, e-commerce, CRM systems.	Real-time analytics, social media, big data.
Examples	MySQL, Oracle, PostgreSQL, Microsoft SQL Server.	MongoDB, Cassandra, Redis, Neo4j, CouchDB, Elasticsearch.
Pros	Strong consistency, robust queries, well-understood integrity.	Flexible models, high scalability, ideal for large data volumes.
Cons	Rigid schema, difficult to change schema, single point of failure without replication.	Limited ACID support, less mature querying, potential consistency issues.





SQL – Oracle - NoSQL

Topics Includes

- ❖ What is RDBMS ?
- ❖ DBMS v/s RDBMS
- ❖ Introduction of MySQL / SQL-Server / Oracle
- ❖ Functionality of Queries
- ❖ What is NoSQL
- ❖ Practical Session

Presenter :

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MySQL 5.7 Administration Certified
PGCM in Business Analytics (MIT Pune)

30 year's of Academic Experience
& Professional Developer



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