



U.S. DEPARTMENT OF ENERGY'S
CYBERFORCE[®]
PROGRAM

CyberForce[®] 101

Databases

 October 2023

 cyberforcecompetition@anl.gov

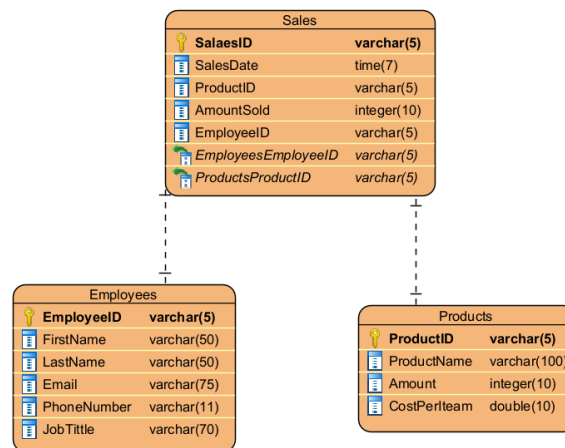
Databases 101

Databases

A database is a structured collection of data in one centralized digital location.

Database Types

Relational- These Databases have connections between the different tables. They are one of the most common types of DBs and are SQL compatible.



Object Oriented- These databases are capable of storing almost any type of data. They are organized into objects that have attributes (category) and methods (operations).

Centralized- These databases are stored in one centralized location and allow users to access them from anywhere.

Distributed- These databases are stored in multiple locations and allow users to access them from anywhere. They are still only one database.

Cloud- These databases store their data on the cloud. This allows for flexible scalability and remote access by users. They are also applicable to many types of devices such as desktops and phones.

Hierarchical- These databases rely on the Parent-Child model to organize their data. Each child node inherits all the data from their parent. A parent node can have many children, but a child can only have one parent.

Network- These databases resemble a spider web with their connections. They have a series of connections between different hierarchical DBs (records). They resemble the way a Wide Area Network (WAN) connects Local Area Networks (LAN).

NoSQL- These databases do not use the normal table structure that almost all other DBs have. They utilize different models such as documents and graphs to store structured and semi-structured data.

Graph- These databases organize data into nodes(entities/objects) and connect them with edges (relationships). They are good for storing data with complex relationships.

Open Source- These databases are free and available for anyone to view, download, and manipulate. They are usually run by volunteers.

Database Hardening

Database Hardening is the process of securing a database by addressing its vulnerabilities. To do this, the admin should go through many steps.

The admin should:

- Consistently update the database to the most current version, and installing patches.
- Reduce all unnecessary functions and services.
- Remove all unused accounts, especially the default ones.

- Change all default passwords to more secure ones.
- Make all passwords follow strong security protocols.
- Null any passwords that are not used.
- Remove all temporary files from the set-up of the database (especially if they contain any passwords).
- Make sure all accounts are for individuals and not groups.

Sources

- <https://www.guru99.com/introduction-to-database-sql.html>
- <https://www.mongodb.com/databases/types>
- <https://emn178.github.io/online-tools/sha256.html>
- <https://www.diligent.com/insights/data-management/centralized-vs-distributed-databases/#:~:text=A%20distributed%20database%20is%20the,modified%20only%20from%20that%20location.>
- <https://youtu.be/KG-mqHoXOXY>
- <https://youtu.be/ObuKQHokLK8>