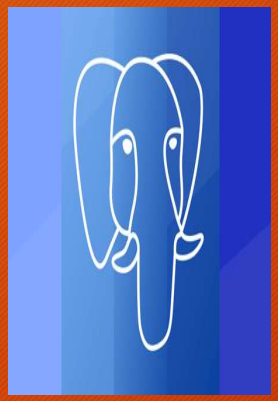
Data base administration (MySQL, PostgreSQL)



Mr. BOMMEU

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Lesson 1: What Is a DBA?

- Database administration refers to the whole set of activities performed by a database administrator to ensure that a database is always available as needed.
- Other closely related tasks and roles are database security, database monitoring and troubleshooting, and planning for future growth.
- Database administration is an important function in any organization that is dependent on one or more databases.

The database administrator (DBA)

- is usually a dedicated role in the IT department for large organizations.
- However, many smaller companies that cannot afford a full-time DBA usually outsource or contract the role to a specialized vendor, or merge the role with another in the ICT department so that both are performed by one person.

primary role of database administration

- The primary role of database administration is to ensure maximum up time for the database so that it is always available when needed.
- This will typically involve proactive periodic monitoring and troubleshooting.
- This in turn entails some technical skills on the part of the DBA.
- In addition to in-depth knowledge of the database in question, the DBA will also need knowledge and perhaps training in the platform (database engine and operating system) on which the database runs.

Others secondary, critically, important, tasks and roles

- A DBA is typically also responsible for other secondary, but still critically important, tasks and roles.
- Some of these include:
  - ✓Database Security
  - ✓Database Tuning
  - ✓Backup and Recovery
  - ✓Producing Reports from Queries

Database Security

Ensuring that only authorized users have access to the database and fortifying it against any external, unauthorized access.

https://www.scnsoft.com/blog/database-security-best-practices

Database Tuning

Tweaking any of several parameters to optimize performance, such as server memory allocation, file fragmentation and disk usage.

https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.thecrazyprogrammer.com%2F2014%2F12%2Fdatabase-tuning.html&psig=AOvVaw35hTHZvncaLveH3u9w0q_W&ust=1611206859211000&source=images&cd=vfe&ved=0CA0QjhxqFwoTCKit7rnjqe4CFQAAAAAdAAAAABAD

Backup and Recovery

It is a DBA's role to ensure that the database has adequate backup and recovery procedures in place to recover from any accidental or deliberate loss of data

https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.colocationamerica.com%2Fblog%2Fnine-benefits-of-data-backup&psig=AOvVaw0yi4y73MULTq1V52hVNzQo&ust=1611206761178000&source=images&cd=vfe&ved=0CA0QjhxqFwoTCKiFsozjqe4CFQAAAAAdAAAAABAK

Producing Reports from Queries

DBAs are frequently called upon to generate reports by writing queries, which are then run against the database

conclusion

- It is clear from all the above that the database administration function requires technical training and years of experience.
- Some companies that offer commercial database products, such as Oracle DB and Microsoft's SQL Server, also offer certifications for their specific products.
- These industry certifications, such as Oracle Certified Professional (OCP) and Microsoft Certified Database Administrator (MCDBA), go a long way toward assuring organizations that a DBA is indeed thoroughly trained on the product in question.
- Because most relational database products today use the SQL language, knowledge of SQL commands and syntax is also a valuable asset for today's DBAs.

Lesson 2 : Creating the Database Environment

- One of the primary tasks associated with the job of DBA is the process of choosing and installing a DBMS.
- Unfortunately, many business executives and IT professionals without database management background assume that once the DBMS is installed, the bulk of the work is done.
- The truth is, choosing and installing the DBMS is hardly the most difficult part of a DBA's job.
- Establishing a usable database environment requires a great deal of skill, knowledge, and consideration.
- This lesson will outline the principles involved in establishing a usable database environment.

Defining the Organization's DBMS Strategy

- The process of choosing a suitable DBMS for enterprise database management is not as difficult as it used to be.
- The number of major DBMS vendors has dwindled due to industry consolidation and domination of the sector by a few very large players.
- Yet, large and medium-size organizations typically run multiple DBMS products, from as few as two to as many as ten.
- Who chose to install all these DBMSs and why?

Defining the Organization's DBMS Strategy(2)

- There are other reasons for the existence of multiple DBMS platforms in a single organization.
- Perhaps the company purchased a commercial off-the-shelf application package that does not run on any of the current DBMS platforms.
- Sometimes the decision to buy a new DBMS is driven by the desire to support the latest and greatest technology.

Defining the Organization's DBMS Strategy(3)

- Once a DBMS is installed, removal can be difficult because of incompatibilities among the different DBMSs and the necessity of converting application code.
- Furthermore, when a new DBMS is installed, old applications and databases are usually not migrated to it.
- The old DBMS remains and must continue to be supported. T
- This complicates the DBA's job.

Defining the Organization's DBMS Strategy(4)

- So what should be done? Well, the DBA group should be empowered to make the DBMS decisions for the organization.
- No business unit should be allowed to purchase a DBMS without the permission of the DBA group.
- This is a difficult provision to implement and even more difficult to enforce. Business politics often work against the DBA group because it frequently possesses less organizational power than other business executives.

Choosing a DBMS

- The DBA group should set a policy regarding the DBMS products to be supported within the organization.
- Whenever possible, the policy should minimize the number of different DBMS products.
- For a shop with multiple operating systems and multiple types of hardware, choose a default DBMS for the platform.
- Discourage deviation from the default unless a compelling business case exists—a business case that passes the technical inspection of the DBA group

- Most of the major DBMS products have similar features, and if the feature or functionality does not exist today, it probably will within 18 to 24 months.

DBMS Vendors

Of course, there are other DBMS products on the market, many of which are fine products and worthy of consideration for specialty processing.

open-source software movement for DBMS

- PostgreSQL, EnterpriseDB, or MySQL might be viable options. If an object DBMS is important for a specific project, you might consider ObjectDesign or Versant.

- And there are a variety of NoSQL DBMS offerings available, too, such as :
  - Hadoop,

  - Cassandra,

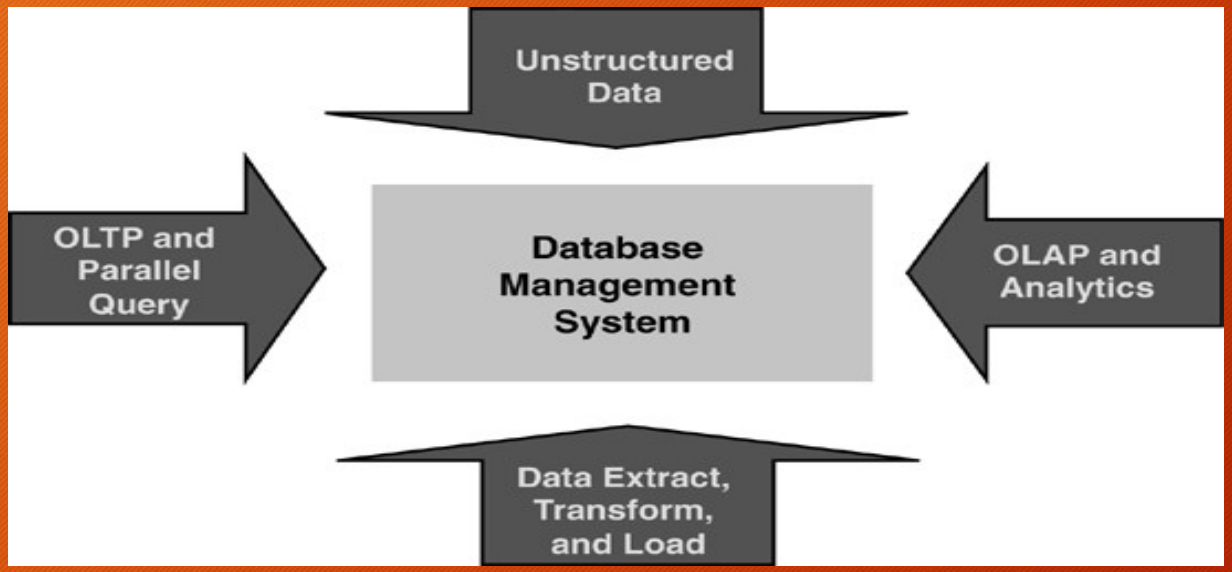
  - MongoDB.

Factors for choosing a DBMS

- *Operating system support.*
- *Type of organization*
- *Benchmarks*
- *Scalability*
- *Availability*
- *Technicians*
- *Release schedule*
- *Reference customers*

Factors for choosing a DBMS

- *When choosing a DBMS, be sure to take into account the complexity of the products. DBMS software is very complex and is getting more complex with each new release.*

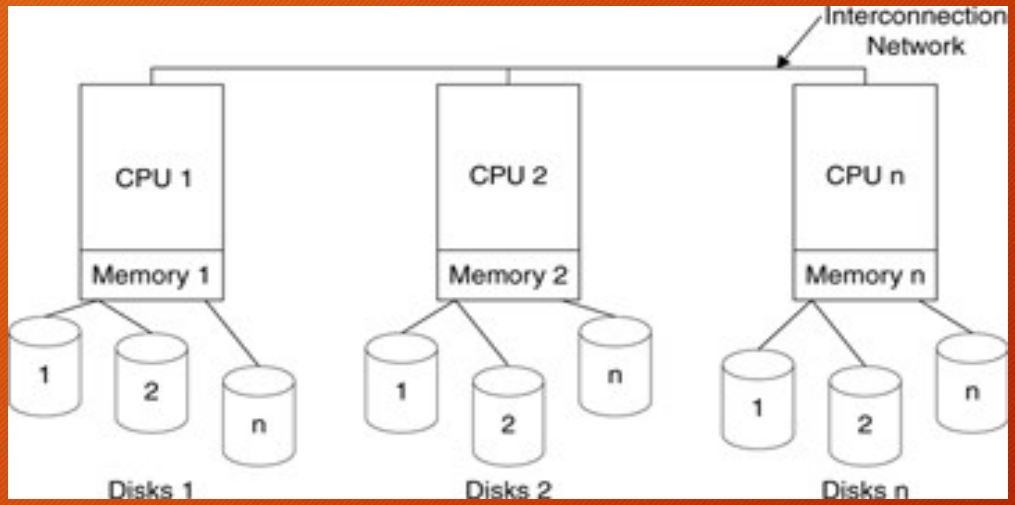


https://www.guru99.com/oltp-vs-olap.html

Convergence of features and functionality in DBMS software

DBMS Clustering

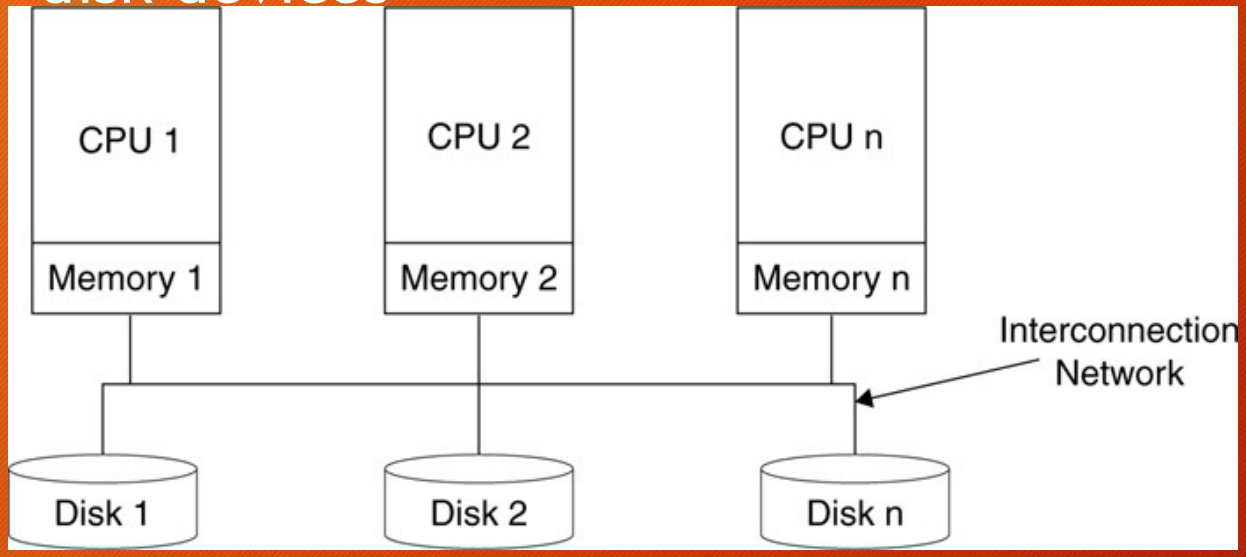
- A modern DBMS offers clustering support to enhance availability and scalability.
- The two predominant architectures for clustering are shared-disk and shared-nothing.
- The main advantage of shared-nothing clustering is scalability.



Shared-nothing architecture

DBMS Clustering

- Shared-disk clustering is better suited to large-enterprise processing in a mainframe environment.
- In a shared-disk environment, all the connected systems share the same disk devices



Shared-disk architecture

Comparison of Shared-Disk and Shared-Nothing Architectures

Shared-Disk	Shared-Nothing
Quick adaptability to changing workloads	Can exploit simpler, cheaper hardware
High availability	Almost unlimited scalability
Performs best in a heavy read environment	Works well in a high-volume, read-write environment
Data need not be partitioned	Data is partitioned across the cluster

The major DBMS vendors provide support for different types of clustering with different capabilities and requirements

DBMS Clustering Benefit

- For most users, the primary benefit of clustering is the enhanced availability that accrues by combining processors.
- In some cases, clustering can help an enterprise to achieve five-nines (99.999 percent) availability.
- Additionally, clustering can be used for load balancing and failover.

DBMS Proliferation

- As a rule of thumb, create a policy (or at least some simple guidelines) that must be followed before a new DBMS can be brought into the organization.
- Failure to do so can cause a proliferation of different DBMS products that will be difficult to support. It can also cause confusion regarding which DBMS to use for which development effort.

- As mentioned earlier, there is a plethora of DBMS vendors, each touting its benefits.
- As a DBA, you will be bombarded with marketing and sales efforts that attempt to convince you that you need another DBMS.

DBMS Proliferation

- Remember, every DBMS requires database administration support.
- Moreover, each DBMS uses different methods to perform similar tasks.
- The fewer DBMS products installed, the less complicated database administration becomes, and the better your chances become of providing effective data management resources for your organization.

Hardware Issues

- When establishing a database environment for application development, selecting the DBMS is only part of the equation.
- The hardware and operating system on which the DBMS will run will greatly impact the reliability, availability, and scalability (RAS) of the database environment.

Cloud Database Systems

- Cloud computing (see the sidebar) is increasing in usage, especially at small to medium-size businesses.
- A cloud implementation can be more cost-effective than building an entire local computing infrastructure that requires management and support.

- A cloud database system delivers DBMS services over the Internet. The trade-off essentially comes down to trusting a cloud provider to store and manage your data in return for minimizing database administration and maintenance cost and effort.
- Using cloud database systems can enable organizations, especially smaller ones without the resources to invest in an enterprise computing infrastructure, to focus on their business instead of their computing environment.