Database Management Systems

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1 Database management systems (DBMS)

For overall history see [Grad and Bergin, 2009].

1.1 Client-server

Most database management systems run in a client-server model, Figure 1.

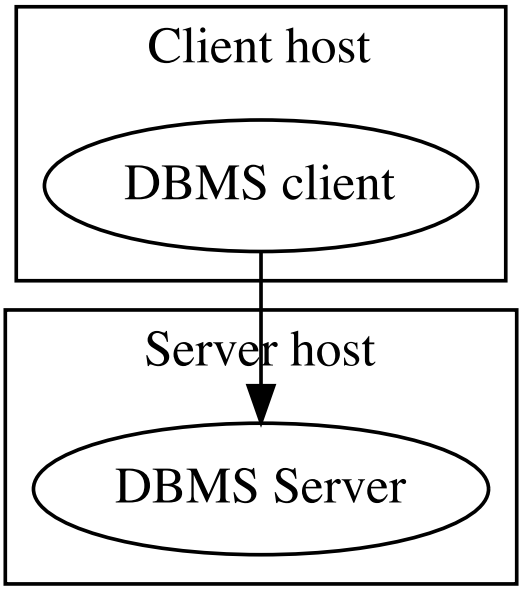

Figure 1: Client-server DBMS

The server process manages the data store and processes requests from clients. The server can be running on any of the following *hosts*:

- Standard laptop / desktop computer
- Dedicated server computer (in a data centre environment)
- Cloud-based virtual host, called a compute instance. (e.g. Amazon EC2)
- A managed database service provided by a cloud service provider (e.g. Amazon RDS, Azure, Google Cloud, IBM Cloud)

The client program accesses the server using a server-specific protocol. Clients normally access through IP networks using TCP on a specified port number. Examples of clients:

- Most databases have a simple command-line client that can send requests to the database and display results
- Apps can be written to access database servers using a client library.
  - Generally the text-mode client uses this library internally too!

Two things to note about the client:

- The client may in some cases be running on the same host as the server.
- Software that is the client of a DBMS may itself be a server.
  - Example: a web application is written in Java using the Spring framework and provides a web server using an embedded Tomcat server. The web application is itself a client of the DBMS it accesses.

This also implies that there is a degree of concurrency, where multiple clients access the same database at the same time.

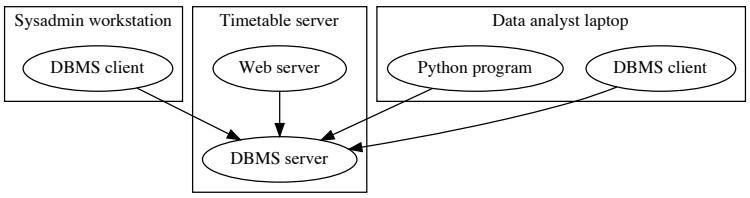

Figure 2: Concurrent access to a DBMS hosting a college timetable

2 Key terms

3 Structured query language (SQL)

For a general overview see [Chamberlain, 2012].

4 PostgreSQL

We will focus on PostgreSQL as our primary database. Later on we will introduce other technologies. Reasons:

- Support exists for geospatial data, JSON, XML, full-text search etc.

- It is free software and can be installed on any operating system.

You should bookmark the PostgreSQL documentation.

As we continue we will refer to PostgreSQL as Postgres for brevity.

4.1 Connecting to a remote host

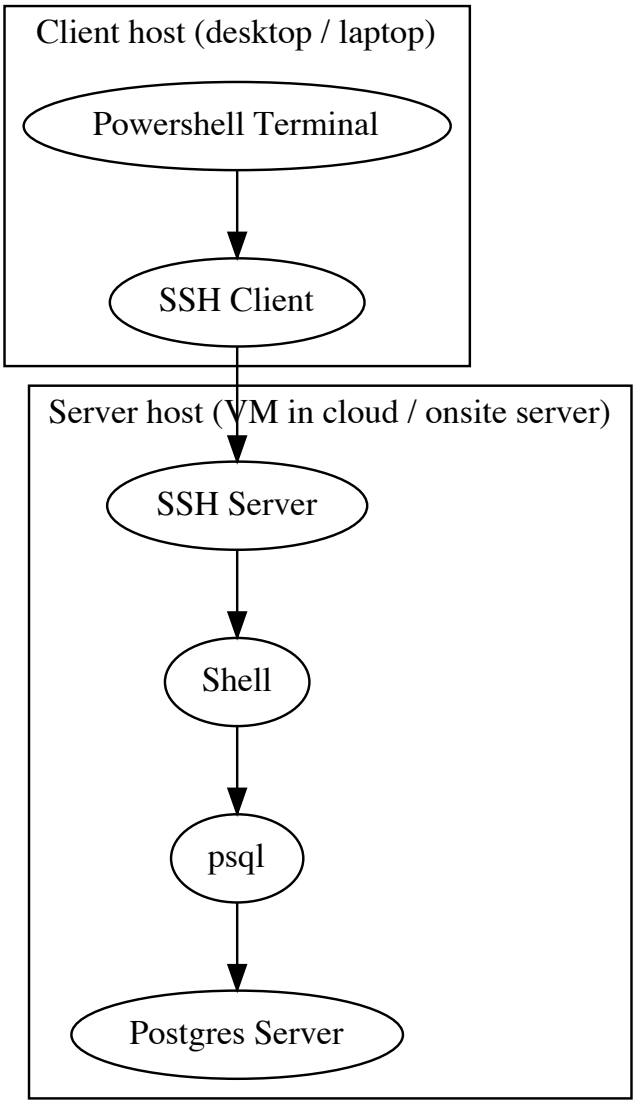

Figure 3: Using psql on a remote host over SSH

References

Donald D Chamberlain. Early history of sql. *IEEE Annals of the History of Computing*, October-November 2012.

Burton Grad and Thomas J Bergin. History of database management systems. *IEEE Annals of the History of Computing*, 2009.