Database Management System – 8 (Centralized and Client/Server Architectures for DBMSs)

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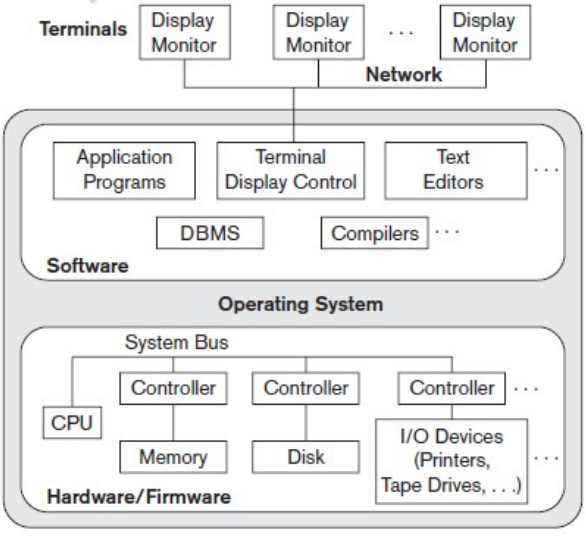
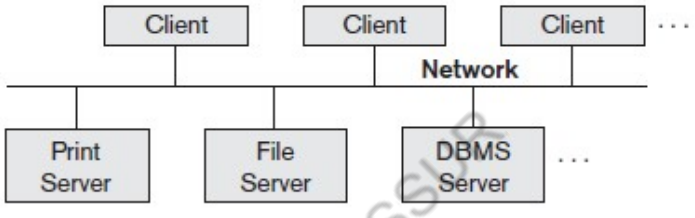
Centralized DBMSs Architecture

- Combines everything into single system

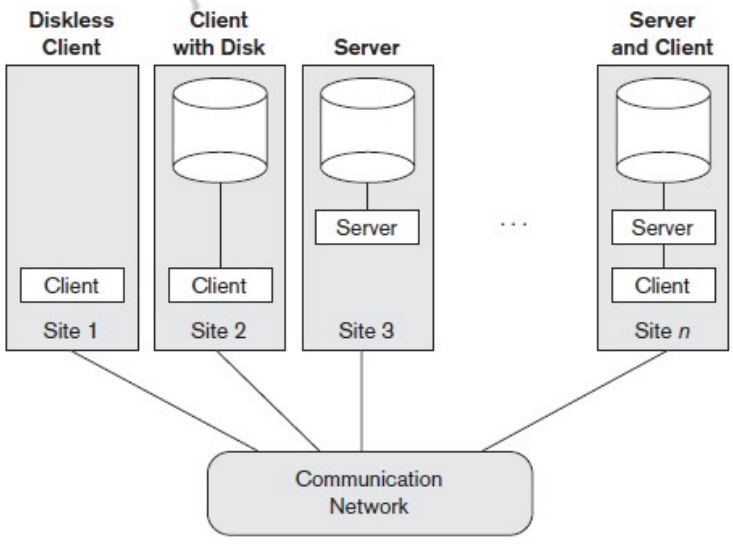


Client/Server Architectures

- Logical Two tier Client/server architecture
  - Specialized servers
  - client machines provide the user with the appropriate interfaces
  - Clients may be diskless machines or PCs or Workstations with disks
  - Connected to the servers via some form of a network



Physical two tier architecture

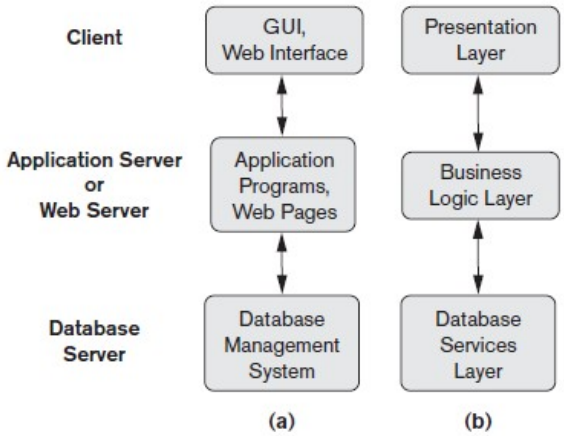


Two-Tier Client/Server Architectures for DBMSs

- Created a **logical division** between client and server
- Client side
  - user interface and application programs
- Server side
  - query server or transaction server
- Application Program Interface (**API**) to access server databases
  - ODBC: Open Database Connectivity standard
  - JDBC: for Java programming access
- Must install appropriate client module and server module software for ODBC or JDBC

Three-Tier Architecture

- Common for Web applications
- Intermediate Layer called Application Server or Web Server:
  - Stores the web connectivity software and the business logic part of the application
  - Enhances Security
  - n-tier architecture



Classification of DBMSs

- **Based on Data models**
  - Relational data model (SQL Systems)
  - Object data model
  - Object relational Data model
  - Hierarchical data model
  - Network data model
  - Big data systems (NOSQL systems) (key value storage systems)
    - document-based, graph-based, column-based, and key-value data models
  - Tree-structured data model (based on XML)

Classification of DBMSs

- **Based on number of users**
  - Single-user systems vs Multiuser systems
- **Based on number of sites over which the database is distributed**
  - Centralized vs. distributed
  - Homogeneous DDBMS vs Heterogeneous DDBMS
- **Based on Cost**
  - Open source (free) DBMS products like MySQL and PostgreSQL
  - Commercial DBMS

History of Data Models

- **Network Model:**
  - Honeywell in 1964-65 (IDS System)
  - CODASYL - DBTG Model (Conference on Data Systems Languages - Database Task Group)
- **Hierarchical Data Model**
  - Initially implemented in a joint effort by IBM and North American Rockwell around 1965
  - Resulted in the IMS family of systems

History of Data Models

- **Relational Model:**
  - Proposed in 1970 by E.F. Codd (IBM), first commercial system in 1981-82
  - Commercial products (e.g. DB2, ORACLE, MS SQL Server, SYBASE, INFORMIX).
  - Open source implementations, e.g. MySQL, PostgreSQL
- **Object-oriented Data Models:**
  - Models of persistent O-O Programming Languages such as C++ (e.g., in OBJECTSTORE or VERSANT), and Smalltalk (e.g., in GEMSTONE).
  - Additionally, systems like O2, ORION (at MCC - then ITASCA), IRIS (at H.P.- used in Open OODB)
- **Object-Relational Models:**
  - Oracle-10i, DB2, and SQL Server

Reference

- Elmasri R. and S. Navathe, Database Systems: Models, Languages, Design and Application Programming, Pearson Education 6th edition and 7th edition

Thank you