

Advanced Database

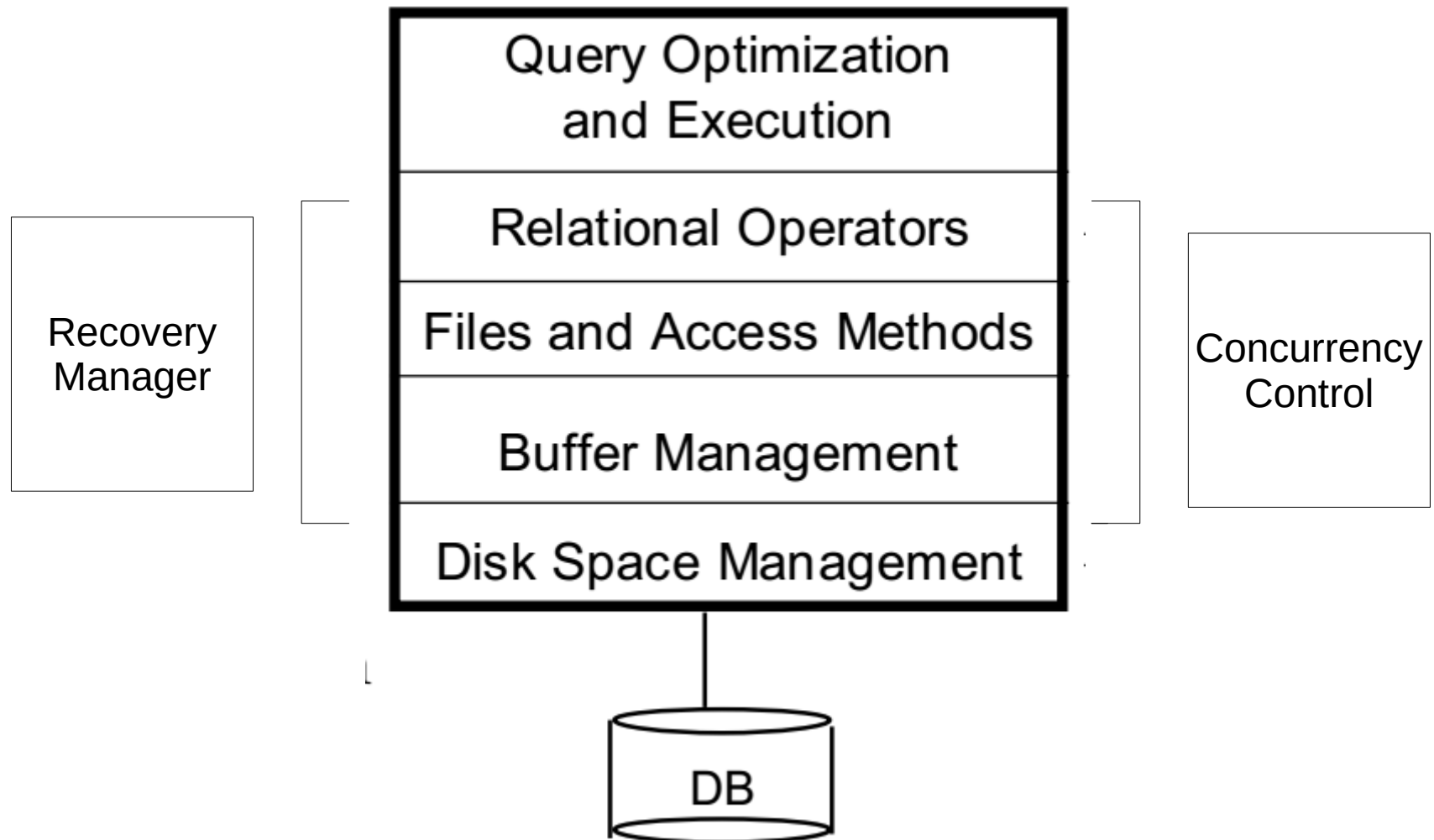
Database Management System Structure

Plan

- Structure: overview
- Query evaluation engine
- File and access method
- Buffer manager
- Disk space manager
- Recovery manager
- Transaction manager

Structure

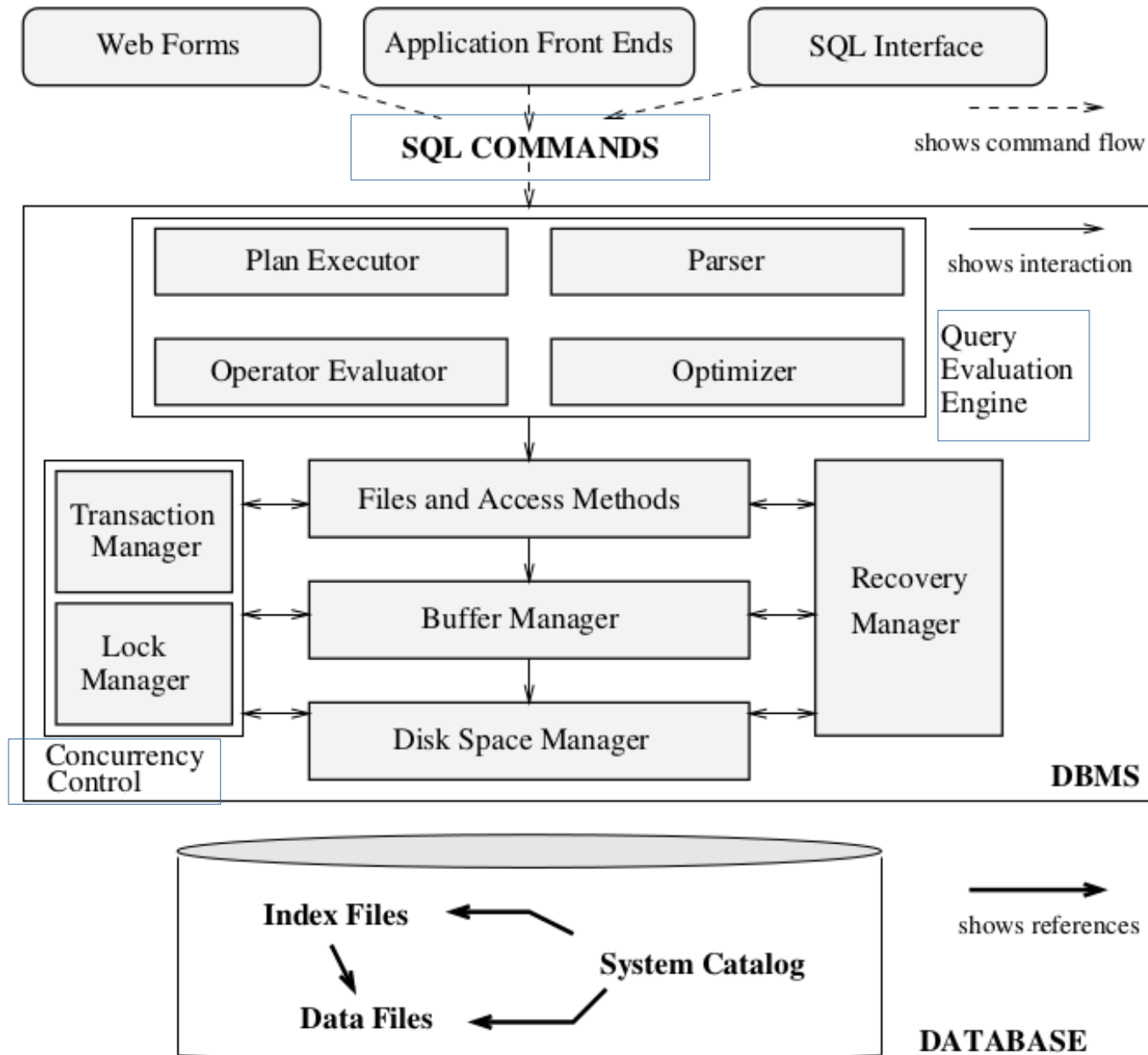
- One possible structure



Structure

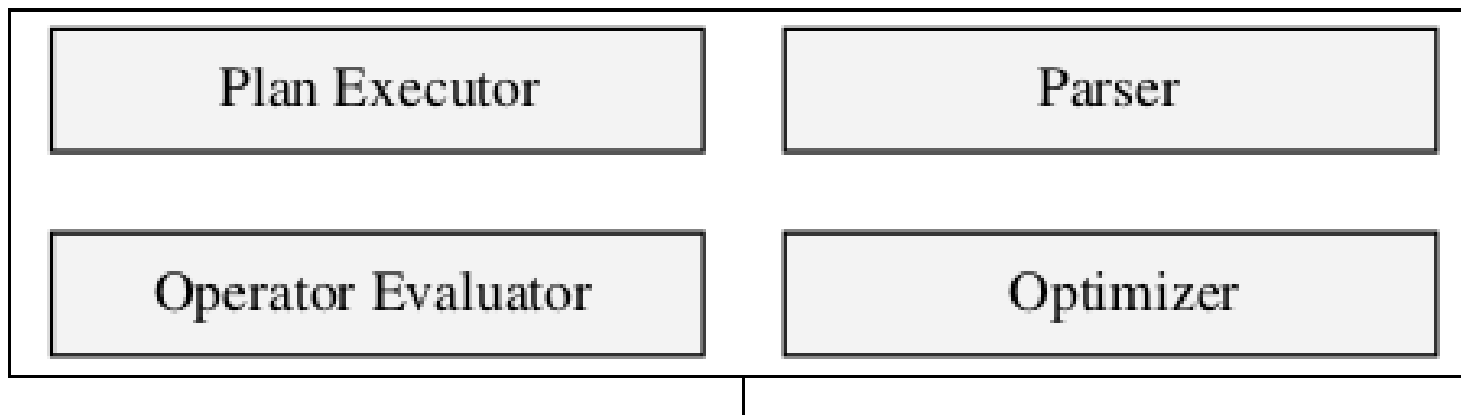
Unsophisticated users (customers, travel agents, etc.)

Sophisticated users, application programmers, DB administrators



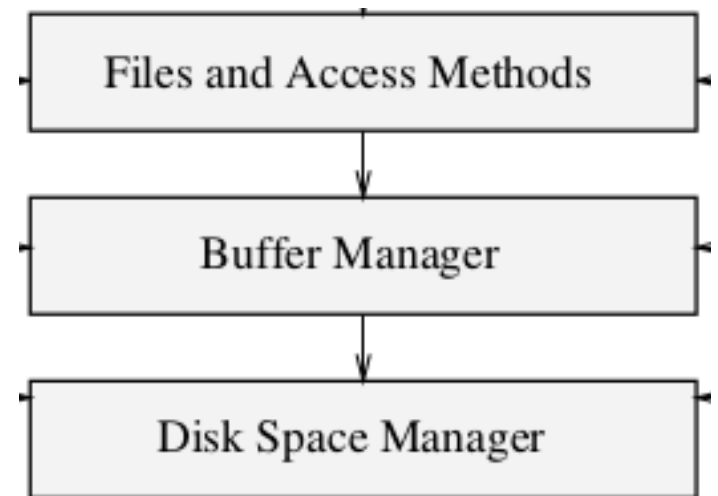
Structure: Components

- Query evaluation engine
 - Parser: syntactic and semantic analysis
 - Query optimizer: suggest a good execution plan using information about how data is store (system catalog)
 - Execution plan: a tree of relational operator with annotation about access methods.



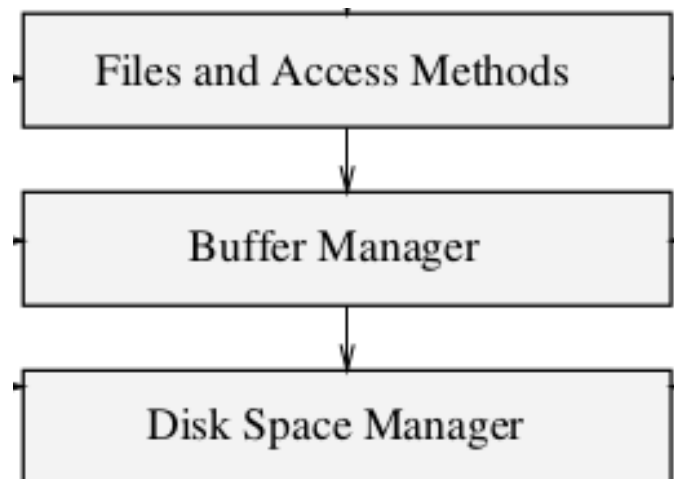
Structure: Components

- File and access method: support heap file (unordered file), sort file, index file.
 - file: pages; page contains records.
 - Data file: stores data in database
 - Index file: stores search key and data entry, helps to locate data on disk.
 - System catalog: store data about data (fields, index... of table)



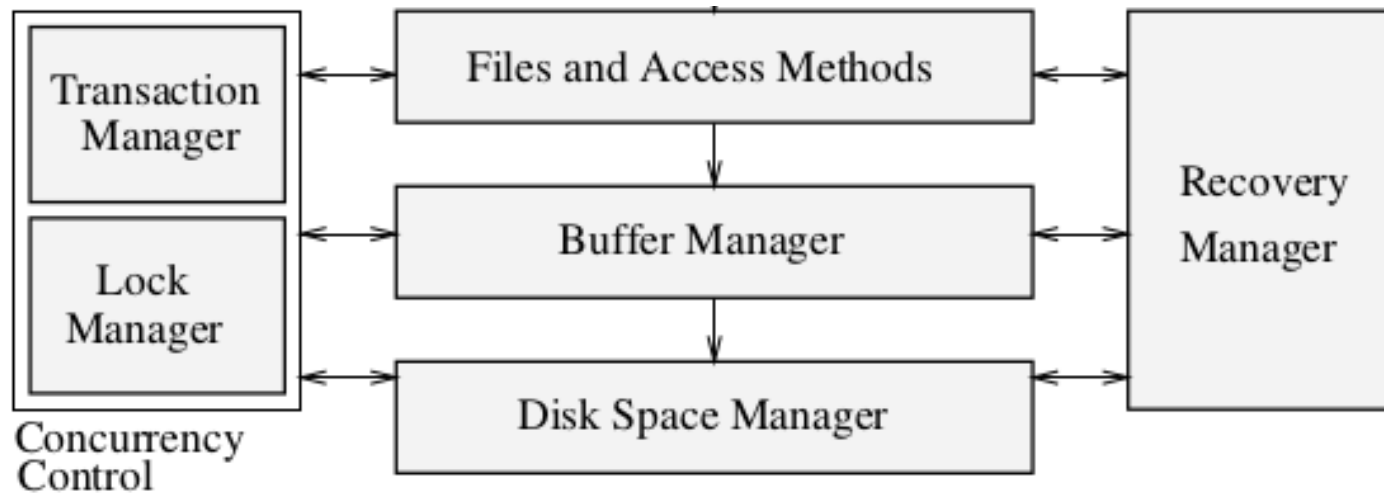
Structure: Components

- Buffer manager: bring pages from disk to main memory
- Disk space manager: manage disk where data is stored
 - Help higher layers allocate, deallocate, read, and write pages



Structure: Components

- Write-Ahead Log (WAL): write the record about change on database to hard disk before writing the change to hard disk.
 - Used for recovery in case of system crash in the middle of a transaction.
- Recovery Manager
 - Schedules user requests
 - Stores log of all changes in database
 - Restores system to a consistent state after crash.



Structure: Components

- Transaction: a sequence of operations performed as a single logical work.
 - Example: transferring money from one account to other account
 - Debit money from account A.
 - Deposit money to account B.
- Locking protocol : is used to control access to database objects.
 - Shared lock (read): can be held by two different transaction at the same time.
 - Exclusive lock (write) : ensures that no other transaction can hold any lock on that object.

Structure: Components

- Transaction manager:
 - Transaction: a sequence of operations performed as a single logical work.
 - Schedules transaction execution.
 - Ensures that transaction requests and release lock correctly
- Lock manager: keeps track of lock request and grants locks on database objects

