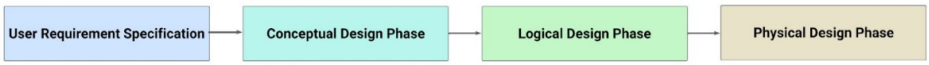
Database Design & Database Engine

23 September 2023 10:22



- Mainly design of schema
- The db environment must meet the users requirements

User requirement specification
- Figure out the user's data needs
- Interact with domain experts and users

Conceptual Design Phase
- Choose data model (ex: relational)
- Translate requirements to conceptual schema (data and relationships)
- Make sure no conflicts by reviewing schema and remove redundancies
- Decide how to group into tables (for relational)
- Can use ER model or employ set of algorithms called normalization to take in attributes and give out tables
- Review schema to ensure it meets functional requirements

Logical Design Phase
- Implements the high level schema to data model selected

Physical Design Phase
- Decide on internal storage structure or file organization

Functional Requirements Specification:
- Users describe operations (transactions) on data.
- Ensure schema meets functional requirements.

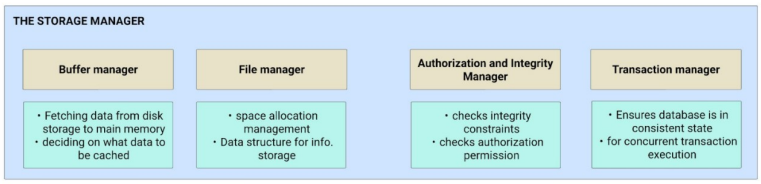
Logical-Design Phase:
- Mapping conceptual schema to implementation data model.
- Using entity-relationship model for relational design

Physical-Design Phase:
- Using system-specific database schema.
- Specifying physical features (file organization, indexes).

Database Engine

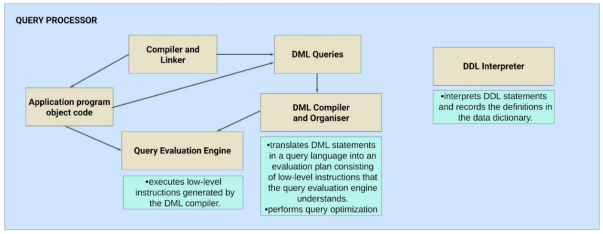
Database system divided into modules to deal with different responsibilities of the overall system
- Storage Manager
- Query processor
- Transaction Manager

Storage Manager
- Interface between low level data and application program that processes queries
- Responsible for interacting with OS file manager and efficient storing, retrieval and updating of data
- Data structures of storage manager
  - Data files: store the db
  - Data dictionary: store metadata of db
  - Indices: provide fast access to data items, provides pointers to those items that hold a particular value

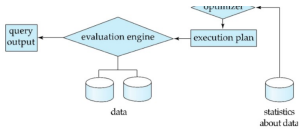


BFAT

Query Processor
- Helps simplify and facilitate access to data i.e getting good performance while working at view level
- Components
  - DDL interpreter
  - DML interpreter
  - Query evaluation engine



- 1. Parsing and translation
- 2. Optimization
- 3. Evaluation



POE

Transaction Manager

- Collection of operations that perform single logical function
- Make sure db stays in consistent state despite system failures (power failures, system crash) and transaction failures
- A transaction is a logical unit of work that must maintain atomicity (all-or-none execution), consistency (database remains valid throughout), and durability (changes are permanent even after system failure).
- During the execution of a transaction, temporary inconsistency may be allowed, but the database must return to a consistent state after the transaction completes successfully.