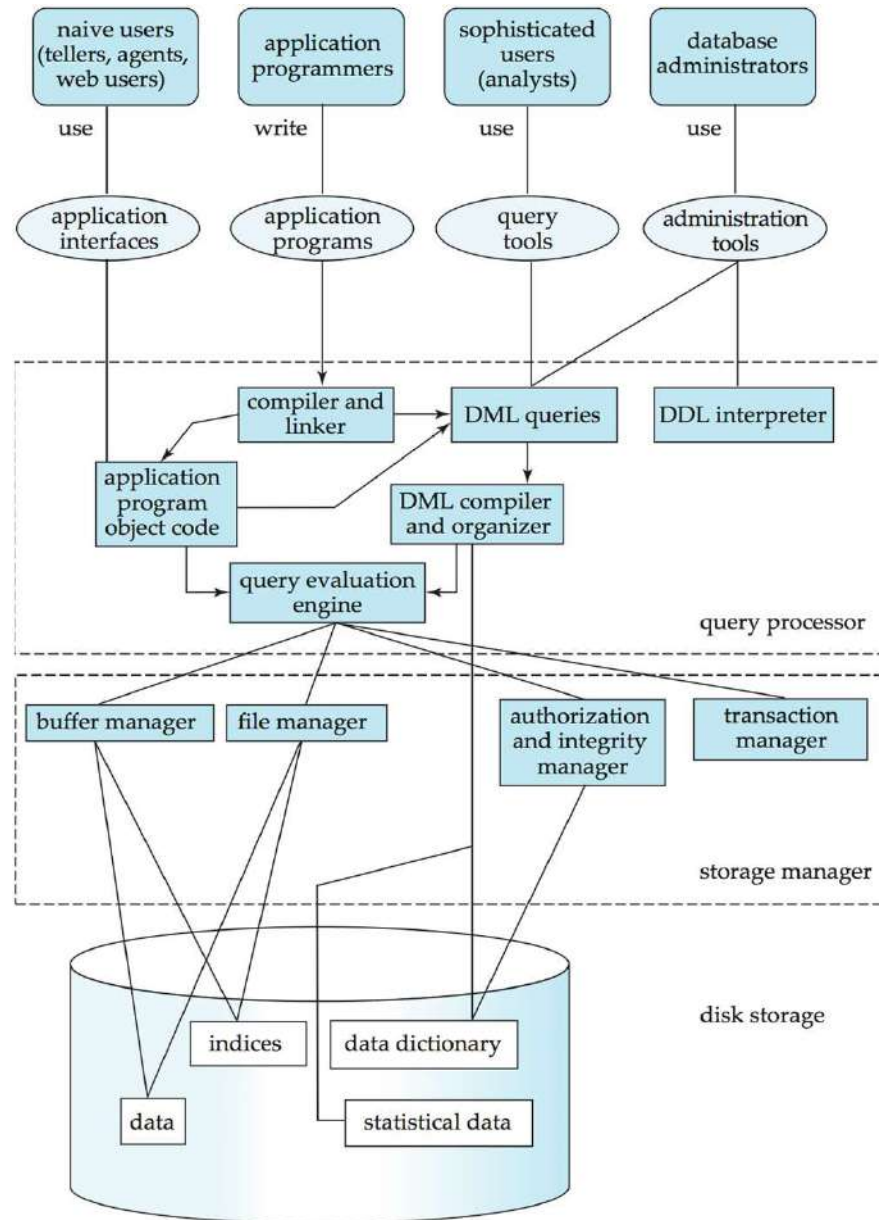


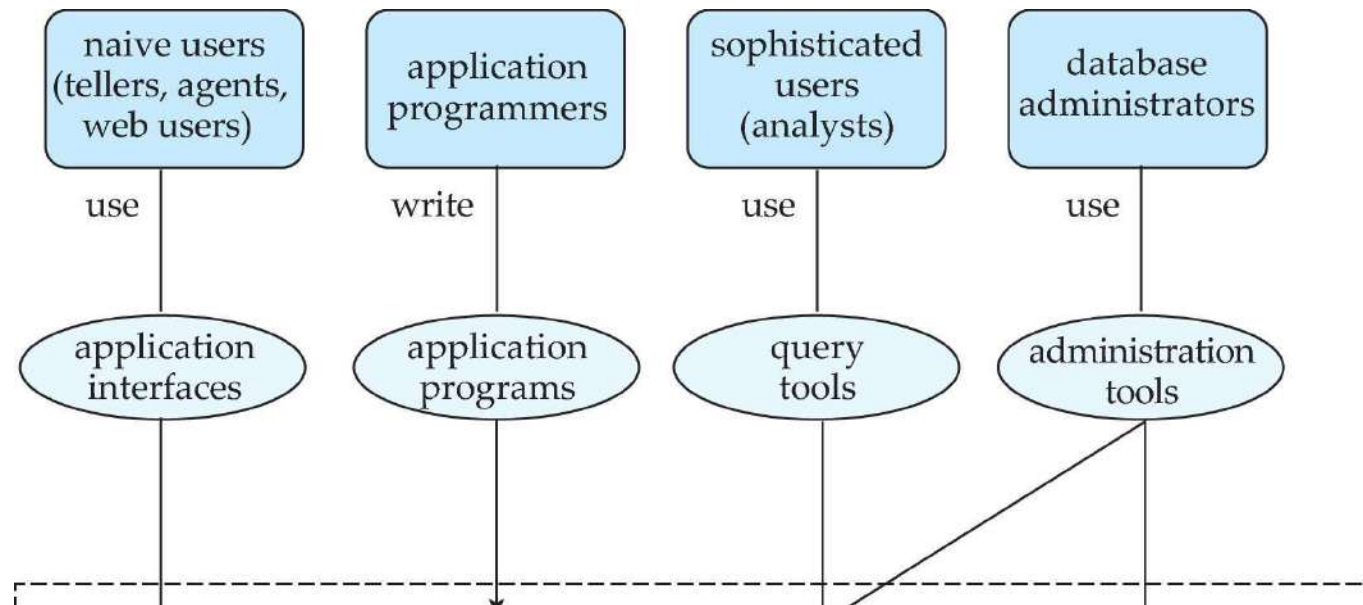


Database System structure





Database Users and Administrators





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Database Engine

- Storage manager
- Query processing
- Transaction manager



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Storage Management

- **Storage manager** is a program module that provides the interface between the low-level data stored in the database and the application programs and queries submitted to the system.
- The storage manager is responsible to the following tasks:
 - Interaction with the OS file manager
 - Efficient storing, retrieving and updating of data
- Issues:
 - Storage access
 - File organization
 - Indexing and hashing



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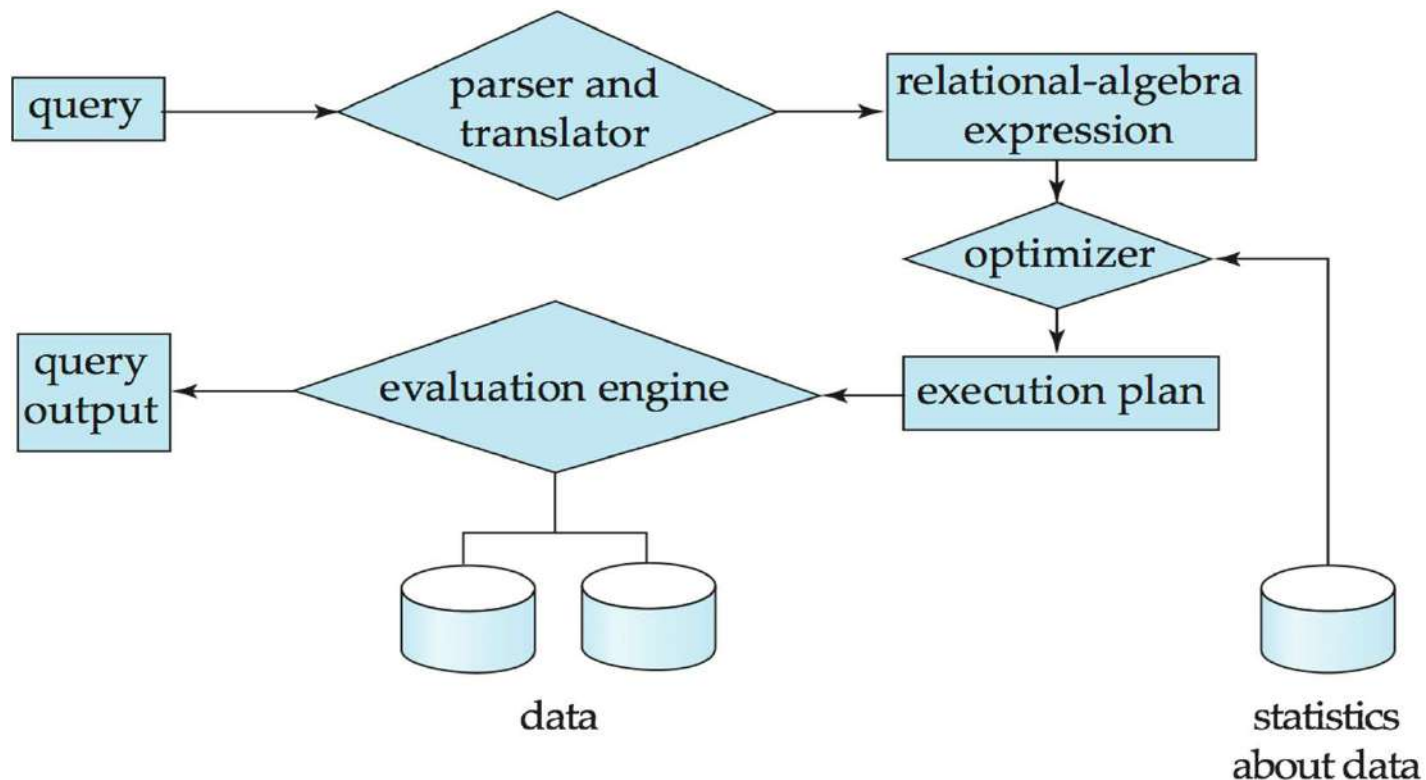
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Query Processing

1. Parsing and translation
2. Optimization
3. Evaluation





Query Processing (Cont.)

- Alternative ways of evaluating a given query
 - Equivalent expressions
 - Different algorithms for each operation
- Cost difference between a good and a bad way of evaluating a query can be enormous
- Need to estimate the cost of operations
 - Depends critically on statistical information about relations which the database must maintain
 - Need to estimate statistics for intermediate results to compute cost of complex expressions



Transaction Management

- What if the system fails?
- What if more than one user is concurrently updating the same data?
- A **transaction** is a collection of operations that performs a single logical function in a database application
- **Transaction-management component** ensures that the database remains in a consistent (correct) state despite system failures (e.g., power failures and operating system crashes) and transaction failures.
- **Concurrency-control manager** controls the interaction among the concurrent transactions, to ensure the consistency of the database.