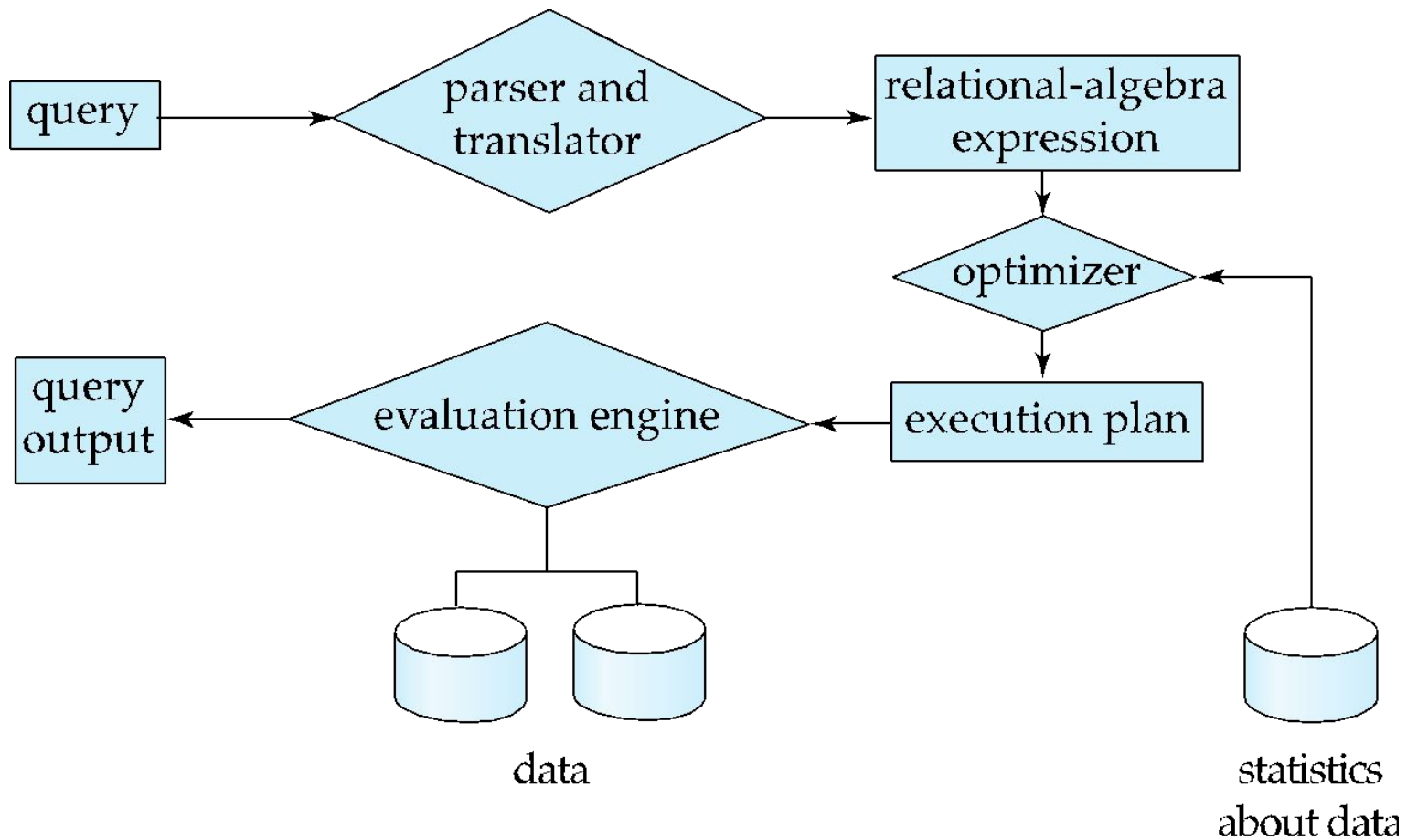# Query Processing

- **Query Processing** is a translation of high-level queries into low-level expression. It is a step wise process that can be used at the physical level of the file system, query optimization and actual execution of the query to get the result.

Basic Steps in Query Processing

1. Parsing and translation
2. Optimization
3. Evaluation

Basic Steps in Query Processing (cont.)

- Parser and translator

  - Translate the (SQL) query into relational algebra

  - Parser checks syntax (e.g., correct relation and operator names)

- Evaluation engine

  - The query-execution engine takes a query-evaluation plan, executes that plan, and returns the answers to the query

- Optimizer (in a nutshell – more details in the next slides)

  - Chooses the most efficient implementation to execute the query

    - Produces equivalent relational algebra expressions
    - Annotates them with instructions (algorithms): query execution plan (QEP)
    - Estimates the cost of each equivalent QEP, according to a given cost model
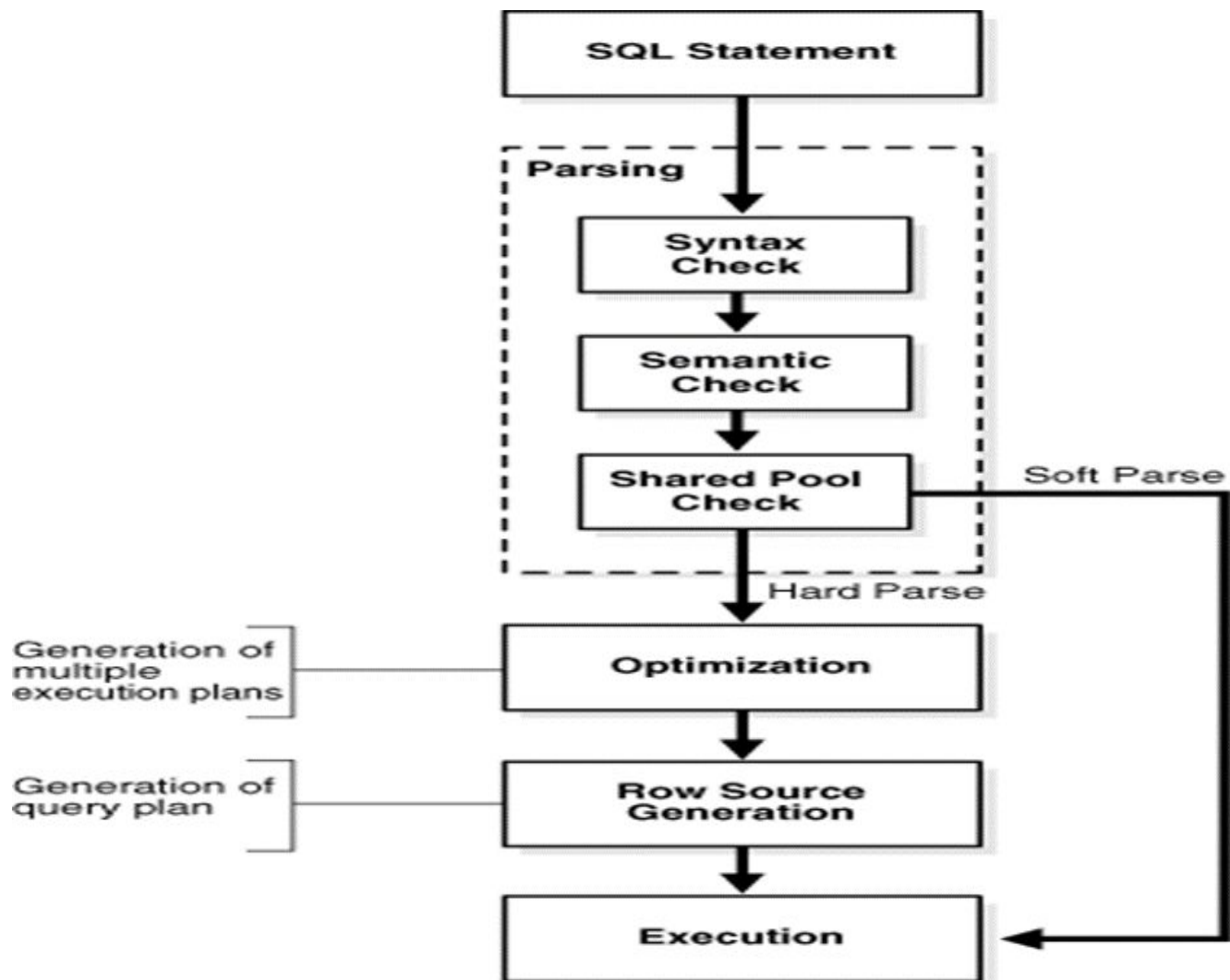   - Choose the "best" QEP

Step 1

Parser − While parsing, the database performs the checks like, Syntax check, Semantic check and Shared pool check, after converting the query into relational algebra.

The syntax check concludes SQL is syntactically correct or not, that means it checks SQL syntactic validity.

The syntax for parser to do syntax check is −

SELCT * FROM Student;

Semantic check It determines whether the statement has meaning or not. Example: query contains a table name which does not exist is checked by this check.

The semantics of a statement are its meaning. A semantic check determines whether a statement is meaningful, for example, whether the objects and columns in the statement exist.

A syntactically correct statement can fail a semantic check, as shown in the following example of a query of a nonexistent table:

SQL> SELECT * FROM nonexistent_table;

SELECT * FROM nonexistent_table

ERROR at line 1:ORA-00942: table or view does not exist

- **Shared Pool check** This check determines existence of written hash code in shared pool, suppose if code exists in shared pool then database will not take additional steps for optimization and execution because every query possess a hash code during its execution.

Step 2

Optimizer − In this stage, the database has to perform a hard parse at least for one unique DML statement and it has to do optimization during this parse. This database never optimizes DDL unless it includes a DML component.

It is a process where multiple query execution plans for satisfying a query are examined and the most efficient query plan is satisfied for execution.

Database catalogue stores the execution plans and then optimizer passes the lowest cost plan for execution.

Row Source Generation − The Row Source Generation is software which receives an optimal execution plan from the optimizer and produces an iterative execution plan which is used by the rest of the database. The iterative plan is the binary program that when executed by the sql engine produces the result set.

Step 3

Execution Engine − Execution engine is helpful to run the query and display the required result.

The query execution engine takes a query evaluation plan, executes that plan and produces the desired output. The different execution plans for a given query can have different costs based on the number of disks. It is the responsibility of the system to construct a query evaluation plan which minimizes the cost of query evaluation. This task is called query optimization.

- A sequence of primitive operations that can be used to evaluate a query is called query execution plan or query evaluation plan.