Query Execution Process

Initial Query
  ↓
  Syntax Verification
  ↓
  Semantic Validation
  ↓
  Query Tree Transformation
  ↓
  Optimized Query Tree
  ↓
  Code generation for the Query Tree
  ↓
  Runtime DB Processor.

Preprocess
Preprocess of
Save the
Executable Code

Stored Procedure

A procedure with several SQL statements and can accept parameters.
It also supports input/output operations within the procedure.
Further local variables can be declared and used for passing values between SQL statements and data manipulations. Additionally, flow control such as if, while, can be supported.

* The procedure will be stored as an executable object within the DB.
Create procedure USP_EmpSalary

parameter specifications

AS

Begin

[Declaration of local variables]

[Statements]

End

- Stored procedures are preprocessed
  and saved as an executable object inside the DB.

Later this executable SP object can be invoked:

* interactively on the GUI interface
  Right-click on the SP object
  Select "Execute Stored Procedure..."

* SQL Query Window
  EXEC sp_name parametervalue
Database Design

1. Design a Conceptual (Logical) Schema for the DB

   E-R Diagram
   Entity | Relationship
   Company Database
   Employee
   Salary
   Ssn
   Name
   Was_for
   Many:1
   Many:1
   Department
   Manages
   1:1
   1:many
   Dependent
   Many:many
   Many:many
   Project

   Entity: Rectangle blocks
   Relationship: Diagonal block
   Attribute: Oval block
A minimal subset of attributes of a table that uniquely determines all other attributes of a table.

Keys:
- \( \{ \text{Frame}, \text{Name}, \text{SSN} \} \rightarrow \{ \text{Minit}, \text{Bdate}, \text{Address}, \ldots \} \) (marked with an 'X')
- \( \{ \text{SSN} \} \rightarrow \{ \text{Frame}, \text{Minit}, \text{Name}, \text{Bdate}, \ldots \} \) (circled)
- \( \{ \text{Frame}, \text{Minit}, \text{Name}, \text{Address} \} \rightarrow \{ \text{SSN}, \text{Bdate}, \text{Sex} \} \)

Candidate keys:
- \( \{ \text{Frame}, \text{Minit}, \text{Name}, \text{Address} \} \)

Candidate keys (uniquely identify each row of the table):
- \( \{ \text{SSN} \} \) (Primary key)
- \( \{ \text{Driver License}, \text{State} \} \) (Alternate keys)
Relational Database Design

Conceptual Schema ➔ Map ➔ Relational Schema
E-R Diagram ➔ 2-D Tables

Entity Type ➔ Table
Attributes ➔ Columns of the Table

Relationships:
- 1:1
- 1:N
- M:N
  - 1:many
  - many:many

Manage ➔ Works_for ➔ Works_on

Mapping of E-R Diagram to Relational Schema

Top-down
- Start with one big table
- Decomposition
- Normalization
- Set of Tables

Bottom-up
- Start with several small tables
- Merge tables
- Set of Tables

Middle-out
- Segment the E-R Schema
- For each segment
- Apply decomposition
- Merge tables of Segments