Learning Objectives

- After this segment, students will be able to
  - List building blocks for graph queries
  - Compare 2 algorithms for a connectivity query

Data Models of Spatial Networks

1. Conceptual Model : Entity Relationship Diagrams, Graphs
2. Logical Data Model : Abstract Data types , Custom Statements in SQL
3. Physical Data Model
   - Storage-Structures
   - Algorithms for common operations

Query Processing for Spatial Networks

- Query Processing
  - DBMS decomposes a query into building blocks
  - Keeps a couple of strategy for each building block
  - Selects most suitable one for a given situation

- Building blocks
  - Connectivity(A, B): Is node B reachable from node A?
  - Shortest path(A, B): Identify least cost path from node A to node B

Algorithms

- Main memory
  - Connectivity: Breadth first search, depth first search
  - Shortest path: Dijkstra's algorithm, A*
- Disk-based
  - Shortest path - Hierarchical routing algorithm
  - Connectivity strategies are in SQL3

Algorithms for Connectivity Query

- Breadth first search
  - Visit descendent by generation
  - Children before grandchildren
  - Example: 1 - (2,4) - (3, 5)
- Depth first search
  - Try a path till dead-end
  - Backtrack to try different paths
  - Like a maze game
  - Example: 1-2-3-2-4-5
  - Note backtrack from 3 to 2