Outline

1. What is a Query? Query Language?
2. Example Database Tables
3. SQL Overview: 3 Components
4. SELECT statement with 1 table
5. Multi-table SELECT statements
6. Why spatial extensions are needed?
7. 1-table spatial queries
8. Multi-table spatial queries
9. Trends

Learning Objectives

- After this segment, students will be able to
  - List trends in Spatial Query Languages
  - Facilities for user defined data types in SQL3

Defining Spatial Data Types in SQL3: Libraries

- Third party libraries implementing OGIS are available
- Almost all user use these libraries
- Few users need to define their own data types

- We will not discuss the detailed syntax of CREATE TYPE

Defining Spatial Data Types in SQL3: Overview

- CREATE TYPE statements
- Defines a new data types
- Attributes and methods are defined
- Separate statements for interface and implementation
- Example:

```
CREATE TYPE Point AS OBJECT (
        x NUMBER
        y NUMBER,
        MEMBER FUNCTION Distance (P2 IN Point) RETURN NUMBER,
        PRAGMA RESTRICT _REFERENCES (Distance, WWDS));
```


Summary

- Queries to databases are posed in high level declarative manner
- SQL is the “lingua-franca” in the commercial database world
- Standard SQL operates on relatively simple data types
- SQL3/OGIS supports several spatial data types and operations
- Additional spatial data types and operations can be defined
  - CREATE TYPE statement

More Details

[1] S. Shekhar, and S. Chawla, Spatial Database: A Tour, Prentice Hall 2003, ISBN 0-13-017480-7. (Chapter 3 on Spatial Query Languages).

[2] A. Neumann, Open-Source GIS Libraries, Encyclopedia of GIS, Springer, 2008, pp. 816-820.

[3] C. Strobl, PostGIS, Encyclopedia of GIS, Springer, 2008, pp. 816-820. pp. 891-898.

[4] R. Kothuri and S. Ravada, Oracle Spatial, Geometrics, Encyclopedia of GIS, Springer, 2008, pp. 821-826.