Lecture 15 February 2005

Database Technology II
DATABASE TECHNOLOGY II

• Structured Query Language (SQL)
• Third generation Languages (3GL)
• Stored procedures and similar mechanisms
• Designing database schema
• Local vs. global databases
• Database federation
Structured Query Language (SQL) data types

- Integer
- Floating point number
- Character string, fixed or variable length
- Date, time, datetime, interval
- Numeric and defined

→ Defined operations on each data type
Third generation extensions (3GL)

- “Looks like Basic”
- If . . then . . elseif . . while . .
- Trigonometric (sin, cos, tanh, exp, hex, ..)
- Rollback, update,
- Blob technology
- Proprietary?
Stored procedures and similar mechanisms

- A stored procedure can be used to manipulate data within the database logical memory space.
- Local procedure call (LPC) vs. remote procedure call (RPC).
- Related to object-relational “data blade” or “cartridge.”
Performance issues for DBMS extensions

create table Bond(
    bond_id int,
    coupon_rate float,
    face_value decimal (10,2),
    bought date,
    matures date,
    value decimal (10,2);
)

update bond
    set value = face_value +
              coupon_rate * (matures - bought)

<table>
<thead>
<tr>
<th>Call</th>
<th>Resp. Time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPC</td>
<td>3.1</td>
</tr>
<tr>
<td>RPC (same machine)</td>
<td>45.0</td>
</tr>
<tr>
<td>RPC (another machine)</td>
<td>104.0</td>
</tr>
</tbody>
</table>

What is a database schema?

- A schema is an expression of the relationship between different data elements within a database. It defines the rules by which the data elements are accessed.

- The schema provides an intellectual map of the information content of the database.
An example schema for medical images

DICOM Database
(Ngon Dao: 1999)
Federating databases: queries that span several sources

“GATC+” Database

- External Gene Databases
  - Structure information
  - Family information
  - Pathway information
  - Other annotations, etc.

- Probe Information
- Clone Information
- Chip Design Information
- Analysis Type Information
- User Information
- Hybridization Condition
Local vs. global databases

- View integration systems
  - Example: Kleisli/K2 and Federation Engine
  - Query global schema with high-level language, system returns with information extracted from outlying databases.
  - Involves having “connection” between system engine and outlying databases
  - Potential performance penalty

- Local warehouse approach
  - Use view to gather and import foreign databases
  - Issue of updates (concurrency) and size

The full machinery: Database Federation

Ref: Ben Fu, M.S. Thesis, MIT, 2001