Object Oriented Databases

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Object Databases

- Became commercially popular in mid 1990's
- You can store the data in the same format as you use it. No paradigm shift.
- Did not reach full potential till the classes they store were decoupled from the database schema.
- Open source implementation available – low cost solution now exists.

Object Database Vendors

- Matisse Software Inc.,
- Objectivity Inc.,
- Poet's FastObjects,
- Computer Associates,
- eXcelon Corporation
- Db4o

Db4o

- Object Database
- Can be used with .NET or Java platform.
- Supports Acid Transactions
- Small foot print
- Does not require schema files since it runs natively.

SQL Server

When designing for Sql Server must you consider when using SQL Server?

- Process Model
- Sql Server Installation
- Table Creation
- Stored Procedures
- Possible Separate User System
- Platform Specific
- Views
- Intermediate Table Creation
- Possible Security Issues
- Mapping Code
- Server Centric

Installation – Sql Server

- Sql Server must install Sql Server on server.
- Client can save information to datasets offline.
- For an application shared across a client and a server, separate code must be written for select, insert, update and delete operations – one set for sql server, one for the dataset operations.

Process Model – Sql Server

- Requires the installation of two services, each running out of process.
- Requires inter process calls to save information to the database.

Process Model – Db4o

- Requires the use of a dynamic link library (dll). Represented in memory as a static object.
- Runs in the same process as the running application, so call overhead the same as calling any other function.

Installation – Db4o

- Just have the dynamic link library included as part of your application.
- Application requires
  - An in memory stream, or..
  - An isolated storage stream, or..
  - A file stream, or..
  - A network stream.
- Stream Flexibility and Nestability

Table Creation – SQL Server

- For each object in your client model, usually at least one table needs to be created.
  - Object Tables
  - Linking Tables

"Table Creation" - Db4o

- You do not need to create any special objects to store your data in Db4o.
- The same objects you use in your code class structure can be saved to the database.
- Since it saves the graph, no linking entries need to be made.

Sql Server – Stored Procedures

- For each insert, update, delete, and select statement - a stored procedure.
  - Separate Language
    - Another language for your team to learn.
  - More code to manage
    - Small changes add up
  - Have to write insert, update, delete select procedures for each type you want to serialize.

"Stored Procedures" – Db4o

- You don't have to write any update, delete, insert, or select procedures if you do not want too.
- More complex select procedures might require a separate function.
- Written in the same language

User System – Sql Server

- Either need to use Windows Security, which causes your application to be tied down to a implementation, or use Sql Server Security.

- Both options require a separate security cost CALs.

- Both require the application to support an outside system.

- ACID transactions require use of separate user.

User System – Db4o

- Use whatever security you want to use with the application.
- Can use code access permissions
- Does not require to extend your program

Platform - MS Sql Server

- Requires an Microsoft Operating System

Platform – Db4o

- Can run on almost any platform. Just needs to support Java or MS.NET or Mono.

Views – MS SQL Server

- To increase performance, MS Sql Server offers views. These views though can be costly in terms of memory.

Views – Db4o

- Does not have them. Your data is already in a graph structure.

Intermediate Tables

- Relational Databases require intermediate tables to be created to maintain n to n relationships.

- Object databases do not require this step.

Security – SQL Injection Attacks

- To avoid SQL injection attacks, we must be careful about how we write our code.
- Must either use Stored Procedures or input filters to ensure that an attack does not succeed.
- Either way, more complexity to manage.

Relational Mapping Code

- "Thirty percent of an application's code alone is used for mapping an application's object-oriented design to the database's relational model [1]."

- Mapping code is not a problem till you need to change your code to incorporate new features.

- What could you and your team do with 30% more time for coding?

1 - http://www.15seconds.com/Issue/030407.htm

Server Centric – SQL Server

- Requires that the database be located on a serving device.
- Clients must use a dataset, a separate object for writing information and then synchronize the information.
- Does not support dual client - server mode.

Server and Client Centric – Db4o

- Db4o can run the same code as if it was on a server or on a client computer.
- Can be easily synchronized
- Can run be deployed as a connected or disconnected client model.

Db4o Basics

- Database Creation
- Defining your data classes
- Inserting
- Updating
- Deleting
- Queries
  - By Example
  - Advanced Queries

Basics: An Eight Line Example

"Coders never had it so simple."

```
ObjectContainer oContainer = new ObjectContainer(@"C:\MyFirstObjectDB.odb");

Person oPerson = new Person("Adam");

oContainer.set(oPerson);   // Insertion

oPerson.Name = "Eve";

oContainer.set(oPerson);   // Update

ObjectSet oSet = oContainer.get(oPerson);  // Query By Example, a.k.a. Selection

oContainer.delete(oPerson);   // Deletion

oContainer.Close();
```

Basics: Database Creation & Your Options

- Create In Memory Database
- Create a Database from a File Stream
- Create a Database using an Adapter
  – Supports Network Streams
  – Custom Encryption
  – Isolated Storage

Basics: Insertion

- To insert a new object into the database, it just takes one step:

    oContainer.set(oPerson);

- You can configure your the database to only save certain members and how deep to save.

Basics: Updating

- To update an object in the database, it just takes one step:

    oContainer.set(oPerson);

- Notice the same command is used. This can be done because it keeps track of the reference to the object.

Basics: Querying By Example

- Examines field values. Any field not set to the default value for that data type is used in the query.
- Provides easy fast queries.

```
oPerson.Name = "Adam"
oPerson.Address = "132 Main Street"
ObjectSet oSet = oContainer.get(oPerson);
while (oSet.hasNext())
{
        Person oSelectedPerson  = (Person)oSet.Next();
}
```

Basics: Deletion

- To delete an object in memory that db4o knows the reference too:

    oContainer.delete(oPerson);

- Otherwise do a query and then call the delete.

    // Do Query to get reference.

    oContainer.delete(oPerson);

Links

- Article on Object Databases: http://www.15seconds.com/Issue/030407.htm

- Db4o White Papers: http://www.db4o.com/about/productinformation/whitepapers/default.aspx