

Software Design
CSE 335, Spring 2006

Persistent Objects

Stephen Wagner

Michigan State University

Persistent Objects

- Most real applications work with data that exists for the long term
 - The data exists before the application is executed
 - The data exists after the application is executed
 - The application may modify the data
- A *persistent object* is an object that exists “outside” of the application and can continue to exist when the application quits

Persistent Objects

- Most applications use the filesystem to achieve persistence:
 - Files exist independent of the application
 - There is lots of OS support for file manipulation
 - Not very object oriented.
- Databases provide persistence
 - More complicated than filesystems
 - Usually not very object oriented

C++ and Persistent Objects

- C++ does not offer any real support for persistent objects
 - Libraries and packages exist to help
 - There has been talk of adding support to future versions of C++
- We can mimic Java's *serialization*

Serialization

- Java allows you to serialize an object
 - Essentially it just prints out a string that describes the object
 - All the base Java classes support this
- To save all the objects in an application, you can simply print them all to a file
- Methods exist to read the file and recreate all the objects

C++ and Serialization

- Using streams it is easy to print your own objects
- Have to make sure that the result is unambiguous
 - Have to be able to identify when a field ends
- Pointers are problematic
- The STL does not support serialization
 - You would have to write your own code to do this

C++ and Serialization

- How do you recreate an object?
- In C++ the type of object created by `new` is determined at compile time
- C++ does not support *reflection*
 - It is not possible for a class to “query” itself about its members
- Both of these limitations make persistent objects clunky in C++

Persistence and Databases

- Serialization is useful with files.
- Relational databases offer much more flexibility
 - Relation databases are not object oriented
 - Object Oriented Databases exist, but are not common
- How do you store objects in a relational database?

Objects and Databases

- Relational databases store data in tables (relations)

```
class Student
{
    int PID;
    string firstname,lastname;
}
```

PID	firstname	lastname
8	Joe	Strummer
9	Aimee	Mann

Objects and Databases

- How do you get objects into and out of the database?
- With reflection it is pretty straightforward
- Without reflection, the solutions are not so pretty