A picture containing graphical user interface

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COMP 6231 DISTRIBUTED SYSTEMS DESIGN

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DESIGN DOCUMENT FOR ASSIGNMENT 2

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Introduction

**Distributed Class Management System (DCMS) using CORBA (Common Object Request Broker Architecture):**

Distributed Class Management System is a distributed system used by center managers to manage information regarding the teachers and students across different centers.

The three centers locations are:

* Montreal (MTL)
* Laval (LVL)
* Dollard-des-Ormeaux (DDO)

The server for each center (called CenterServer) maintains a number of Records. The two types of Records are:

* TeacherRecord
* StudentRecord

A Record a unique RecordID starting with TR - TeacherRecord or SR – StudentRecord.

Fields in TeacherRecord – First Name, Last Name, Address, Phone, Specialization and Location.

Fields in StudentRecord – First Name, Last Name, Courses Registered, Status and Status Date.

Managers with a unique ManagerID can perform operations:

* createTRecord
* createSRecord
* getRecordCounts
* editRecord
* **transferRecord** (new feature)

This application has a number of CenterServers(one per center) each implementing the above operations for that center and ManagerClients(one per center) invoking the manager’s operations at the associated CenterServeras necessary.

It has been developed using JAVA IDL - CORBA

Description of the technique used:

Common Object Request Broker Architecture (CORBA):

DCMS has been designed using CORBA which is the object oriented equivalent of remote procedure calls (RPC). ORB (Object Request Broker) is responsible for management of the remote access to objects. Common ORB architecture is a software bus for distributed objects. CORBA provides a nearly transparent access to remote objects from a local program using the client-server paradigm. Unlike RMI, CORBA has an advantage of being totally platform and language independent.

How does CORBA implementation look like:

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Software-based communications interface

Diagram

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As seen in the figure:

Client Program: ORB Library on the client side determines the location of the target object and sends a request for its access.

Server Program: ORB Library on the server side receives request, processes it and sends a reply to the client object.

Architecture of the system:

The DCMS architecture has 3 locations (Montreal, Laval and DDO) which are the clients of the system.

The Managers at these locations have access to the database which consists of the records: Student Record and Teacher Record. The managers can perform functions such as createTRecord, createSRecord, getRecordCounts, editRecord and transferRecord as per requirement.

ManagerClient is the client program which handles these requests and attempts to create, edit or transfer the appropriate record with the corresponding server associated with the manager in the form of a hashmap and each server also maintains a log containing the history of all the operations that have been performed on that server in a separate text file. By invoking getRecordCounts, the manager of a center can also get the number of record (both teacher and student) present in their respective database.

This system has multiple centers and one CenterServer for each of them which make use of a centralized ManagerClient to invoke the required method from the repository, for each operation it finds the information about the requesting server and invokes the corresponding operation.

Diagram

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TEST CASES EXECUTED:

# D. Test Scenarios:

|  |  |  |  |
| --- | --- | --- | --- |
| ID | Description | Expectation | Result |
| 1 | Manager creating Teacher records | Record should be saved in database | PASS |
| 2 | Manager creating Student records | Record should be saved in database | PASS |
| 3 | Managers requiring valid id to access the server Test Data: (MTLXXXX / LVLXXXX / DDOXXX) | Managers should be able to connect to the right server | PASS. |
| 4 | Managers not able to connect with invalid id | Invalid managers id will get an error message | PASS |
| 5 | Managers able to get all the record counts | The total count of all the records should be printed for each of the servers | PASS |
| 6 | Manager should be able to edit records | Manager should be able to modify records from the record id | PASS |
| 7 | Phone number validation in Teacher Records | Only numeric values in Phone number | PASS |
| 8 | Status Field validation in student record | Only Active and IActive status | PASS |
| 9 | Managers should not be allowed to edit any fields other than Address, Phone and Location in the Teacher Record. | Any fields other than Address, Phone and Location in the Teacher Record are not modified | PASS. |
| 10 | Managers should not be allowed to edit any fields other than Course Registered, Status and Status Date in the Student Record. | Any fields other than Course Registered, Status and Status Date in the Student Record are not modified | PASS |

CHALLENGES FACED:

* The most difficult and important part of the design and execution was creating the correct client-server architecture which would work exactly as given in the problem statement.
* Another challenge faced by us was to understand the specifics and limitations of the CORBA system and use it to implement our proposed architecture without any shortcomings in the required features.
* Third difficulty we faced was to maintain concurrency in the system.
* Getting the whole distributed system to run on a single system using different ports and sockets for the development purpose was also a tough task.

UML Diagrams:

Use case diagram:

Diagram

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Class diagram

References:

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