

IMPLEMENTATION OF DISTRIBUTED COMPUTING ENVIRONMENT BASED ON JAVA

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Abstract

Distributed computing is widely used in around the world. As the mean of "distribute", the required tasks can be performed concurrently on separated nodes. The proposed system is to implement the roll call system of university as the distributed computing environment. This system consists of two parts by the functionality, the administrator and the teacher. The administrator can add, edit and delete teachers, class, monthly call, department and years of courses. And the administrator can view and print the total roll call of each class. Each family teacher can add, modify and delete the students and calculate the attendance of the students. And then the teacher can also view and print the result of the attendance of the class. This system intends to ease the calculation of roll call system of university over distributed computing. In order to facilitate such a set of events and actions, many development platforms are available. The system uses the Java programming language and Java distributed system, called Java Remote Method Invocation (RMI) and MySQL database server.

Keyword: RMI, MySQL

1. INTRODUCTION

The distributed system can run on several computers that locate separately through the network. A common way of organizing software to run on distributed systems is to separate functions into two parts: clients and servers. A client is a program that uses services that other programs provide. The programs that provide the services are called servers. The client makes a request for a service, and a server performs that service. Server functions often require some resource management, in which a server synchronizes and manages access to the

resource, and responds to client requests with either data or status information. Servers can in turn be clients of other server. Client programs typically handle user interactions and often request data or initiate some data modification on behalf of a user. A common design of client/ server systems uses three tiers. A client interacts with the user. An application server contains the business logic of the application. A resource manager stores data [7].

2. AIM AND OBJECTIVES

This system intends to implement with studying the necessary theory for distributed system and network technology.

The aim and objectives of this system are as follows:

- To know the basic concepts and general architecture of distributed computing environment
- To understand how the computer can interact over the communication
- To get the knowledge in the usefulness of distributed objects
- To provide more efficiency and performance than that of stand-alone system
- To help for making the roll call system of universities

3. BACKGROUND THEORY

3.1. Introduction of Distributed Computing

A distributed system consists of multiple computers that can communicate through a network. The computers can connect with one to another in order to achieve a common goal. A computer program can runs in a distributed system is called a distributed program.

Distributed programming is the process of writing that programs.

Figure 1 shows the organization of the Distributed system.

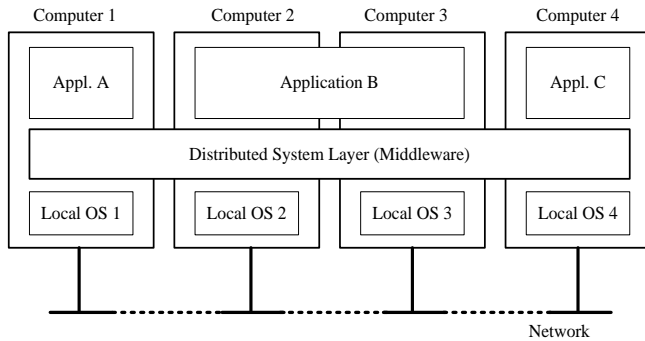


Figure 1. Organization of the distributed system

3.2. Anatomy of a Distributed Application

A distributed application is built upon several layers. At the lowest level, a network connects a group of host computers together so that they can talk to each other. Network protocols like TCP/IP let the computers send data to each other over the network by providing the ability to package and address data for delivery to another machine. High level services can be defined as on the top of the network protocol, they are directory services and security protocols. Finally, the distributed application can runs on top of these layers, using the mid-level services and network protocols.

3.3. Goals of Distributed System

There are four important goals in distributed system. They are described as the following.

- Making Resources Accessible: The main goal of a distributed system making resources accessible is for the users to access remote resources easily, and to share them efficient way.
- Distribution Transparency: An important goal of a distributed system distribution transparency is to hide the fact and resources are physically when distributed across multiple computers.
- Openness: One of the important goal of distributed systems is openness. An open distributed system is a system

that will be services as according to standard rules which are described the syntax and semantics of those services. Interface definitions written in an IDL capture only the syntax of services.

- Scalability: The last goal of the distributed system is Scalability. Scalability of a system can be measured at least three different dimensions. First, a system can be scalable its size. Second, age graphically scalable system in which the users and resources can lie far apart. Third, a system can be administratively scalable, it can still be easy to manage administrative organizations.

3.4. Types of Distributed Systems

Generally, the distributed systems can be classified into three types. They are distributed computing system, distributed information system, distributed pervasive systems.

- Distributed Computing Systems: Distributed systems are used for high performance computing tasks Cluster computing systems. For using this system price and performance ratio of personal computers and workstations improved. It became financially and technically attractive to build a supercomputer in a high speed network. Cluster computing is used for parallel programming in which single program can run in parallel on multiple machines.

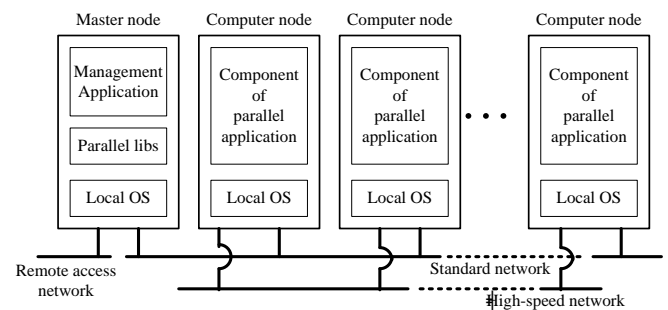


Figure 2. An Example of a Cluster Computing System [2]

- Distributed Information Systems: Another important class of distributed systems is information system. In this system found in organizations that were confronted with a wealth of networked applications. Many of

middleware solutions are the result of working with an infrastructure which it was easy to integrate applications into an enterprise wide information system.

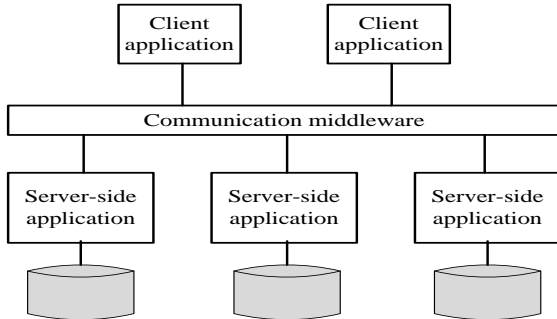


Figure 3. Middleware as a Communication Facilitator in Enterprise Application Integration [5]

- Distributed Pervasive Systems: An important feature distributed pervasive system is the general lack of human administrative control. In this system, devices can be configured by their owners, but, they need to automatically discover their environment and "nestle in" as best as possible.

3.5. Distributed System Architectures

Various hardware and software architectures are used for distributed computing. In lower level, it is necessary to interconnect with multiple CPUs with some sort of network. At a higher level, it is necessary to interconnect [processes](#) running on those CPUs with some sort of [communication system](#). The architecture of distributed system can be classified into three types forms. They are centralized distributed system, decentralized distributed and hybrid forms. [2]

4. SYSTEM DESIGN AND IMPLEMENTATION

The proposed system architecture and the functions of the main entities in the system are explained in detail. And the database design of the system is also presented in this chapter. Some interfaces of the system are also described and explained.

4.1. The Proposed System Architecture

The system flow chart of admin, server side program, application server is shown in Fig. 5. Firstly, the system will be established the connection with the database server. And the login process for the admin will be performed. If the login process is correct, the system provides the application functions. The functions contain adding, editing and deleting of admin, teacher, department, class, year and monthly call. Not only those functions but also assigning family teacher to class, viewing or printing of the roll call of required class can provide by the admin server side program.

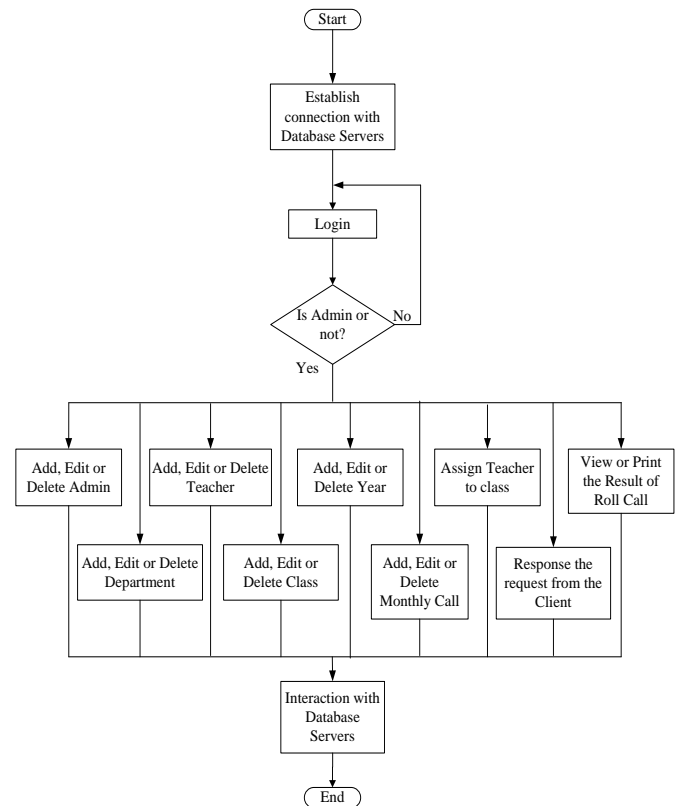


Figure 4. The System Flow Chart of the Admin Side Program

The system flow chart of the head of department, server side program is shown in Fig 5. The first process is the establishing the connection with the admin database server and the department database server. The login process will be performed if the database servers are running. If the login was correct, the head can perform adding, deleting and editing of the teachers and classes of the department and assigning the family teacher to the class. Viewing and printing of the result of the roll call can also perform.

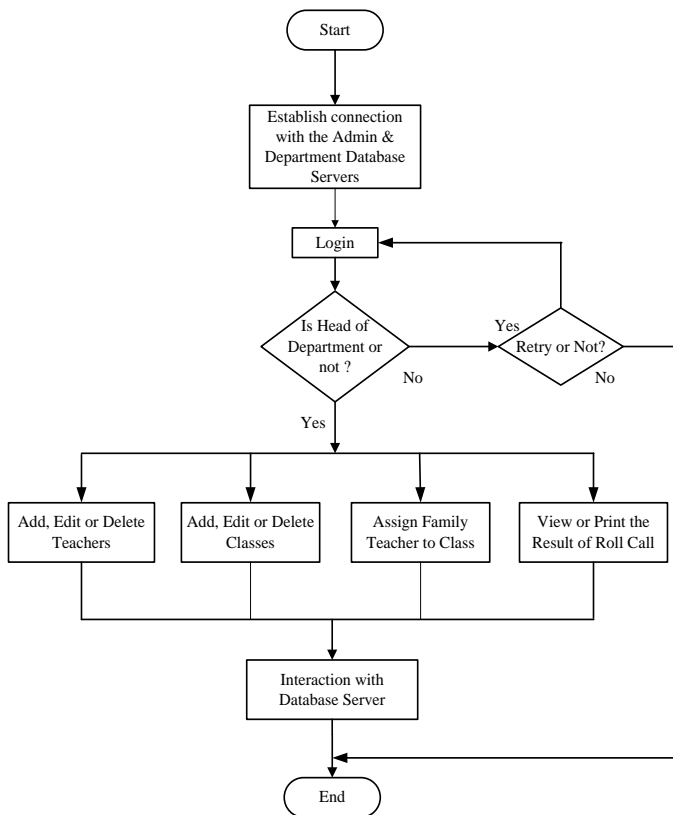


Figure 5. The System Flow Chart of the Head of Department Program

The system flow chart of the family teacher, client side program is shown in Fig. 6. First of all, the client needs to establish the connection with the server. If the connection isn't success, the process can retry or terminate. The login process will proceed if the connection was ok. The login process can retry or terminate when the login wasn't correct. If the login was correct, the client can perform adding, editing and deleting of the students and attendance of the students. Viewing and printing of the result of the roll call can also perform. All the changes made in the client process send back to the database server through the application server.

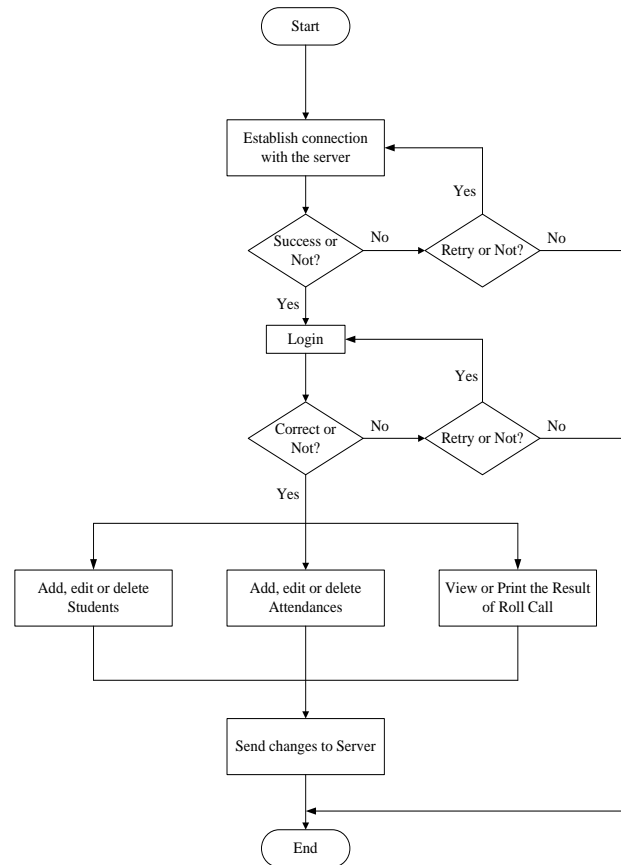


Figure 6. The System Flow Chart of the Client Side Program

4.2. The Implementation of the Proposed System

Before the admin program's processing has not started, the database server has been connected by server. Without being inputted the address of the database server to the server side program in order to connect to the database server. The input dialog box for the database server address is shown in Fig. 7. After giving the database server address, the server side program will connect the database server that locates in that address. Then the program will prompt the login dialog box to enter the system. The user has to type name and password. The user of the server side program is always administrator of the system. The login dialog box is shown in Fig. 8.

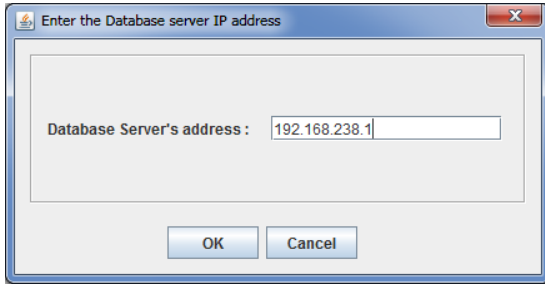


Figure 7. The Input Dialog Box for the Database Server's Address

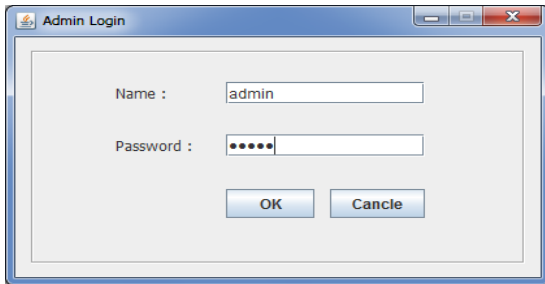


Figure 8. Admin Login Form

The system need to add the teachers in order to assign the family teacher to the classes. The family teacher is needed because he or she has to entry the attendances of the students to the system. The adding screen of the teacher is shown in Fig.9. The user has to input teacher's information such as name, password and department of that teacher.

The implementation has to add the teacher with name of "it_teacher_eee" and department of "IT".

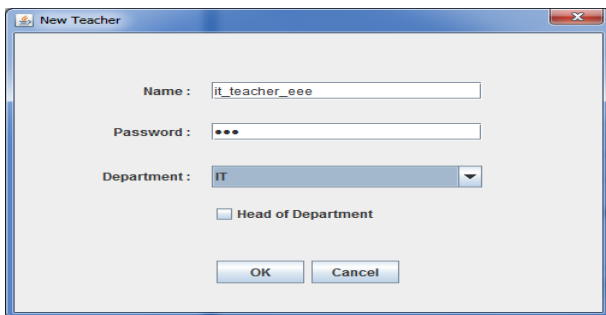


Figure 9. The Screen of Adding New Teacher

The adding of new class is shown in Fig. 10. There will be needed to fill the required information such as class's name, department of class, year of class and class's

family teacher. The corresponding teacher's list will be shown atomically by selecting one of departments.

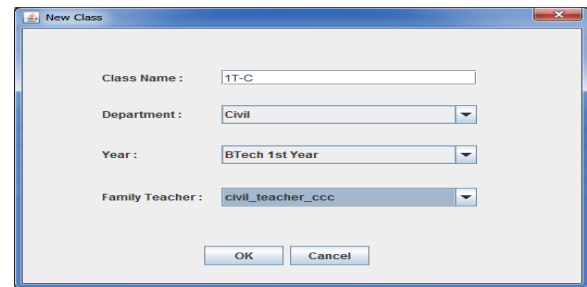


Figure 10. The Adding of New Class

The monthly call is needed in calculation of monthly roll call. So, the server needs to provide the number of call of each month. This can be performed in the monthly call screen, shown in Fig. 11. From this point, the user can add, edit and delete the class's information.

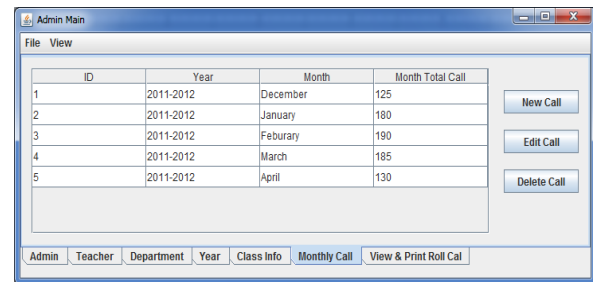


Figure 11. The Monthly Call's Screen

The last function of the server side program is viewing or printing the required roll call. This is shown in Fig. 12. The user has to select required year or class, month, and percentage and view mode to view the result of roll call. If the user chooses the "Year" check box, the roll call of the entire year can be shown. The month list shown in here will dynamically change according to the month of monthly call. Firstly, the "Print" button will disable. When the user sees the list of roll call, the "Print" button will enable and can print the result of current viewing roll call. The result will shows the student's roll No., name, total call, total attendance, attendance's percentage and the current status of student. The result will be calculated the status of the student based on the inputted percentage.

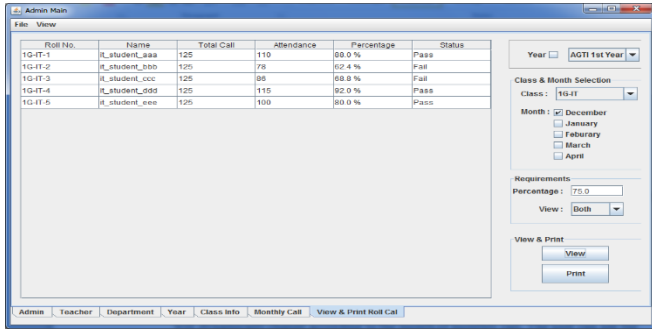


Figure 12. The Viewing and Printing of Roll Call

If the user clicks the "Print" button, he or she will see the preparation screen for printing, shown in Fig. 13. And he can check or uncheck the dialog box of printing options. If he checks the "Show print dialog", he can see the print setup page for printer, page setup and appearance. If he checks the "Interactive", the printing status box will show while printing the document. If he checks "Fit width to printed page", the roll call result's table will fit to the width of the printed document.

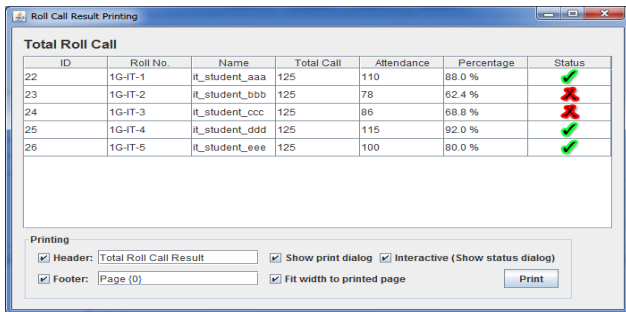


Figure 13. The Preparation Screen of Printing Roll Call

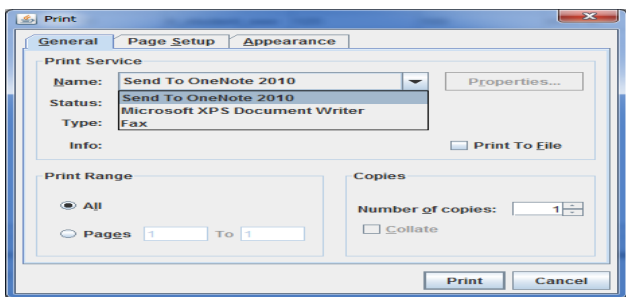


Figure 14. The Print Setup Dialog Box

The input dialog box of server address to connect is shown in the following Fig.15. The client program will connect to the server by using this inputted address and

display an error message if there is no server in that address. The login screen will be displayed when the connection was success.

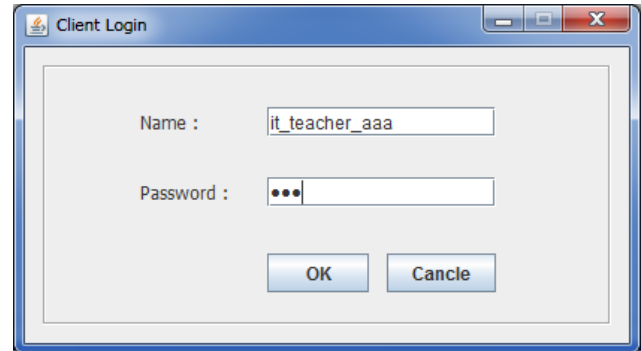


Figure 15. The Login Screen of Client Side Program

If a family teacher is successfully login to the system, the client main screen will appear. This is shown in Fig. 16. In the client program, the name of class and name of family teacher are shown in header field. The client program consists of student list, monthly attendance and total attendance of the class. And this function can view by click the appropriate tab or choosing from "View" menu. The main screen is focus on student list. From this window, the teacher can see the lists of student. And the teacher can perform adding of new student, editing of existing student and deleting of existing student. If a student is added, the attendance list of that student will created automatically by the system.

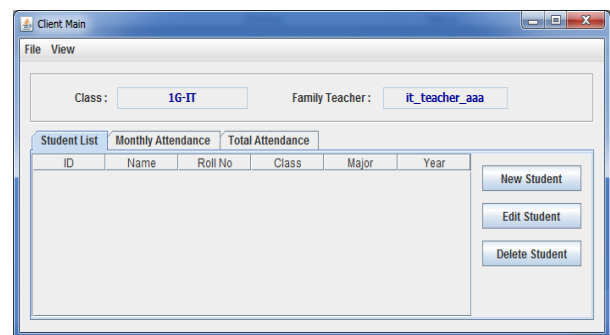


Figure 16. The Student List and Main Screen of Client Program

The system design of the system is presented. The detail presentation of the system implementation is discussed in section 4 by step by step. The use of distributed

computing in the era of calculation of roll call system in university can be got many benefits such as reliability, performance and speed, transparency.

5.CONCLUSION

Nowadays, the roll call calculation systems used in many technological universities are carried out by individually of family teacher. The overall system for the whole university is not yet implemented. If a system that can be used by all family teachers for the calculation of student attendance and roll call is implemented, there will be many benefits. The proposed system intends to use the distributed computing environment to this era of roll call calculation for the university. The use of distributed computing will bring many advantages such as time consumption, stability and reliability, performance. This system is implemented by the use of remote invocation technology of the distributed system. The system has included the server and the client to perform the task separately. The number of server can be more than one and they can be performed in parallel. Other factors, such as call of month, month list and assigning the family task can be carried out by the system administrator. By performing the task separately, this system provides the transparency.

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