EFFICIENT RESOURCE MANAGEMENT DISCOVERY IN A DECENTRALIZED MANNER IN DISTRIBUTED SYSTEMS

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ABSTRACT

A distributed system is a collection of autonomous computers aimed at increasing resource sharing. Resource management in a distributed system involves resource discovery and resource determination. Resource discovery can be implemented in a centralized or decentralized way. Our application is based on efficiently handling resource discovery in a decentralized way in distributed delivery systems. We have implemented the main information server which holds information about all the servers in the network as all the servers have to register themselves with the information server to be part of the network. Each server maintains a record of all resources between its clients.

Whenever a client issues a request for a resource, it is first tested on its own and if the requested resource is not available there, it makes a request to its immediate server. If it also fails on its immediate server then the request is transmitted to the network with the help of the information server. If this request reaches a server that holds the resource then an acknowledgment will be passed to the server in the network that was responsible for generating the request. Our main objective is to perform efficient resource discovery in a decentralized way for distributed architecture.

Keyword: - *Resource Management, Perform, Record, and Server etc.*

1. INTRODUCTION

Distributed system is a collection of loosely coupled processors interconnected by a communication network where each processor is addressed as a machine or a node or a host or a computer. The **main goal of a distributed computing system** is to connect users and resources in a **transparent**, open, and **scalable** way. Ideally this arrangement is drastically more **fault tolerant** and more powerful than many combinations of **stand-alone** computer systems. The basic architecture of a distributed system is shown as follow :-

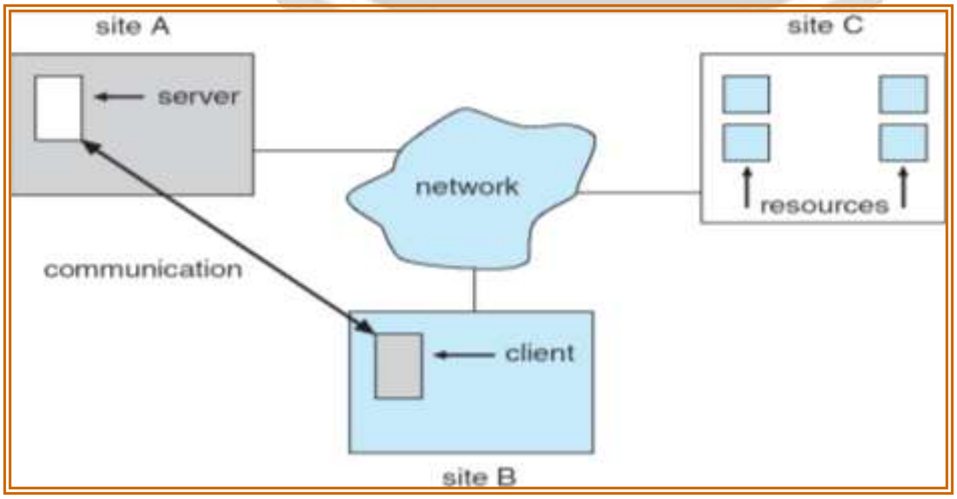


Figure 1.1 Distributed System Architecture

Various hardware and software architectures are used for distributed computing. At a lower level, it is necessary to interconnect multiple CPUs with some sort of network, regardless of whether that network is printed onto a circuit board or made up of loosely-coupled devices and cables. At a higher level, it is necessary to interconnect processes running on those CPUs with some sort of communication system.

Distributed programming typically falls into one of several basic architectures or categories: Client-server, 3-tier architecture, N-tier architecture, Distributed objects, loose coupling, or tight coupling.

- **Client-server** — Smart client code contacts the server for data, then formats and displays it to the user. Input at the client is committed back to the server when it represents a permanent change[1].
- **3-tier architecture** — Three tier systems move the client intelligence to a middle tier so that stateless clients can be used. This simplifies application deployment. Most web applications are 3-Tier[1].
- **N-tier architecture** — N-Tier refers typically to web applications which further forward their requests to other enterprise services. This type of application is the one most responsible for the success of application servers[1].
- **Tightly coupled** (clustered) — refers typically to a cluster of machines that closely work together, running a shared process in parallel. The task is subdivided in parts that are made individually by each one and then put back together to make the final result[1].
- **Peer-to-peer** — an architecture where there is no special machine or machines that provide a service or manage the network resources. Instead all responsibilities are uniformly divided among all machines, known as peers. Peers can serve both as clients and servers[1].
- **Space based** — refers to an infrastructure that creates the illusion (virtualization) of one single address-space. Data are transparently replicated according to application needs. Decoupling in time, space and reference is achieved[1].
- **Grid approach** — A grid uses the resources of many separate computers, loosely connected by a network (usually the Internet), to solve large-scale computation problems. Public grids may use idle time on many thousands of computers throughout the world. Such arrangements permit handling of data that would otherwise require the power of expensive supercomputers or would have been impossible to analyze[1].

2. RESOURCE DISCOVERY

In order to allow sharing of resources in a distributed architecture the very first step of concern is the efficient discovery of the resource requested by a client. Once the client makes a request for a particular resource it becomes the job of the server to go for the discovery of that particular requested resource in the entire distributed environment. So the major step for the utilization of any resource present with any node which is the part of the distributed environment is RESOURCE DISCOVERY[1]. The paper undertaken by us provides with a view of resource discovery in the distributed environment and the scheme followed for this is described as follow :- Whenever a client makes a request for a particular resource first of all that very client is searched for the presence of that requested resource such that if the resource is available with that client and is free in terms of its availability status then the request can be fulfilled by that client only and hence there is no need for the client to communicate with its server for resource. In case the requested resource is not available with the client then it consults its server and makes the server a request for that resource. As here we have considered multiple client – server architecture, i.e , a particular server has many clients associated with it so whenever a resource request reaches a server then the server searches its database which has all the details regarding the resources of its network. If the server is able to find the requested resource within its database then it sends the message that the requested resource has been found and sets its availability status to false. In case the server fails to find the requested resource then it consults the main information server which in the form of database maintains the information of all the servers present in the distributed environment. After consulting the Main Information Server for the presence of other servers within the distributed environment the server floods all the servers of the distributed network with the requested resource’s request. Thus in order to mark the presence of a resource within the distributed architecture use of Flooding is made.

3. OBJECTIVE

We have implemented a main information server which maintains information about all the servers in the network because in order to be the part of network all the servers have to get themselves registered with the information server. Each server keeps a record of all the resources present among its clients. Whenever a client issues a request for a resource it is firstly checked onto itself and if the requested resource is not available there then it makes a request to its immediate server. If it also fails at its immediate server then with the help of information server the request is broadcasted in the network. If this request reaches a server who is possessing the resource then an acknowledgement will be passed to the server in the network which was responsible for generating the request[6]. A Client is a node or a simple part of the local network that can be part of the distributed system by connecting it to a server. This node is equipped with the privileges of adding, deleting, modifying a resource present with it. In order to access the resources of the network connected using distributed architecture the client makes request to its server which provides it with requested resource[6]. A Server is a node or a simple part of the local network that can be part of the distributed system by connecting it to a main information server. Thus it is a node that is particularly used to connect several clients (or nodes) together and is particularly use to deal with resource requests of its clients[6]. A Main Information Server is a node that is used to keep track of all the servers within the distributed architecture. Thus all the nodes which want to act as a server within the distributed architecture must be registered with this main information server. The main information server is used to route a resource request to all the servers in the distributed architecture if a particular server fails to handle the resource request of its client[6].

3. LITERATURE REVIEW

i) 1945 – 1955 : – In this period there was use of single users systems and all custom built to different specifications. Thus each system was designed according to the requirements of its users.
ii) 1955 - 1965 : – During this period the hardware used for designing of distributed systems was based on transistors.The distributed systems made use of batch systems. Languages were first introduced in order to implement distributed systems.
iii) 1965 - 1980 : – During this period the hardware used for designing of distributed systems was based on based on Integrated Circuits. Backward compatible computers were used , first real operating systems. Proliferation of computers in large business'. Networked computers were designed which marked towards the beginning of the internet.
iv) 1980 - 1990 : – During this period the hardware used for designing of distributed systems was based on Large Scale Integrated Circuits which led to the development of personal computer. Further network technologies were improved. Network Operating Systems came into picture. It was this era only which marked the popular use of distributed systems.

4. DESIGN AND ARCHITECTURE

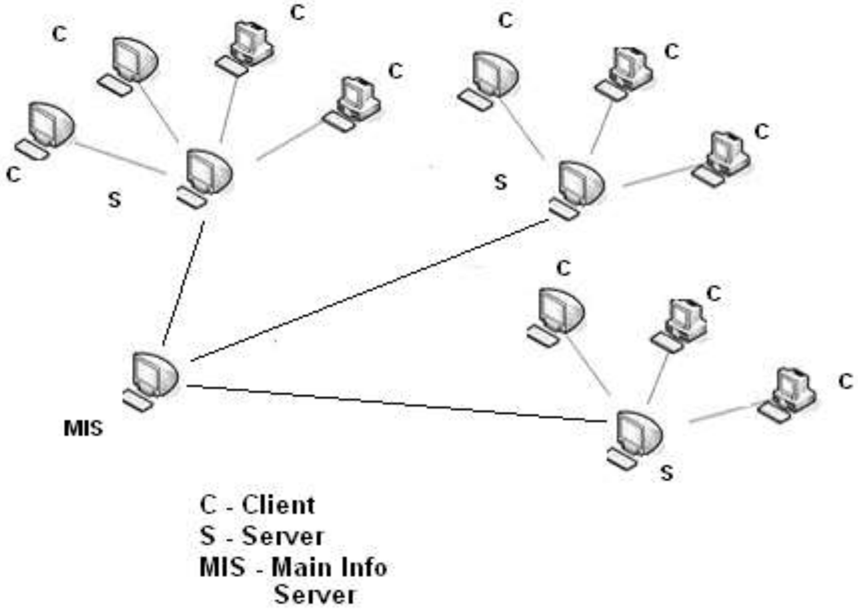
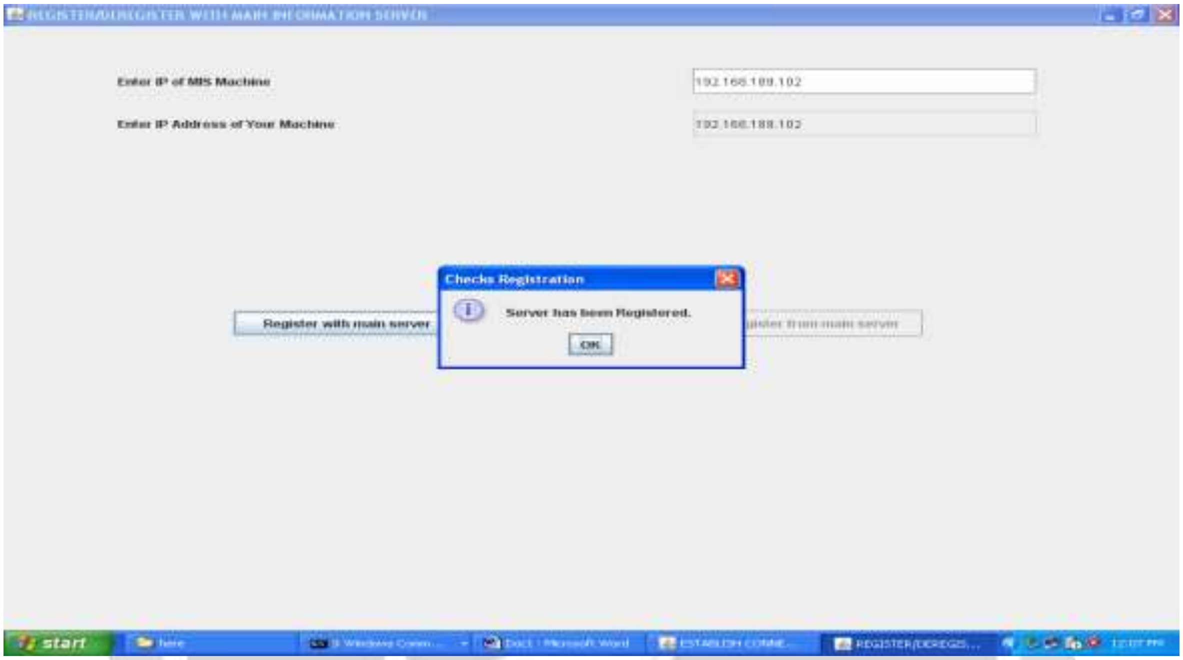


Figure 1.2: Basic Architecture

5. RESULT AND DISCUSSION

SERVER REGISTRATION (or DEREGISTRATION) WINDOW

This is the first page that opens whenever you want to register a server to main information server (Main Information Server runs at the back for registration). This screen prompts the user to enter the IP Address of server as well as main information server machine for the purpose of registration and deregistration.



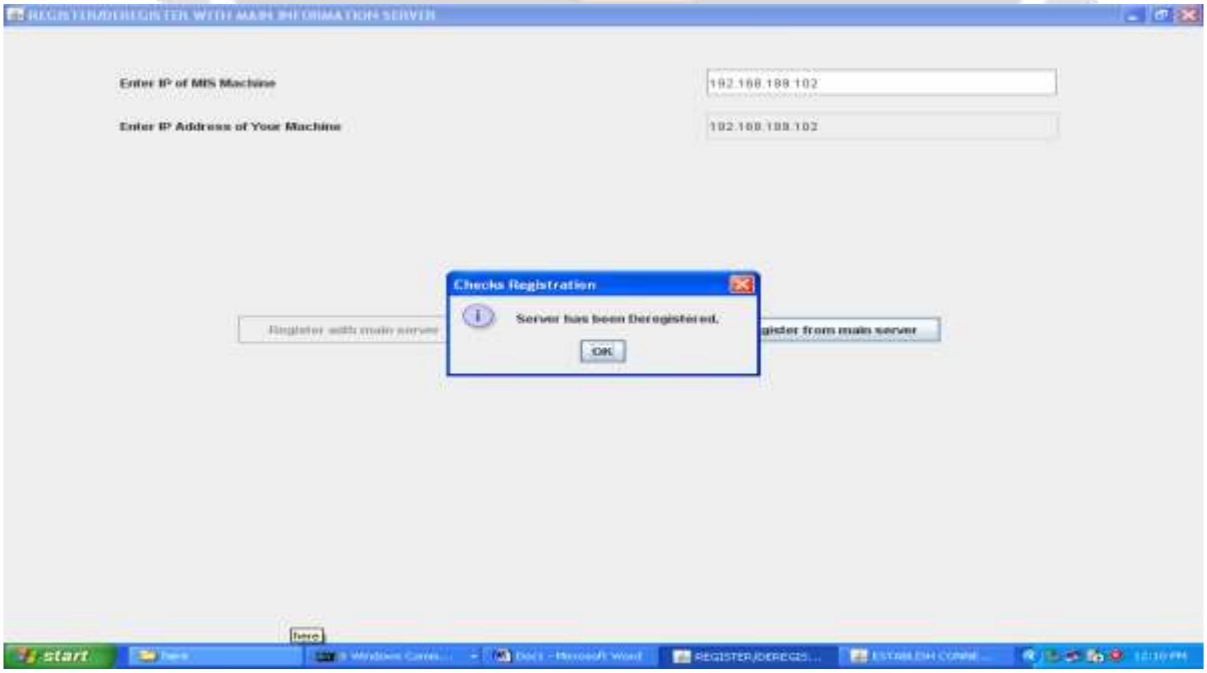
REGISTER/DEREGISTER WITH MAIN INFORMATION SERVER

Enter IP of MIS Machine: 192.168.188.102

Enter IP Address of Your Machine: 192.168.188.102

Checks Registration

Server has been Registered.



REGISTER/DEREGISTER WITH MAIN INFORMATION SERVER

Enter IP of MIS Machine: 192.168.188.102

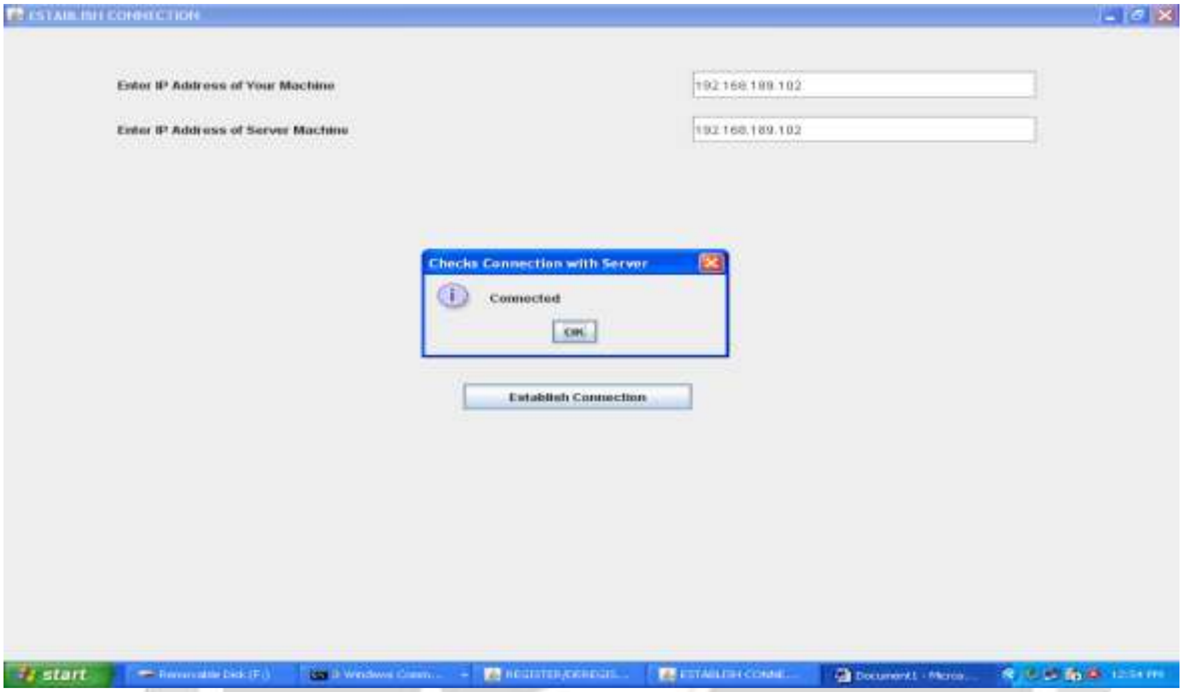
Enter IP Address of Your Machine: 192.168.188.102

Checks Registration

Server has been Deregistered.

REGISTRATION OF CLIENT WITH SERVER

In order to be the part of the distributed network every client must be registered with any of the server which itself has been registered with main information server. This window prompts the user to enter the IP Address of its own machine and also IP Address of that machine to which it wants to act as Client so that a connection can be established between Client and Server.



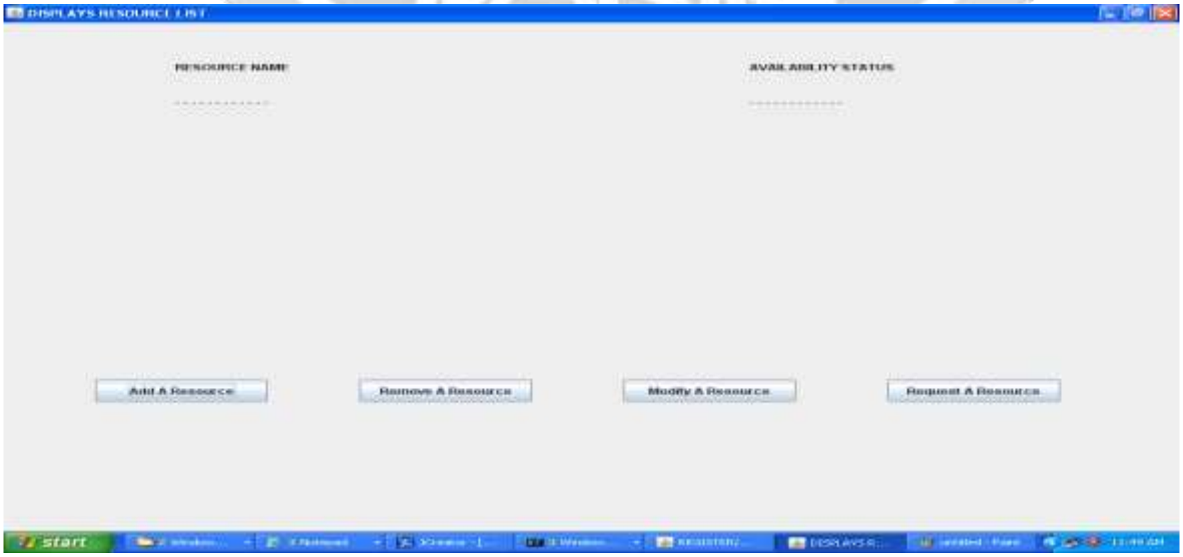
Enter IP Address of Your Machine 192.168.189.102

Enter IP Address of Server Machine 192.168.189.102

Connected

OPTIONS AVAILABLE TO CLIENT

This is the screen which opens when once the client has established connection with the server. This screen shows the various options available at client's disposal through which the client can communicate with the server. Initially client doesn't has any resources with it so its Resource List appears to be empty. Thus whenever client makes any changes with the resources available at its disposal then these changes can occur only if server permits for such changes.



RESOURCE NAME	AVAILABILITY STATUS
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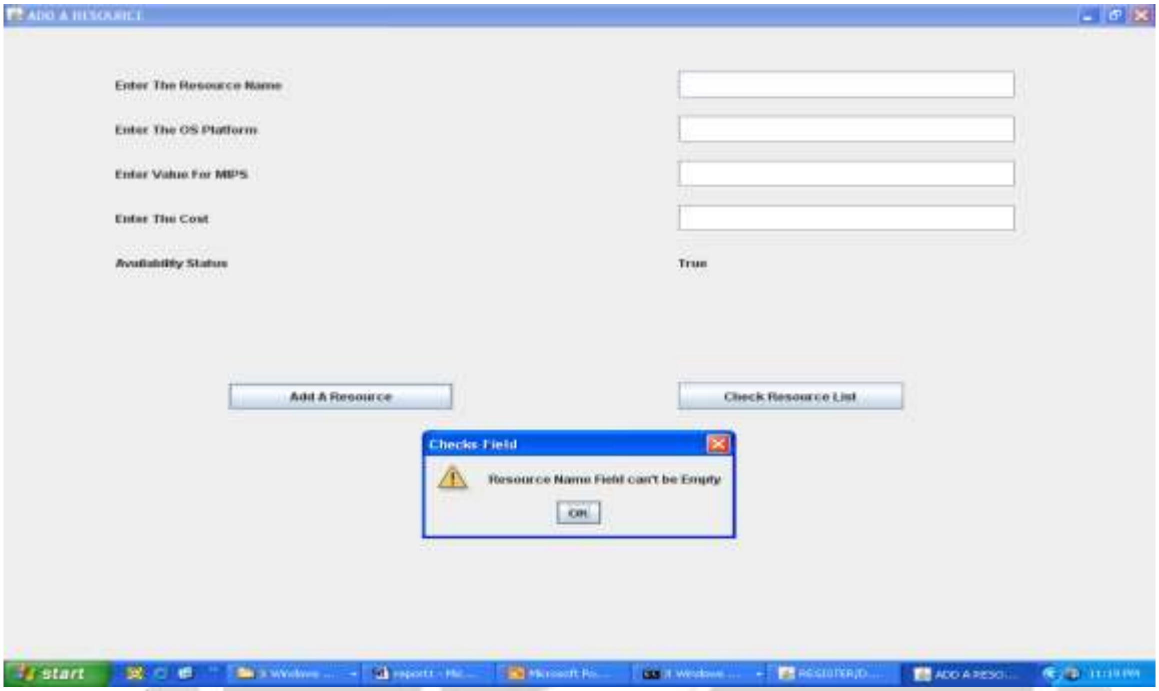
RESOURCE ADDITION AT CLIENT SITE

This window prompts the client to add a resource at its site. In order to add a resource the client must add all the relevant data related to resource's detail because else a Dialog Box will appear and will prompt the client to fill in the necessary information. In order to add a resource at client site the resource alongwith its detail must be added at server site because server keeps the record of all the resources of its respective clients.

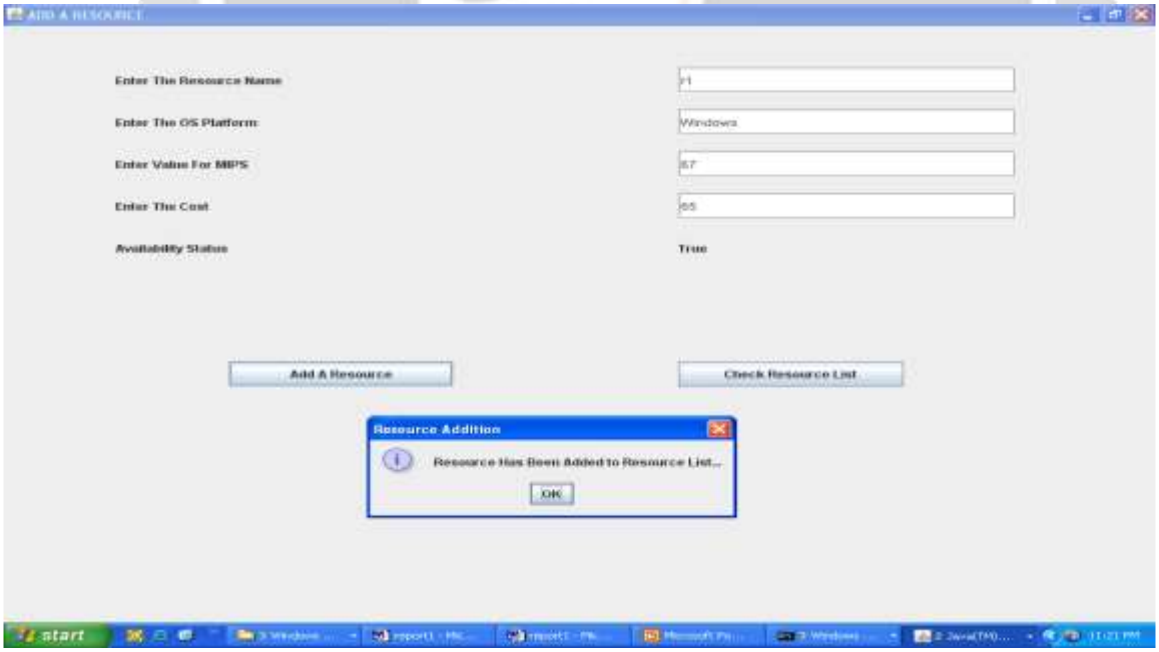


ADD A RESOURCE

Enter The Resource Name
Enter The OS Platform
Enter Value For MIPS
Enter The Cost
Availability Status True

Checks Field

Resource Name Field can't be Empty



ADD A RESOURCE

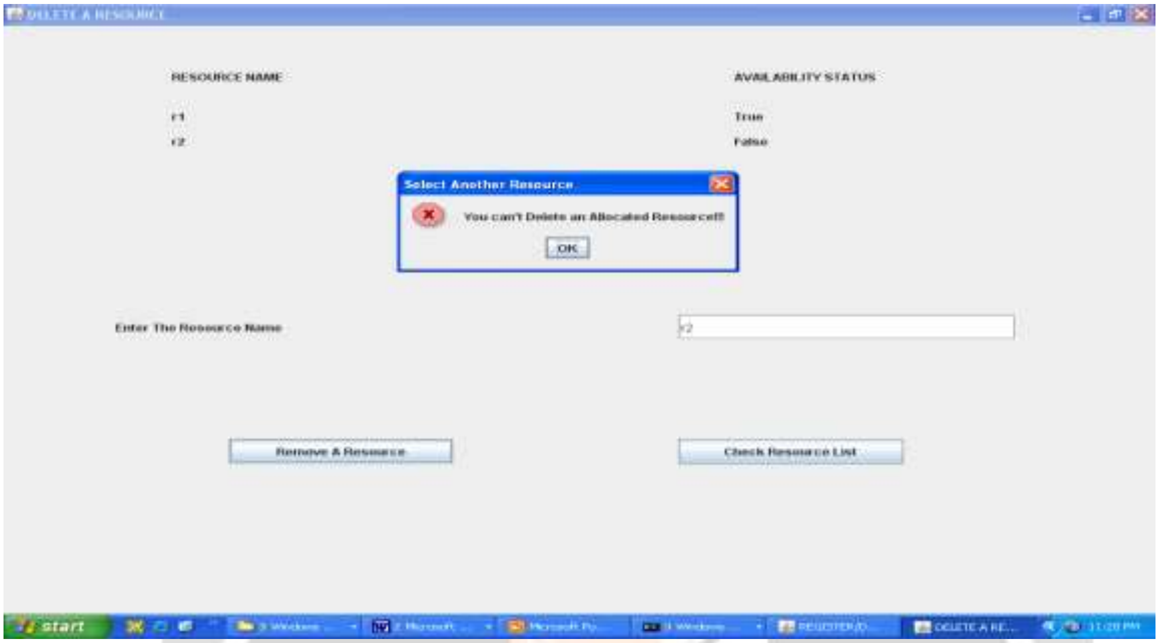
Enter The Resource Name r1
Enter The OS Platform Windows
Enter Value For MIPS 67
Enter The Cost 65
Availability Status True

Resource Addition

Resource Has Been Added to Resource List...

RESOURCE DELETION AT CLIENT SITE

This window prompts the client to delete a resource present at its site. The resource that the client wants to delete must have its availability status true because else a Dialog Box will appear and will prompt the client that it cannot delete an allocated resource site so for this the window also shows the resource list of the client alongwith the availability status of each resource. In order to delete a resource from client site the resource alongwith its detail must be deleted from server site because server keeps the record of all the resources of its respective clients.

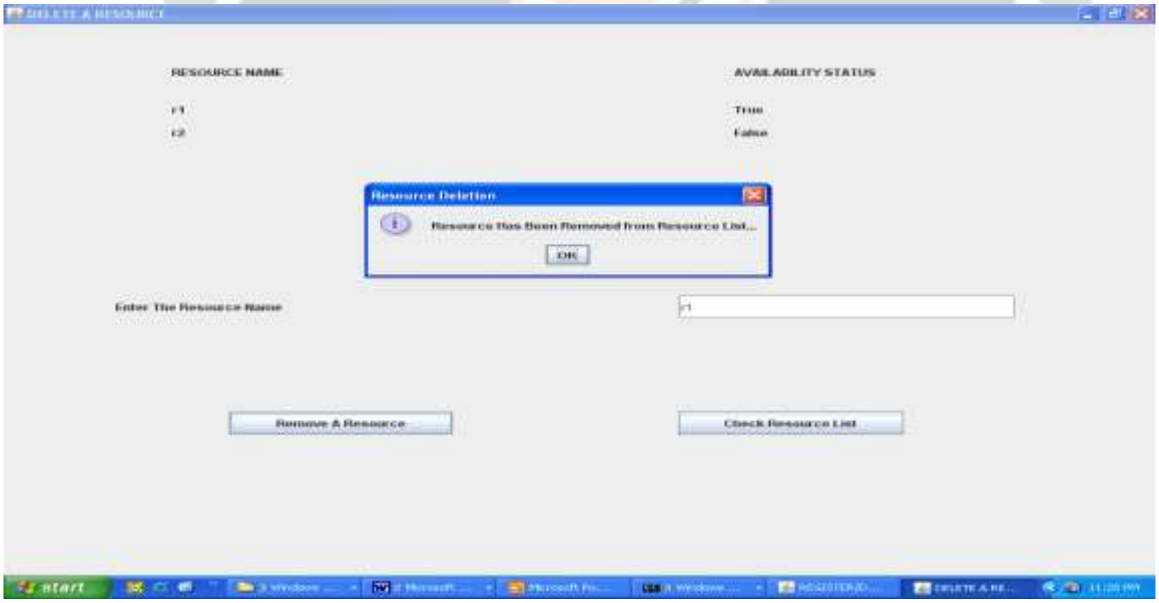

DELETE A RESOURCE

RESOURCE NAME	AVAILABILITY STATUS
r1	True
r2	False

Select Another Resource

You can't Delete an Allocated Resource!!

Enter The Resource Name: r2


DELETE A RESOURCE

RESOURCE NAME	AVAILABILITY STATUS
r1	True
r2	False

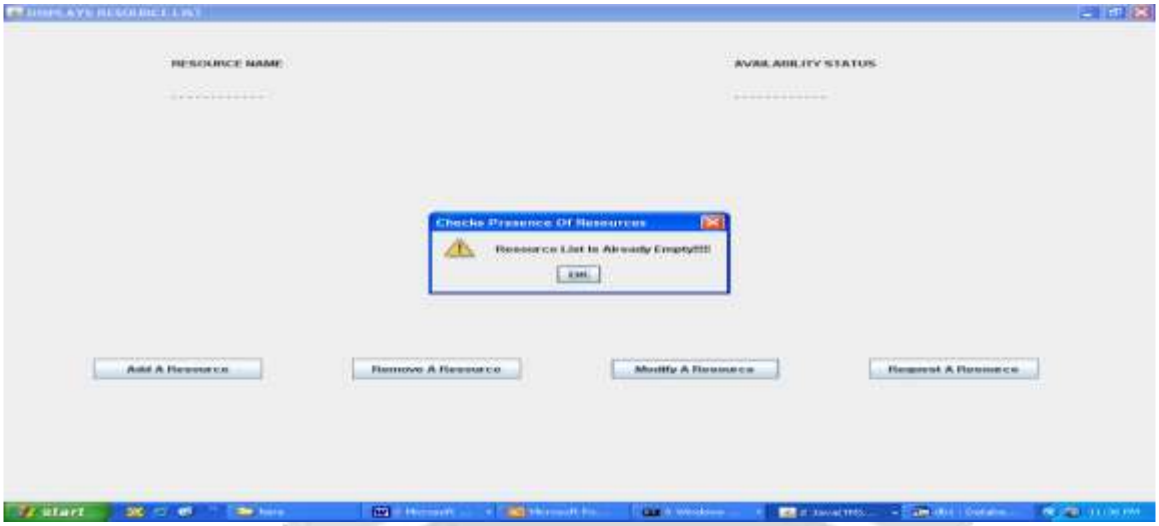
Resource Deletion

Resource Has Been Removed from Resource List...

Enter The Resource Name: r1

RESOURCE MODIFICATION AT CLIENT SITE

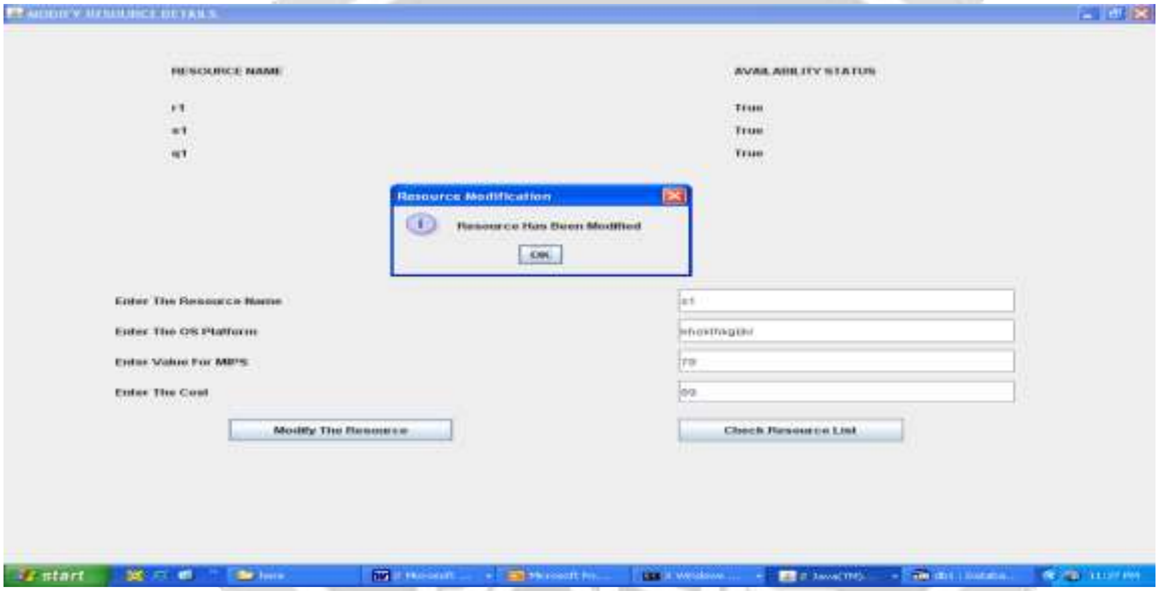
This window prompts the client to modify a resource present at its site. The resource that the client wants to modify must have its availability status true because else a Dialog Box will appear and will prompt the client that it cannot modify an allocated resource site so for this the window also shows the resource list of the client alongwith the availability status of each resource. In order to modify a resource on client site the resource alongwith its detail must be modified at server site because server keeps the record of all the resources of its respective clients.


DISPLAYS RESOURCE LIST

RESOURCE NAME AVAILABILITY STATUS

Checks Presence Of Resources

Resource List Is Already Empty!!!!

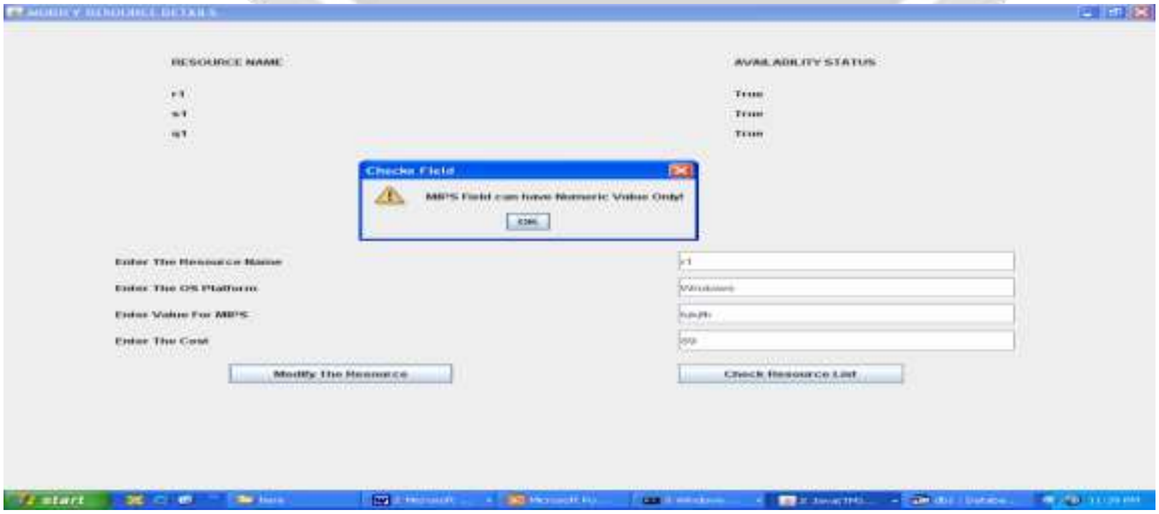

MODIFY RESOURCE DETAILS

RESOURCE NAME	AVAILABILITY STATUS
r1	True
s1	True
q1	True

Resource Modification

Resource Has Been Modified

Enter The Resource Name	r1
Enter The OS Platform	ehostfhagjdkl
Enter Value For MIPS	79
Enter The Cost	89


MODIFY RESOURCE DETAILS

RESOURCE NAME	AVAILABILITY STATUS
r1	True
s1	True
q1	True

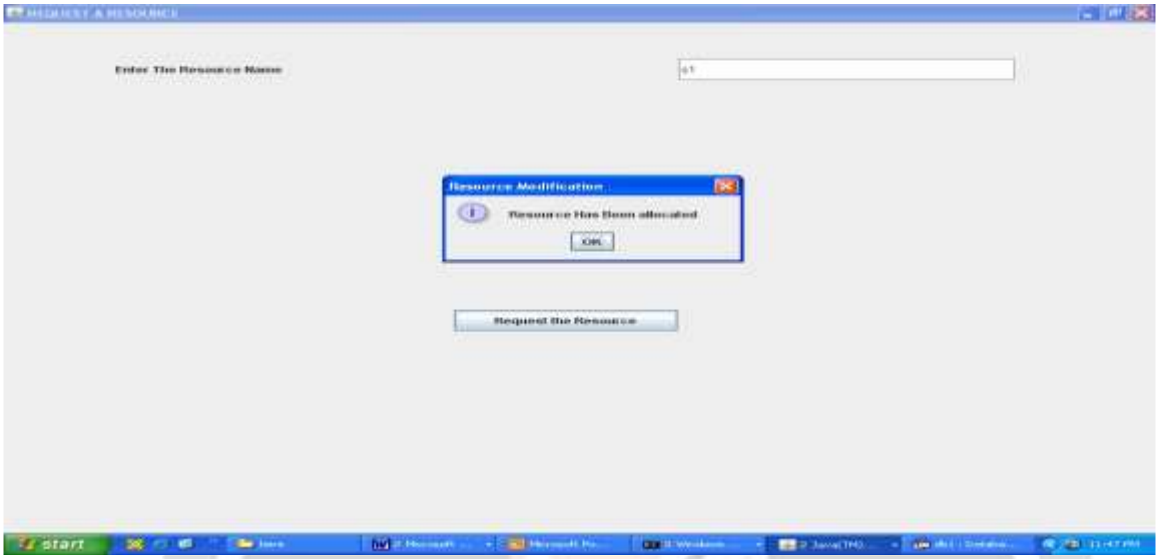
Check Field

MIPS Field can have Numeric Value Only!

Enter The Resource Name	r1
Enter The OS Platform	Windows
Enter Value For MIPS	hjkjfh
Enter The Cost	89

RESOURCE REQUEST FROM CLIENT

This window prompts the client to request a resource present at its site or present at anyother site which is the part of distributed architecture. In case the requested resource is present with the client or with anyother node that is the part of the distributed network and has its availability status true then resource will be allotted to the respective client else a Dialog box will appear which will show that resource can't be allocated right now!



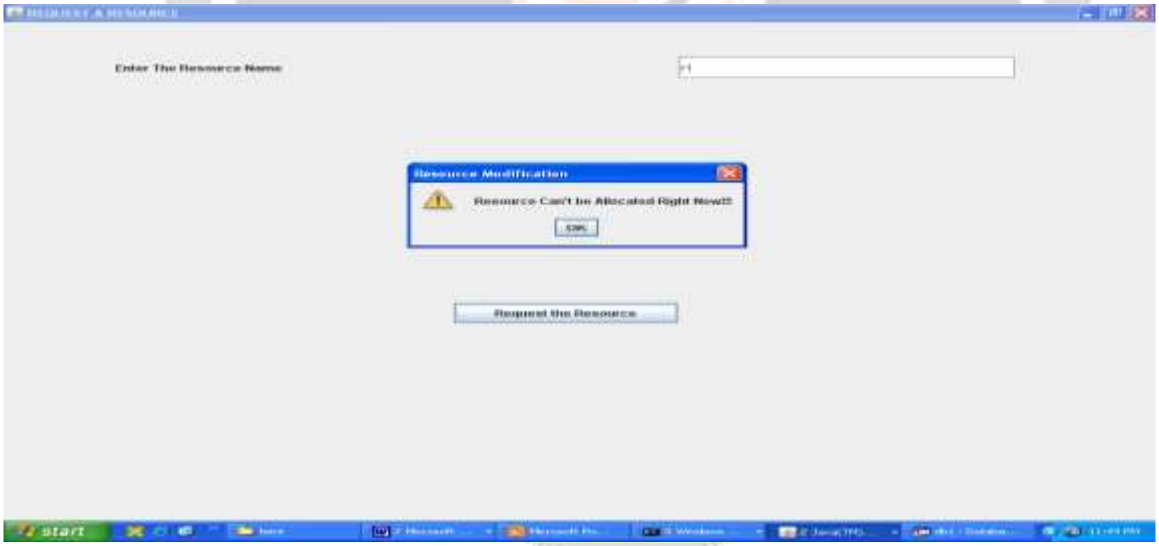
Enter The Resource Name: s1

Resource Modification

Resource Has Been allocated

OK

Request the Resource



Enter The Resource Name: r1

Resource Modification

Resource Can't be Allocated Right Now!!!

OK

Request the Resource

6. CONCLUSION

This paper is a simulation of Resource Discovery in Distributed Systems in decentralised way. The paper implements a 3-level architecture consisting of Main Information Server (MIS) at the topmost level followed by servers at middle level which includes clients in their networks and these clients correspond to the lowest level.

The paper introduces the concept of flooding in order to deal with Resource Discovery. Through this approach the main information server will flood all the servers of the network for the requested resource incase the requesting server fails to deal with the resource request in its own network and forwards its request to the main information server.

7. REFERNCES

[1] Computer Networks – Andrew S Tanenbaum

[2] Core Java 2 Volume 2-Advanced Features – By Cay S. Horstmann, Gary Cornell Sun Microsystems

[3] The Complete Reference Java 2 – By Herbert Schildt, Tata McGraw-Hill

[4] www.sun.java.com

[5] http://java.sun.com/docs/books/tutorial

[6] An introduction to Database Systems – By C.J. Date

[7] A Guide to the Project Management Body of Knowledge, Third Edition. Newtown Square, Pennsylvania: Project Management Institute (PMI). 2004. ISBN 1-930699-45-X.

[8] ^ A Guide to the Project Management Body of Knowledge, Fourth Edition. Newtown Square, Pennsylvania: Project Management Institute (PMI). 2008. ISBN 978-1-933890-51-7.