Internet Control and Monitoring System

A Project work done at

Electronics and Radar Development Establishment, DRDO, Bangalore

Submitted by

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Submitted in partial fulfillment of the requirements for
The award of degree of

MASTER OF COMPUTER APPLICATIONS

Of Bharathiar University

Department of Computer Science and Engineering
Kumaraguru College of Technology
Coimbatore - 641 006

CERTIFICATE

This is to certify that this project work entitled

"INTERNET CONTROL AND MONITORING SYSTEM"

Submitted to

KUMARAGURU COLLEGE OF TECHNOLOGY
(Affiliated to Bharathiar University)

in partial fulfillment for the award of Degree of

MASTER OF COMPUTER APPLICATIONS

Is a record work done by

Mr. MADHAN KUMAR R
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during his period of study in the Department of Computer Science and Engineering, Kumaraguru College Of Technology, Coimbatore – 641 006, under my supervision and guidance and this project work has not formed the basis for the award of any Degree/Diploma/Associateship/Fellowship or similar title to any candidate of any university.

Head Of the Department 4/4/'03.

Internal Guide

Submitted for University Examinations held on ..16..04..2003.....

Internal Examiner 16/4/03

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DEFENCE RESEARCH & DEVELOPMENT ORGANISATION
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CERTIFICATE

This is to certify that the project entitled " ***Internet Control and Monitoring System*** " which is being submitted by Mr. ***R. Madhan Kumar***, in partial fulfillment of the requirements for the award of ***Master of Computer Applications*** from ***Kumaraguru College of Technology, Coimbatore*** is a bonafide work carried out by him, at ***Electronics and Radar Development Establishment (LRDE), DRDO***, Banglore, during the period of Dec 2002 to April 2003.

(V. SRINIVASAN)
Scientist F, MTIS
LRDE

DECLARTION

I hereby declare that the dissertation entitled "***INTERNET CONTROL AND MONITORING SYSTEM*** " submitted by me to Kumaraguru College of Technology, Coimbatore affiliated to Bharathiar University for the award of the degree of ***Master of Computer Applications***, is a original and independent work carried out by me under the guidance of ***Mr. SRINIVASAN V,*** *Scientst "F", Electronics and Radar Development Establishment, Bangalore* and ***Mr. GNANAMURTHY R.K.,*** *Senior Lecturer, Kumaraguru College of Technology, Coimbatore.*

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Place: Coimbatore

Date: 04-04-2003

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PREFACE

The project entitled " Internet Control and Monitoring System" is undertaken in the organization, Electronics and Radar Development Establishment (LRDE), a unit of DRDO, Bangalore for providing controlled Internet access to its employees.

As the use of computer networks has increased drastically over recent years, the need for the servers, routers, and various systems connected to them has grown. Today, the World Wide Web supports connections to systems containing information, electronic commerce sites, and to restricted access systems.

Providing Internet services to the users in a controlled environment is always a problem to any organization. Authorizing the users so that only users with in a closed group alone can access the services is highly important, as to maintain the integrity of services provided. Users of the service must be kept in track for future references. Users may tend to misuse the service provided to them by accessing unwanted sites.

My work on "Internet control and monitoring system" takes in to account of all these factors and acts as a complete controller and an apt monitor by providing services to the users as desired by its administrator. The log reports generated by the system are highly useful for the administrator. Also the online reports are helpful in knowing the current users of the Internet.

The entire package is termed as **"NetCon"**.

Introduction

1.1 Company Profile

Electronics and Radar Development Establishment (LRDE) is one of the R&D Establishments set up under the Defence R&D Organisation to address the Services needs in the field of Radar, Communication Systems and related Technologies.

The genealogy of LRDE starts from the Inspectorate of Scientific Stores created in 1939 at Rawalpindi. This was re-designated as Technical Development Establishment (Instruments and Electronics) (TDE) in 1946 and re-located at Dehradun. Early in 1955, the electronics wing was moved to Bangalore to have a close association with electronics industries located therein. In January 1958, with the formation of Defence Research and Development Organisation (DRDO), the then TDE (Electronics) was further bifurcated into Electronics Research and Development Establishment (LRDE) and Chief Inspectorate of Electronics (CIL).

In 1962, Electronics Research and Development Establishment was renamed as Electronics and Radar Development Establishment (LRDE). The scope of the laboratory was changed to emphasise the greater importance for indigenous development of Radar and Communication systems. In 1986, LRDE moved form High Grounds to the permanent base at CV Raman Nagar, Bangalore.

LRDE has grown to become a major defence R&D establishment employing about 1250 people, out of which over 800 is working in technical fields. The Budget allocation has increased from Rs.34 lakhs in 1968-69 to around Rs.4800 lakhs in the recent years. LRDE has made very significant contributions towards indigenous design and development of complex Military Electronic Systems –Communication and Radar-, which are serving our Armed Forces.

Today, LRDE has the Core Competence and Expertise to build world class Radar Systems and Software Driven Electronic Systems.

VISION OF LRDE

To create a centre of excellence in Radar and Electronics Technologies by developing and delivering world class systems to meet the customer requirements.

MISSION OF LRDE

- To design and develop Radar systems meeting the current and futuristic requirements of Services, keeping in view the emerging threat and EW scenario
- To contribute towards the establishment of indigenous production of our designs through public and private sector, work committed towards introduction of the systems into Services
- To promote research and competence building activities in the field of Radar within the laboratory and in academic institutions and continuously evolve as the centre of excellence in Radar Technology

AWARDS/RECOGNITIONS

- Award for Excellence in 1994
- NRDC Award in 1975, 1977, 1980, 1994, 1997, 2000
- DRDO Awards for 1980, 1984, 1986, 1988, 1994(2), 1996(2)
- Outstanding Scientist of the year in 1983(2), 1985, 1986, 1995, 1998,1999, 2001
- IETE-IRSI Awards for 1985(2), 1991, 1992, 1993(3), 1994, 1995, 1997(2), 1999
- Padmashree Award - 1971, 1987
- Vasvik Award - 1983(4), 1987
- BC Roy Award - 1978
- Silicon Trophy - 1985
- National Safety Award - 1977
- Young Scientist Award - 1999
- INAE Award for Young Engineers - 1999
- Sir CV Raman Award for Young Scientist - 2000

1.2 Project Overview

The system is proposed for installing in a gateway machine, through which the Internet requests of the intranet users are satisfied.

The system gets the input as URL request from the user. It authorizes the request sender, by checking his/her user id, password and machine's address. Concurrent usage of the system through same user id and/or password is restricted. Also certain users are restricted from viewing some URL's.

After authenticating the user, all valid requests are passed to the Web Server. Each and every request of the user (both valid and invalid) is stored in the database.

Log reports are prepared based on the administrator's needs. Online reports providing information about the current users of the Internet and those who have requested for restricted sites are generated. Various other reports based on time (users of the internet between two times), visitors of a particular site etc are generated and options are provided for printing them also.

Various Look and Feel options are provided to the administrator to make the system's screen appearance compatible with the platform he/she is working on.

Any system that is designed now is becoming obsolete in the next day itself in the present world of computers. The system is designed in such a way that any future enhancements required by the organization can be easily updated without going for a new system.

Problem Definition And Analysis

2.2 Problem Statement

The MTIS, Management of Technical Information and Services department, the IT solution provider to LRDE, is to provide internet services to their employees, around 1000 of them over their internal network.. In order to manage the users and keep track of accounts of the usage, an efficient control & management system is required.

2.3 Proposed System

The proposed system is to manage & control the Internet services provided to the scientists. Some of the functionalities provided by the system are explained below.

Closed User Group Management

Only employees who are authorized can only use the Internet services provided. All such employees come under the closed group. Facilities are provided to maintain those set of employee details such as user id, password etc., also facilities such as new user entry, transfer of accounts and deletion of user details are also provided.

Request Processing

This module gets the URL request from the client, authorizes the requesting user and connects or rejects the request based on its validity.

Concurrent User Restriction

Preventing the concurrent access of Internet services using the same Login name and/or Password.

URL Blocking

Preventing users from accessing certain predefined websites, based on the URL request they send it to the system.

Log Report Generation

Reports are generated for various requirements

- Sites visited by the users
- On-line user details
- Daily reports about the users

Programming Environment

3.1 Hardware Configuration

The package is developed in a machine with the following configuration.,

Processor	:	Pentium IV 1.7 MHz
Memory	:	256 MB
Hard Disk	:	40 GB
Keyboard	:	104 Keys
Mouse	:	Logitech Mouse(Scroll mouse)
Monitor	:	17" LG StudioWorks
Operating System	:	Windows NT

3.2 Software Specifications

- ***Java***

Java is a simple language, it is statically typed language like C / C++. The Java runtime system keeps track of all the objects in the system. It is an Interpreted language, the Java compiler generates byte codes which are platform independent. Java is dynamic and provides a lot of high-level support for networking.

Following are some of the features offered by java

- **Jdbc**
- **Swings**
- **Servlets**

JDBC – Java Database Connectivity provides a set of API's, which allow Java programmers to incorporate database services in to their application. JDBC also includes specifications for database drivers, which hide the implementation of a particular database from API-level developers, a driver manager, which allows a single application to access several different databases through several different drivers simultaneously, and a mapping between standard database data types and java classes and primitives. JDBC is built around SQL.

The SwingSet, as it is known, contains a number of basic components as well as some high level components. SwingSet is a set of components that are added to the JFC. All of the SwingSet components are written in 100% pure java, this means that we can use these components on any java platform and they will all look and behave the same. The entire SwingSet components use the lightweight UI framework. The entire SwingSet model is based on MVC (Model – View – Control). Since the MVC components are embedded within itself it is fairly easy to code programs using this.

Servlets are dynamically loaded modules that services request from any client. It runs entirely onside the Java Virtual Machine. Because Servlet is running on the server side, it does not depend on the browser compatibility. Redirection of URL is simple and easy to implement.

- ***Oracle***

Oracle 8.0 is an Object Oriented Relational Database Management System (OORDBMS). It offers capabilities of both relational and object oriented database systems. It is a repository for very large amount of data and gives users rapid access to that data. Oracle products are based on the 'client server technology'.

Features of Oracle:

Security Mechanism:

Oracle's sophisticated security mechanisms control access to sensitive data by an assortment of privileges.

Backup and recovery:

Oracle provides sophisticated backup and recovery routines for secure and storage routines of data. Oracle's backup and the recovery strategy minimize data loss and downtime when and if problem arise.

Space Management:

Oracle offers flexible space management techniques.

Functional Requirements

4.1 Introduction

The network architecture for the proposed system takes the following nature.,

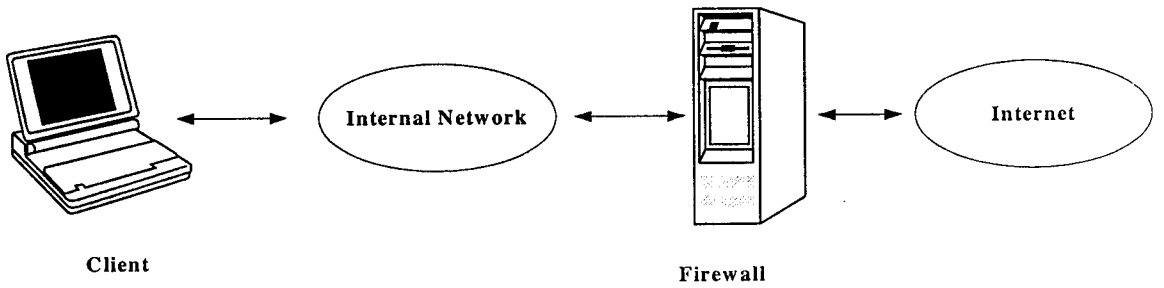
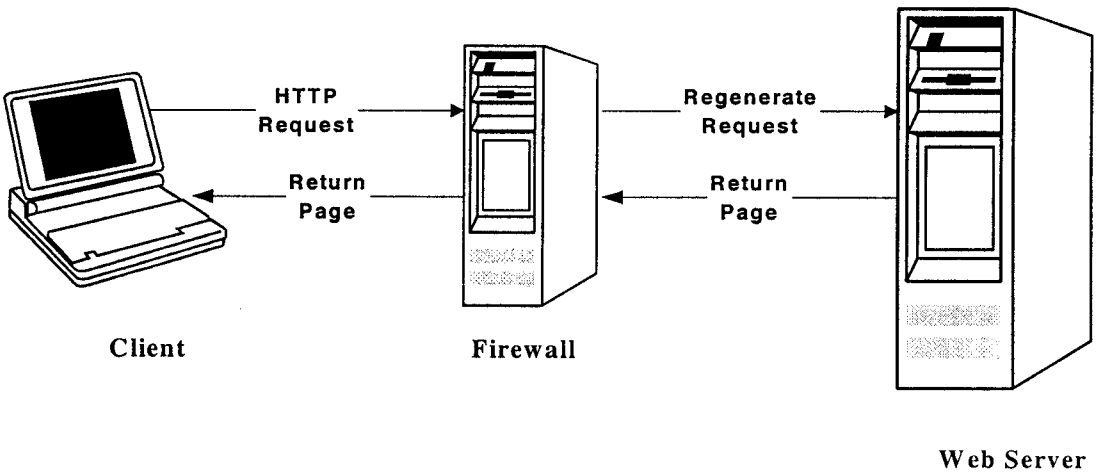


Fig 1. Network Architecture

Every access of the Internet from the internal client network takes place through the firewall. Client sends the request to the firewall, which accepts the request and regenerates to the web server. Firewall receives the web page from the web server and sends to requested client.

4.2 Requirements Statement

The following things are necessary for the communication between client and the firewall and the firewall and web server.



- Browser is needed to send the request to the web server and the browser should be configured in such a way that the request should pass through the firewall.
- Firewall should regenerate the request to the web server.
- After the web page is retrieved from the web server, the firewall should send it to the requested client.

4.3 Input and Output

4.3.1 Input

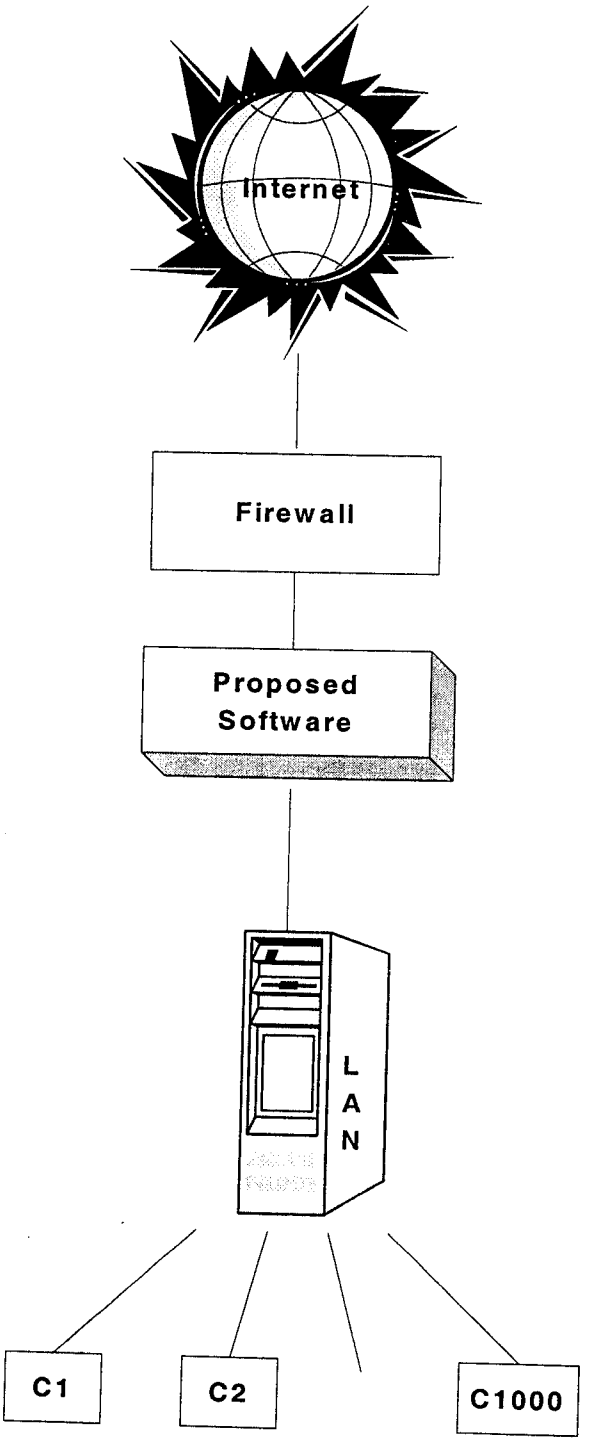
The input for the firewall is the request made by the client.

4.3.2 Output

Client requested web page is displayed in its browser.

System Design And Development

5.1 High - Level Design



5.2 Table Design

- **User Details**

Field	Description	Data Type	Size
User Id	User ID	Text	30
Password	Password	Text	8
User Name	User Name	Text	30
Employee ID	Employee ID	Number	25
Status	For roaming User	Boolean	-

- **Ethernet Card Details**

Field	Description	Data Type	Size
Card Number	Ethernet Card Number	Text	30
User Id	User ID	Text	30

- **Restricted Site Details**

Field	Description	Data Type	Size
Restricted sites	Restricted Site Name	Text	30

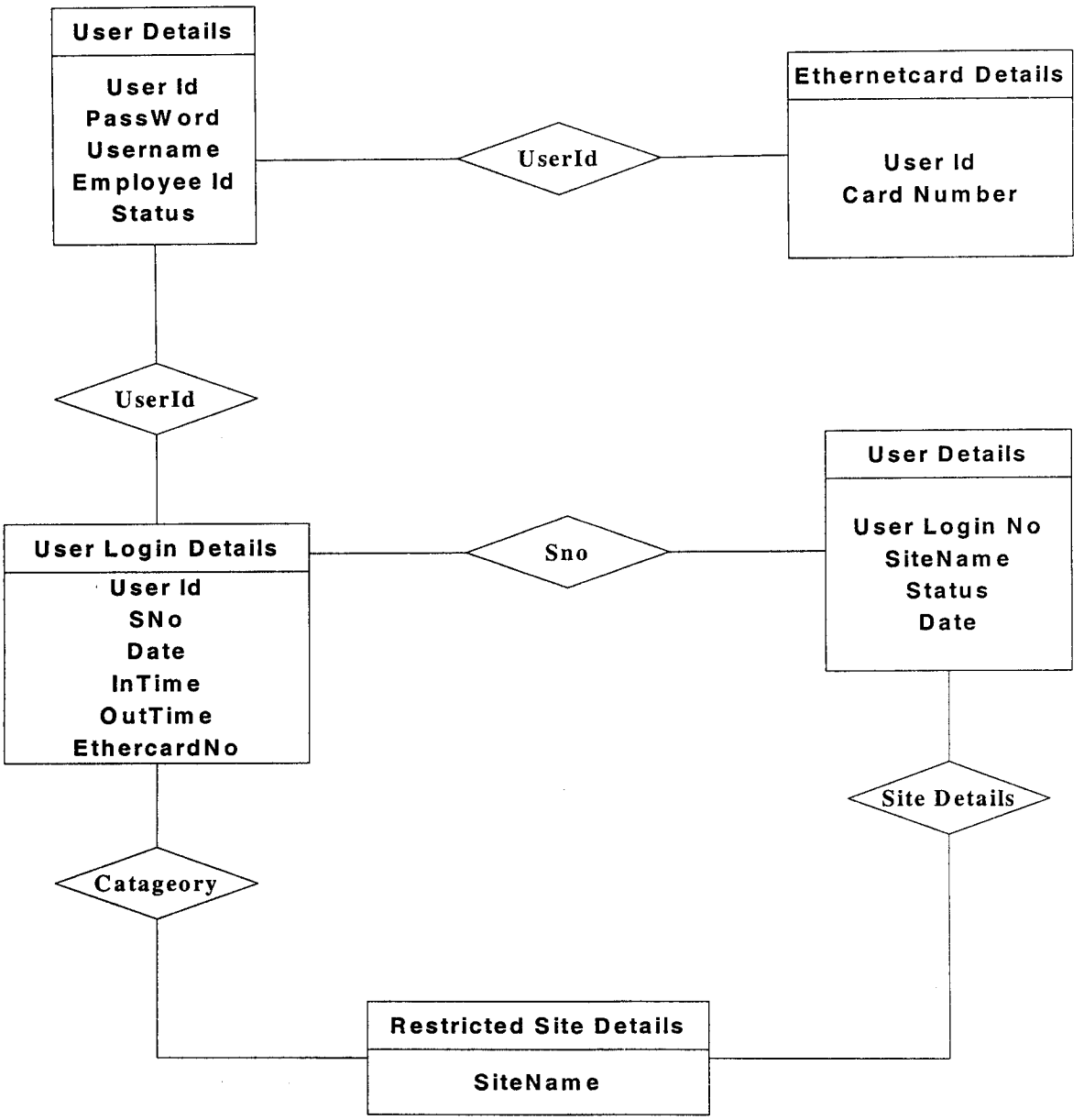
- **User Login Details**

Field	Description	Data Type	Size
User Id	User ID	Text	30
S No	Serial Number	Number	4
Date	Visited Date	Date	8
In Time	Login Time	Time	10
Out time	Logout Time	Time	10
EthernetCardNo	Ethernet Card Number	Text	30

- **Requested Site Details**

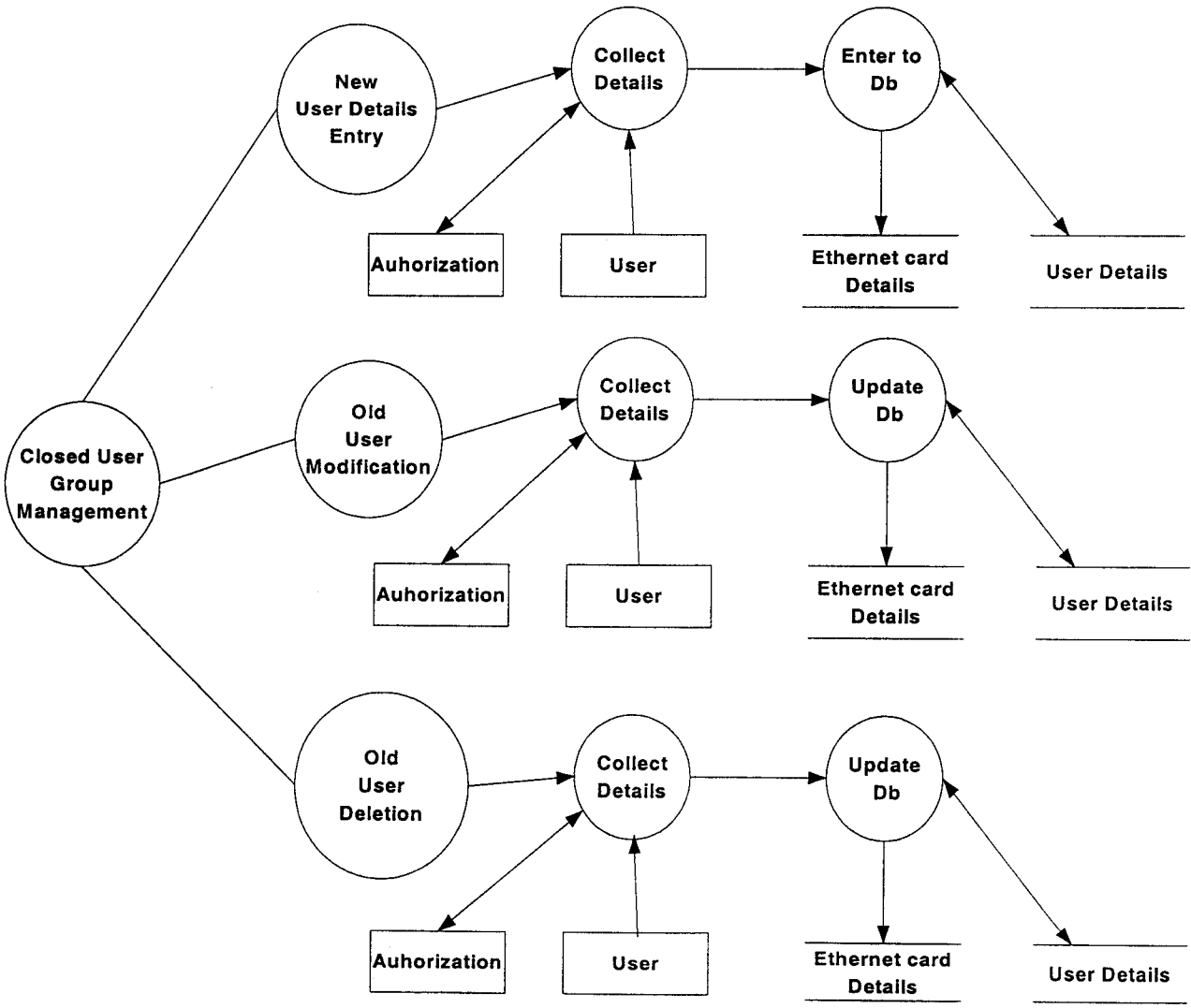
Field	Description	Data Type	Size
UserLoginNumber	Serial Number	Number	4
Site Name	Web Site Name	Text	30
Status	Visited Or Not	Boolean	-
Date	Visited Date	Date	8

- **5.3 Entity Relationship Diagram**

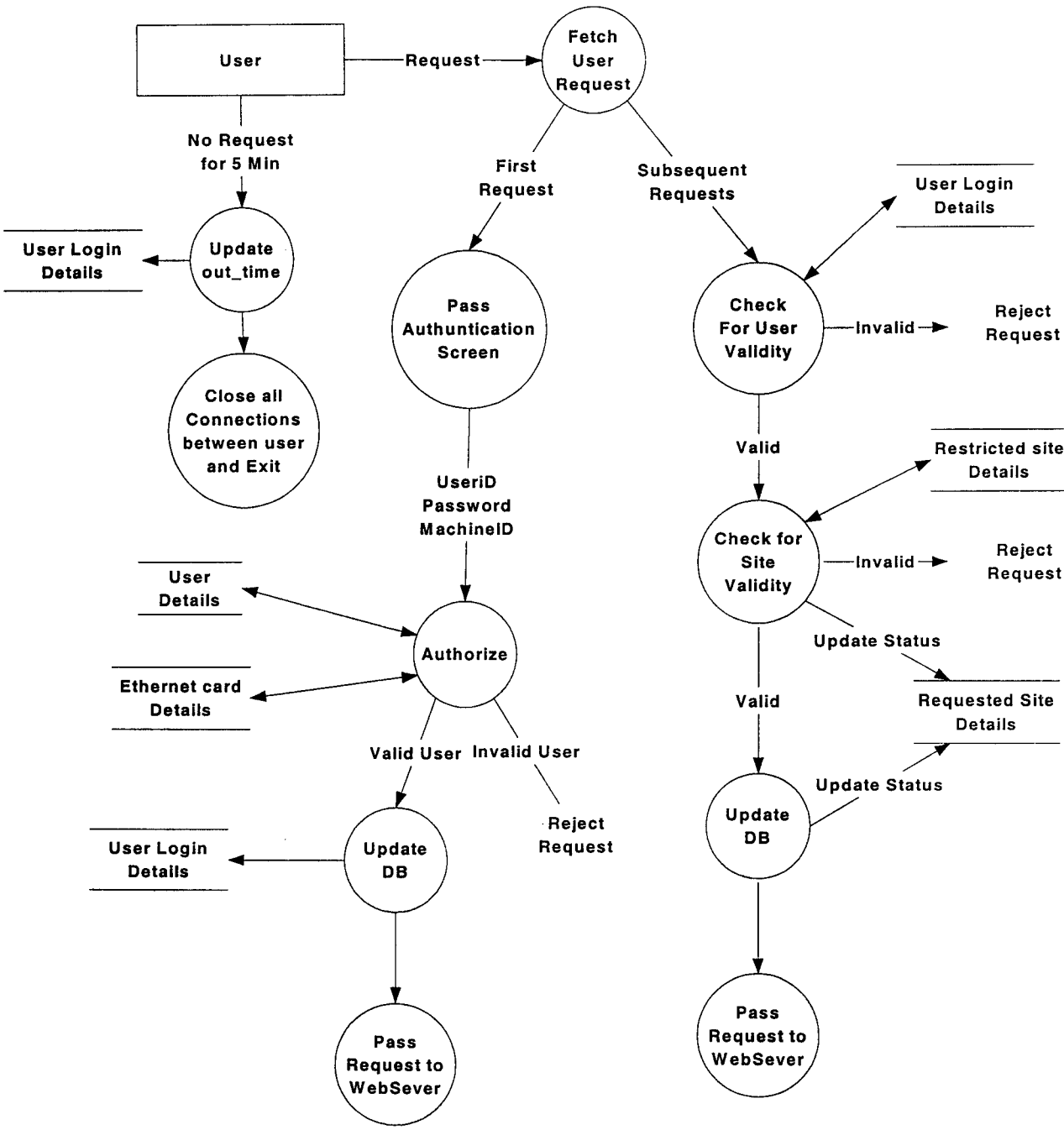


5.4 Data Flow Diagrams

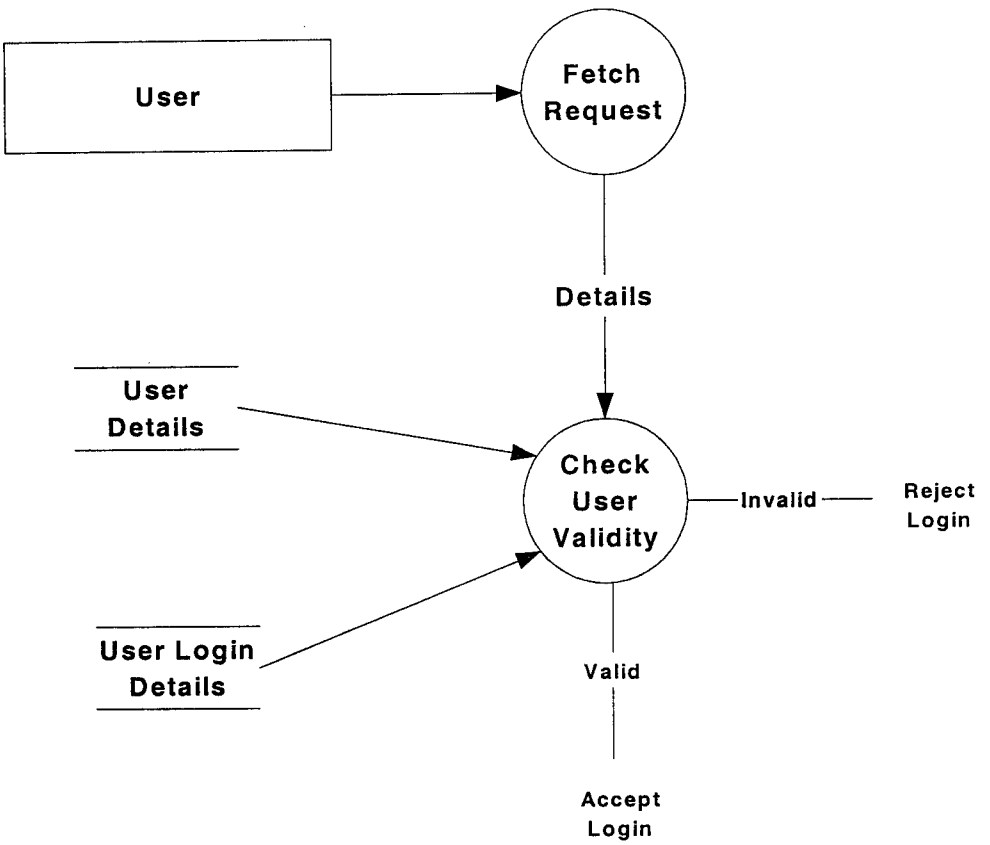
- **Closed User Group Management**



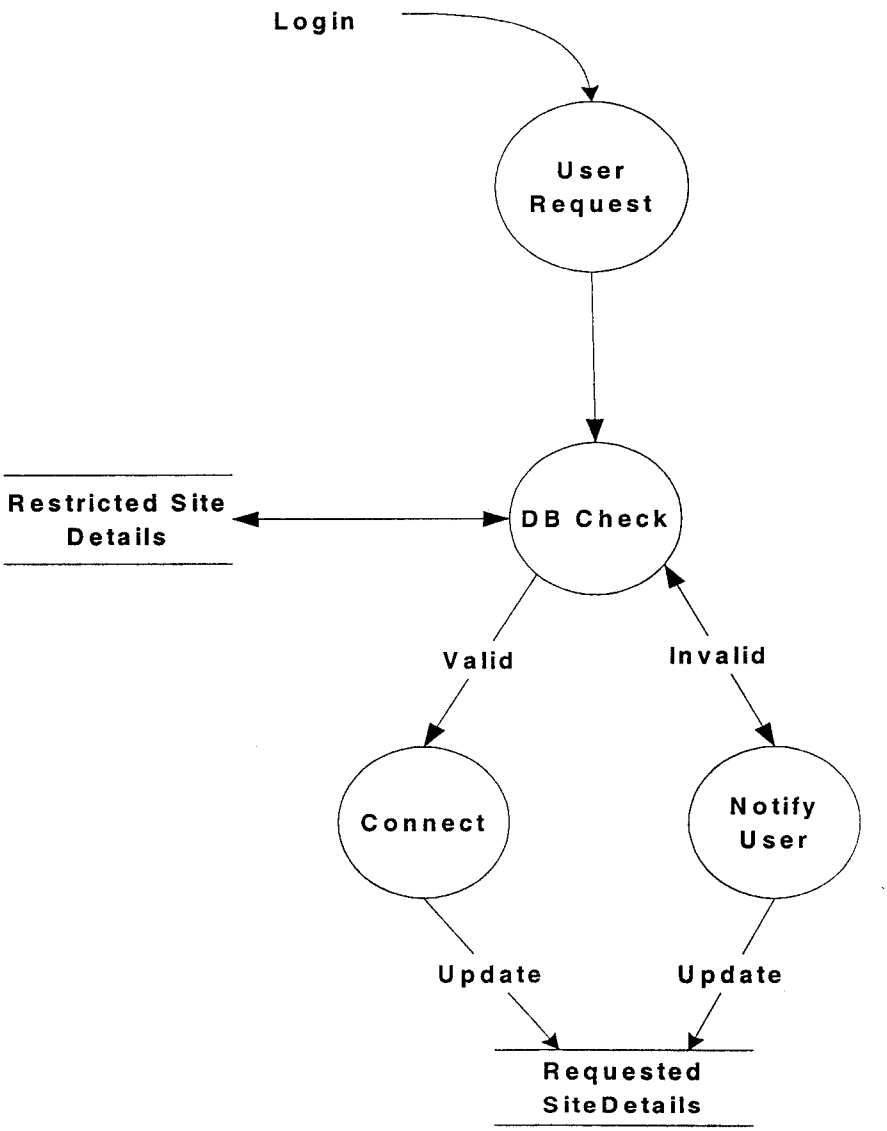
- **Request Processing**



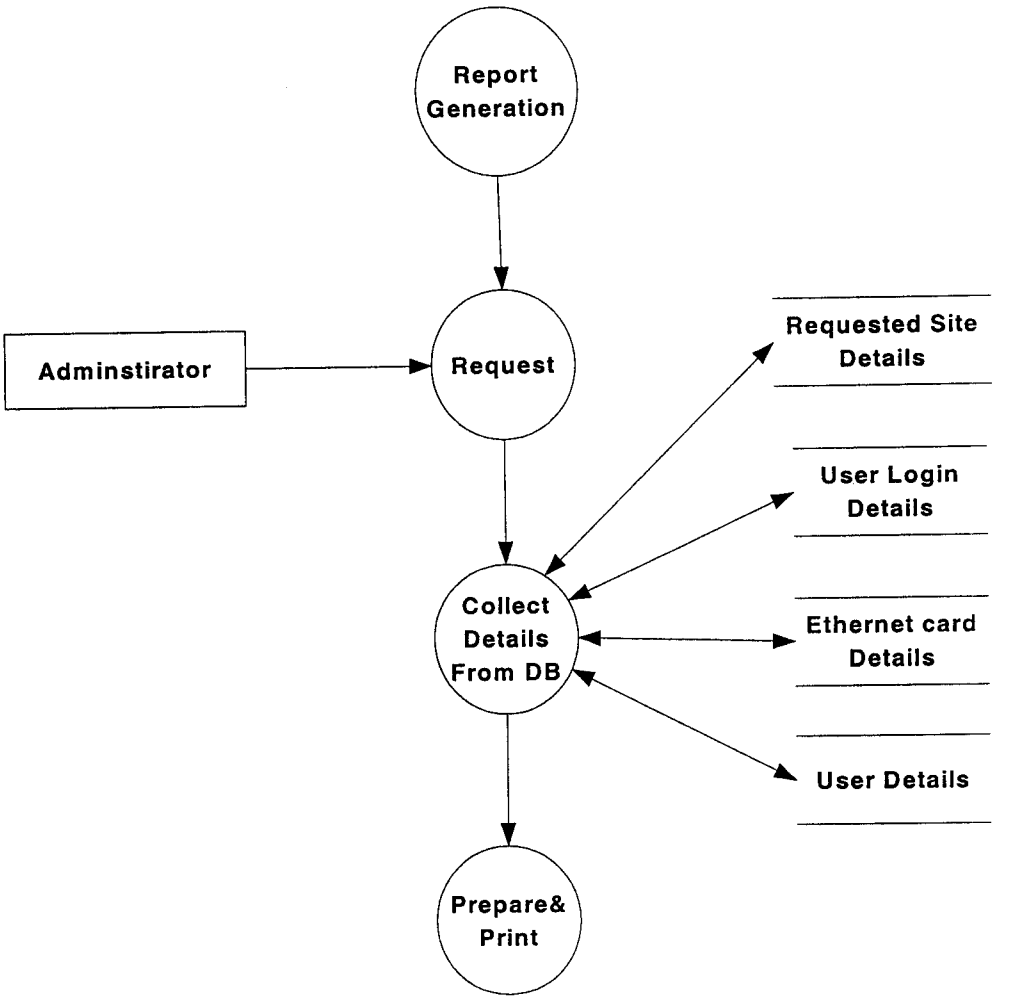
- **Concurrent User Restriction**



- **URL Blocking**



- **Log Report Generation**



Implementation Details

6.1 Closed User Group Management

The employees who are provided with the facility to access the Internet comes under a closed user group. Maintaining various details of this group is the first major task to be handled. This module takes care to maintain the details of the employees.

Basically the employee group is dived in to divisions.

- Restricted Users
- UnRestricted Users

Restricted users are those users who can access the Internet through the machines that are allotted to him/her. So a particular Ethernet Card is associated with such employees. IPAddress Of the machine is stored against their details. Also these users are restricted to view certain predefined sites.

UnRestricted users can access the Internet facility from any where within the network. They don't have any site restrictions.

In order to implement the closed user group, facilities are provided for administrator to Add New User Details, Modify Existing User Details and to Delete any user details.

To add a new user to the group, the administrator gets the details from the user. These details include userid, password, name, and Ethernet card details. If the Ethernet card details are left blank, then that user is taken as a *Roaming User,* and the status field is set to 1 to indicate that he is special user and no entry is made against him in the Ethernet card details table.

To edit a user detail, the user's Id is entered. Search is made in the database and his/her corresponding details are provided. Any changes made are promptly updated in the database.

To delete a user from the group, the User's Id is provided. Then after a warning check up message the corresponding details are deleted.

In order to Add/Delete/Edit user details proper authorization is obtained from his/her department head before any entry is made.

6.2 Request Processing

The most important and core part of the project is request processing module. Users, in order to access the Internet, pass the URL request to the web server. Before servicing the request the following processing's are to be made in order to provide service to the user.

The user types in the request and presses enter key. The request comes to the gateway machine where the NetCon Package is installed. The software checks the *user login* database to check whether the user has already logged in. if not the request is treated as the first request and the following process takes place.

The system stores the request in a log file and sends an authentication screen to the users machine. The user has to type-in his/her user id and password. Along with the user id and password, the system's IPAddress is passed to the servlet that handles these form requests. Now the servlet, accesses the database containing *user details.* The user id and password are verified. If the user is a restricted user, then the corresponding IPAddress is also verified from the *Ethernet card details* table. Then the concurrent user restriction module is called. If the user has not already logged in from a different machine (IPAddress), then a log file is opened and the corresponding user's request is redirected and an entry is made in the *user login details* table. If any of these processing's result in a negative result then an unauthorized screen is sent to the user and the session between the user and the machine ends there by.

To handle subsequent requests the following processing's are executed. Once the request comes from the user, check is made in the *User login details table*, to make sure the user is already an authorized user. Also concurrent user restriction module is called to make sure that no other user is using his/her identity. The URL blocking module is called to ensure that the request is a valid request, in case of the user being a restricted user. If the request is a valid one, the corresponding entry is made in the *requested site details* with status as 1 to indicate that the request is forwarded to the server. If the request is a invalid request, i.e., the URL has to be blocked, then a corresponding entry is made against *the requested site details* with status as 0, to indicate that the request is not satisfied. Now a warning screen is sent to the user.

If there is no request from the user for 5 minutes, close all socket connections between the client and the server and update the *userlogindetails,* with outtime as the current time

6.3 Concurrent User Restriction

This module ensures that the roaming user is not using more than one machine at a time. This module receives the user id and machine IPAddress from the request processing module and does the following checks.

The user login database is checked to see any corresponding entry for that user is made with a different IPAddress other than the one, which the current request has come from. If so the user is a concurrent user and that detail is passed to the request-processing module. If not the user is not a concurrent user and his/her request can be satisfied.

6.4 URL Blocking

The requests from the user have to be checked for validity against restricted site details database in case if the user is not a special user. This is to ensure that the user is not provided with a service that he/she is not intended to use. The URL is passed as an argument to this module from the request-processing module, and this module performs the following check to ensure the validity of the request. The *restricted site details* contain the details of those sites that are to be blocked. The user requested URL is checked against each and every entry in the database and if no similar entries are found, then the request is a valid one and this is returned to the calling module. Or else a negative result is returned.

6.5 Log Report Generation

Keeping track of all the transactions made through the system will prove to be of excellent use for future references. So preparing log reports is one of interesting part of the project.

Following log reports are prepared for online usage and also for producing hard copy. The administrator is provided with the facility to access printer's page setup, print preview and directly print the data through a printer attached.

Details of the current users of the machine (details in *the user login details* table where the out time is null), and those users who have requested for restricted sites will be of great use to the administrator in order to access the efficiency of the server and to keep track those users who attempt to view restricted sites.

Various reports including sites visited by a particular user in day, online users between two times, visitors of a particular site are also prepared and can be directly printed if a printer is attached.

Then a most useful daily report of all users in a particular day is also prepared. This report contains details of all users who has accessed the Internet, time of usage, and sites visited by them.

Testing

Following tests were conducted after the development of the system in order to ensure the validity of the package.,

- Black Box Testing
- White Box Testing

7.1 Black Box Testing

Black box testing was used to uncover errors, and to check the software functions, with little regard for the internal logical structure of the software. Inputs were given, and the system was tested for the desired output.

7.2 White Box Testing

Testing were conducted using white box, to ensure that all the internal operational elements of the package are according to specification, and all the independent paths within a module have been exercised. The status of the program was examined at various points to determine the expected status corresponding to actual status. In this way logical errors, if any, were noted and eliminated from each module. The performance issue was also taken in to consideration in this testing.

Some common tests include

- Standards for the Script
- Logical errors
- Desired output for a given output

7.3 System Testing - I

System Testing - I was conducted by the developer. The developer tested the system with the perspective of the user, and locked the errors and usage problems. Checks were done to the product, for the given specifications. The modifications were made accordingly, and the product went for system testing – II

7.4 System Testing – II

In the System Testing II, the host group prepared exhaustive test cases to check the system. The non-members of the project group did the testing. During this testing, developer was kept out of the site. The errors locked for the coding was rectified within the stated time. Unlike System Testing I, since the test cases were given to the members of different groups and tested, a live application came in for the software in an environment, which was out of the control for the developer. All the problems that were encountered during this testing were reported to the developer. The modifications for the errors were rectified to standards. The product is now ready for use after the successful completion of System Testing – II and I.

Quality Tests were also done to check for

- Data Accuracy
- Performance of the Software
- Integrity of Data

Experimental Results and Conclusion

Experimental Results

- The software and the Apache Tomcat server were installed on one of the machines (192.168.1.94).
- The Internet Explorer was configured with the following LAN Settings.,

  IP Address 192.168.1.94

  Port Number 2222
- Request is made from any client machine say, 192.168.1.74.
- The web page is displayed in the browser if it is not an unauthorized request from an unwanted user from outside the closed group or URL Blocked, via Proxy. Otherwise consequent error page is displayed.

Conclusion

The proposed system "Network control and Monitoring System" was found to be very effective. It was able to achieve its intended goals.

The system was developed with quality consciousness and more importantly it pertained to the standards of the company. Another issues of significance is that this system was built rigidly, and exhaustive testing strategies were adopted. The testing was completely successfully for all the requirements and specifications, and the developer gave the sign off. As per schedule, the objectives of the proposed system have been realized.

I believe that I have put all my effort to implement this project sincerely.

Future Enhancements

✓ Caching facility can be introduced in the system in order to make the access to the Internet effective and faster.

✓ System can be developed to filter contents (both incoming and outgoing) as per the requirement of the administrator.

✓ A special module that prevents the intruders from outside world can be attached to the so developed system with minor modifications.

✓ A variety of extra log reports can be prepared and added to the existing system as and when need arises.

✓ Authorized users can be provided with facilities to change their User Id and password, online.

References

i. Marcus Goncalves, "Firewalls a Complete Guide", Tata McGraw-Hill Edition, 2000

ii. Erik Rozell, Todd Lammele and James C hellis, " Proxy Server 2", BPB Publications, First Edition 1998.

iii. Elias M Awad, "System Analysis And Design", Galgotia Publications, Fourth Edition 1999

iv. Roger S Pressman, "Software Engineering", Addison-Wesley, Fifth Edition 1999

v. Deitel & Deitel, "Java How to PROGRAM", Pearson Education, Third Edition 2001

vi. Brett Spell, "Professional Java Programming", Wrox Press Ltd, First Edition 2001

vii. James Goodwill, "Developing Java Servlets", Techmedia, First Edition 1999

viii. Thomas B Cox, "Oracle Workgroup Server Handbook", Tata McGraw Hill, First Edition 1995

ix. http://www.Firewalls.com

x. http://www.algos/Firewall Security.htm

xi. http://www.javasoft.com

xii. http://www.softgineer.com

xiii. http://www.oracle.org

xiv. http://www.servlet.com

xv. http://www.astlavista.com

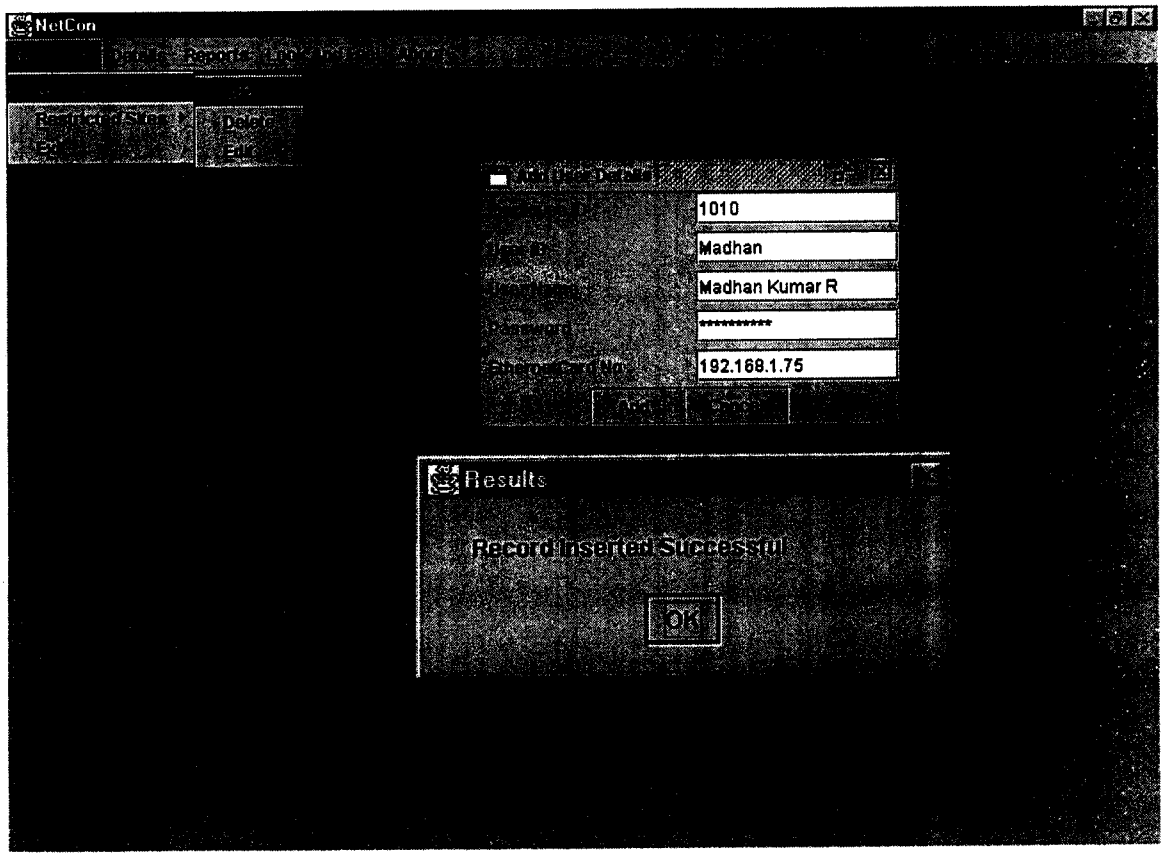


Fig. A1. User Details - Add

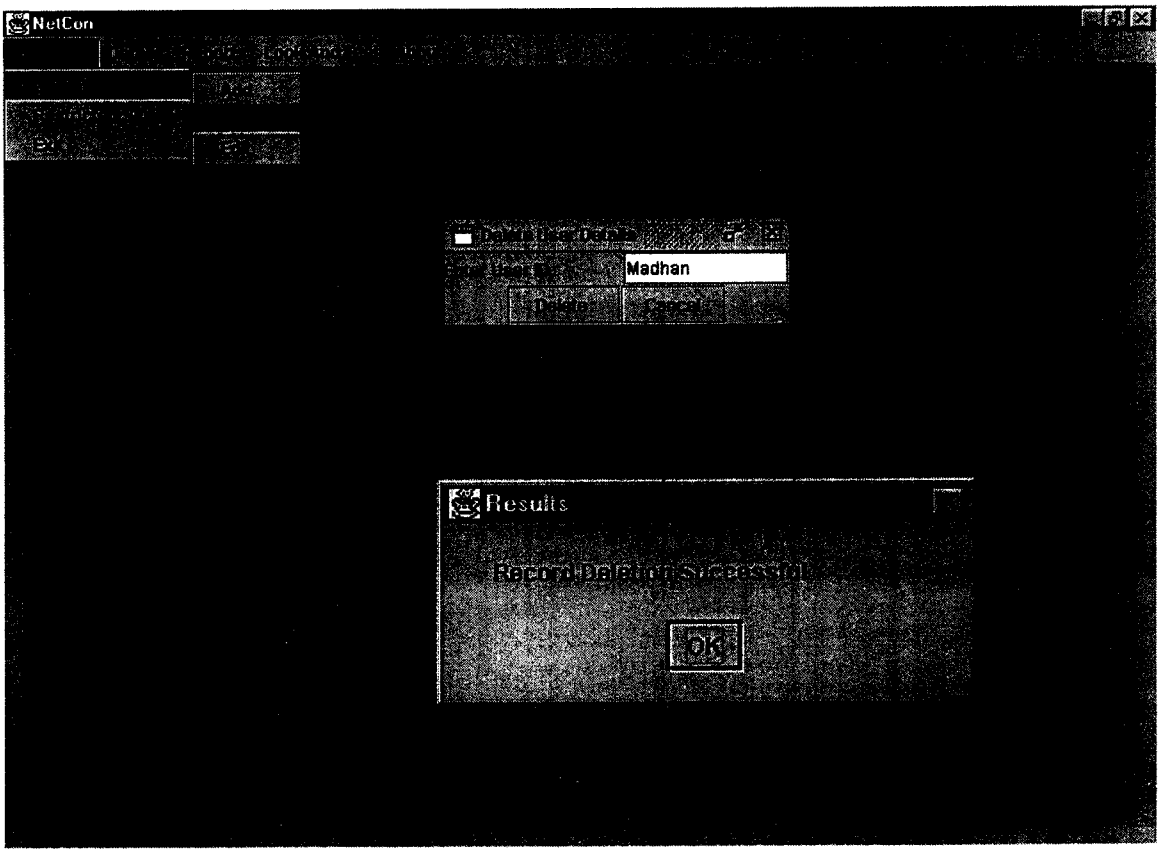


Fig. A2. User Details - Delete

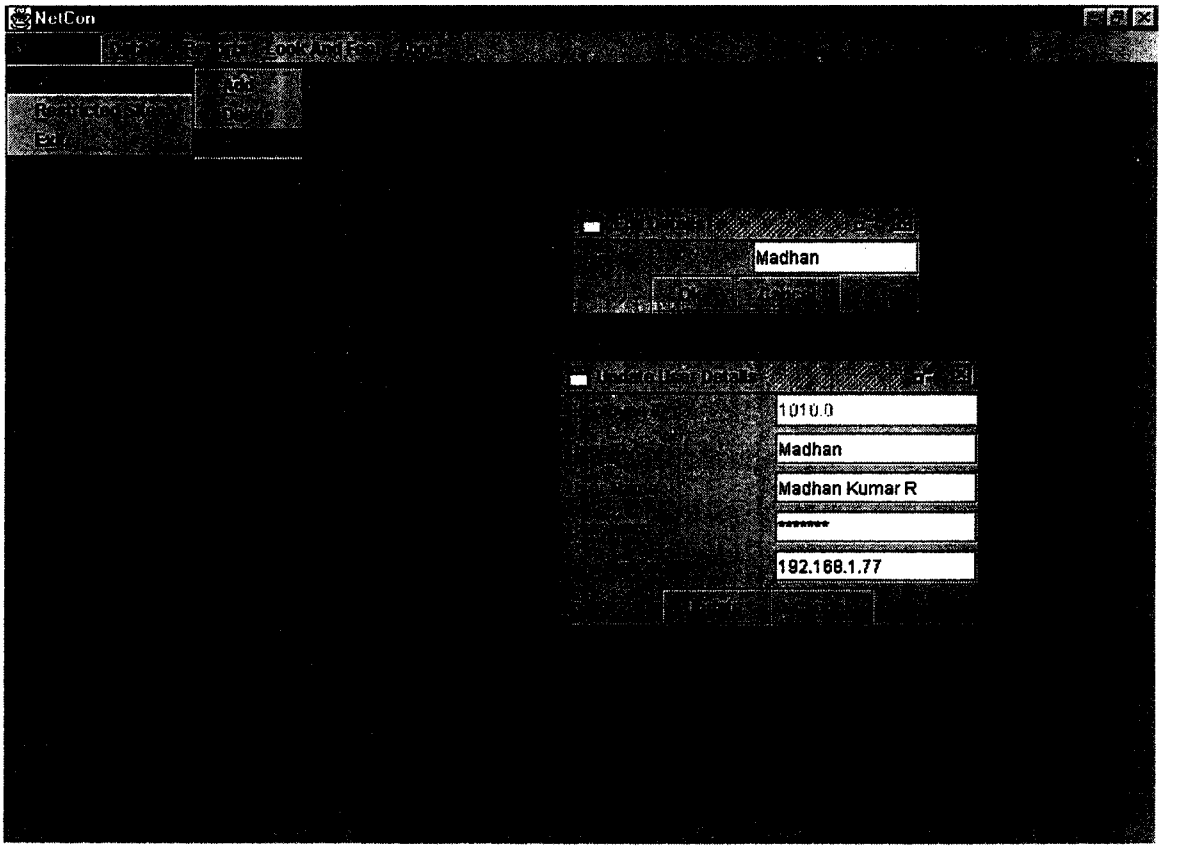


Fig. A3. User Details - Edit

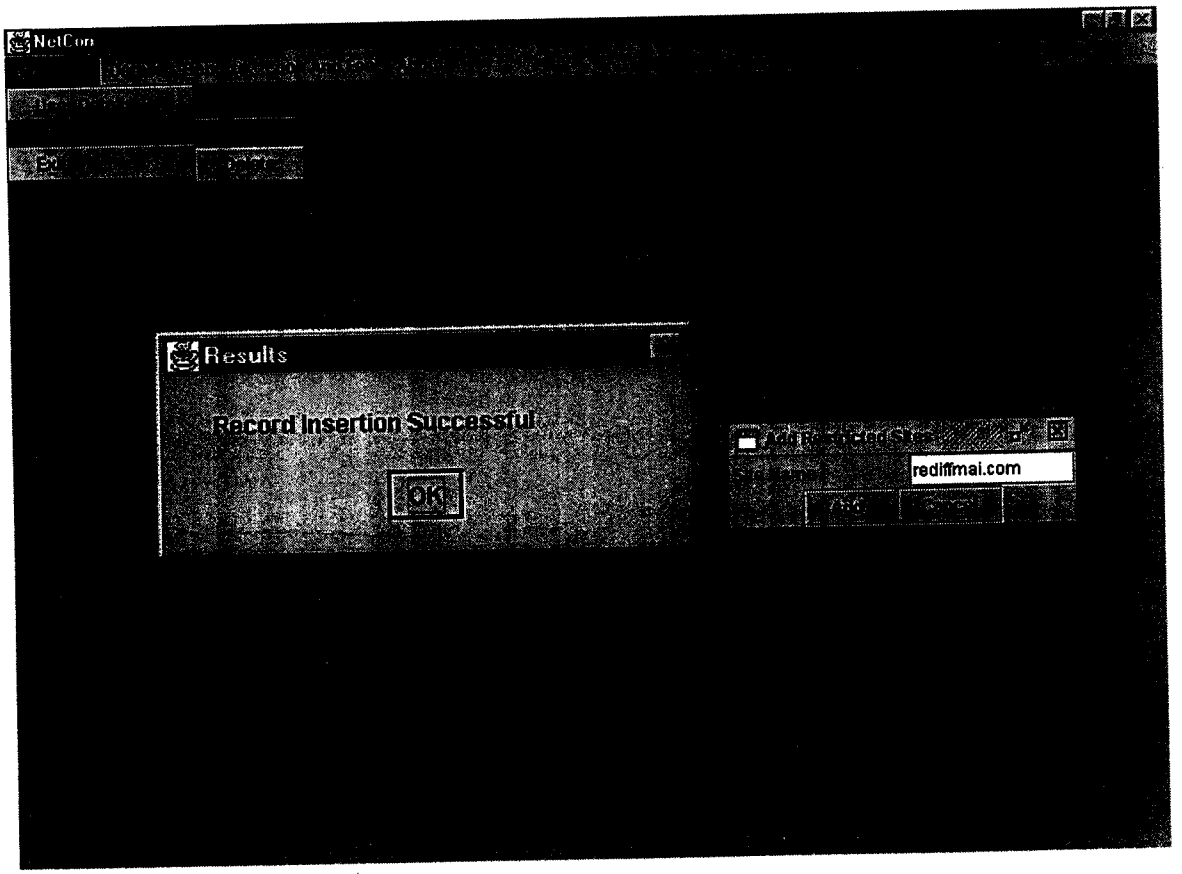


Fig. A4. Restricted Site Details - Add

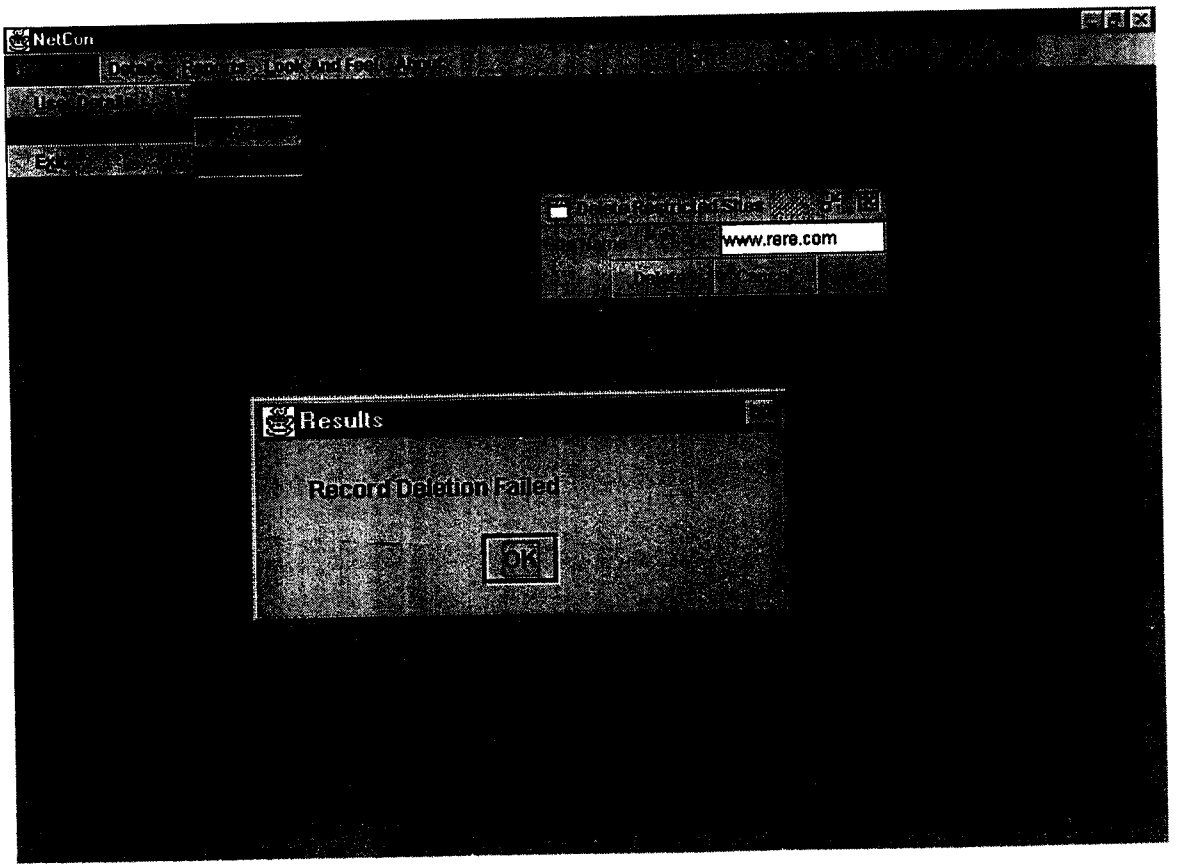


Fig. A5. Restricted Site Details - Delete

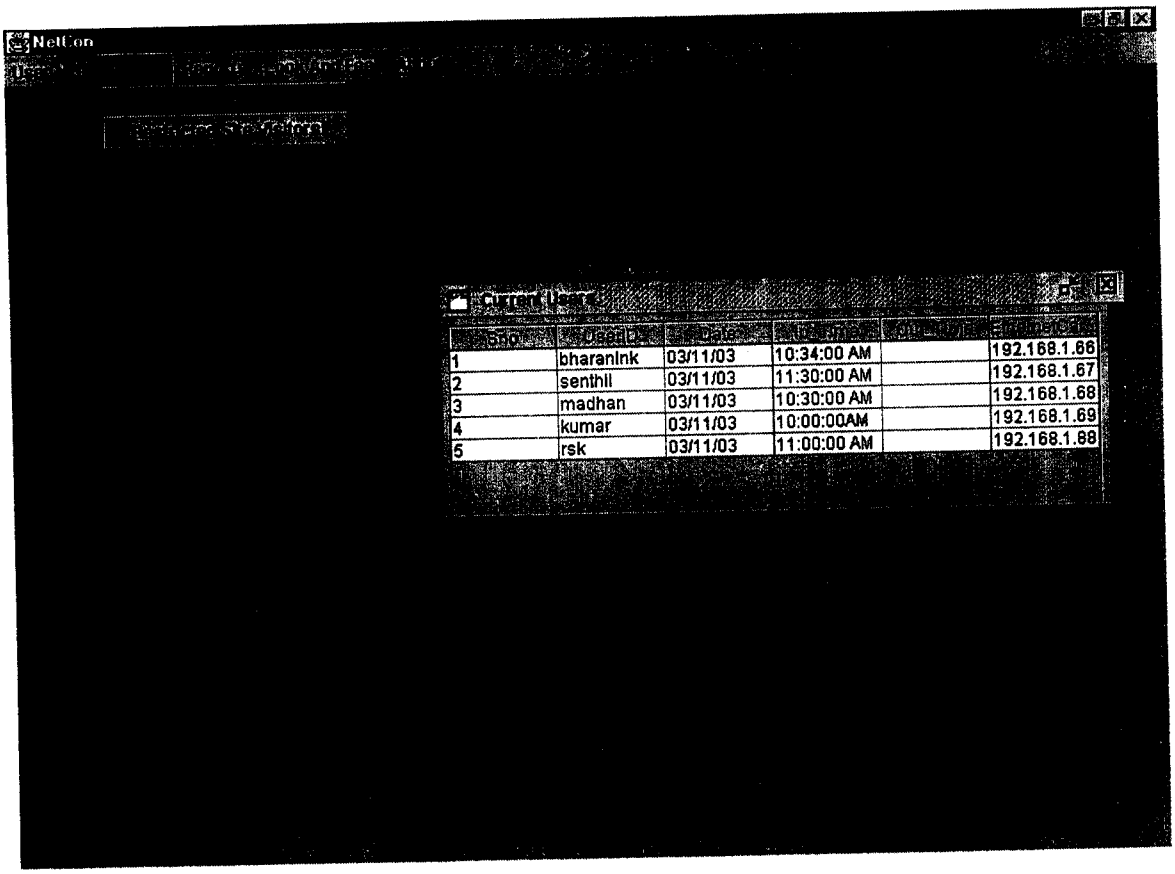


Fig. A6. Online Report - Current Users

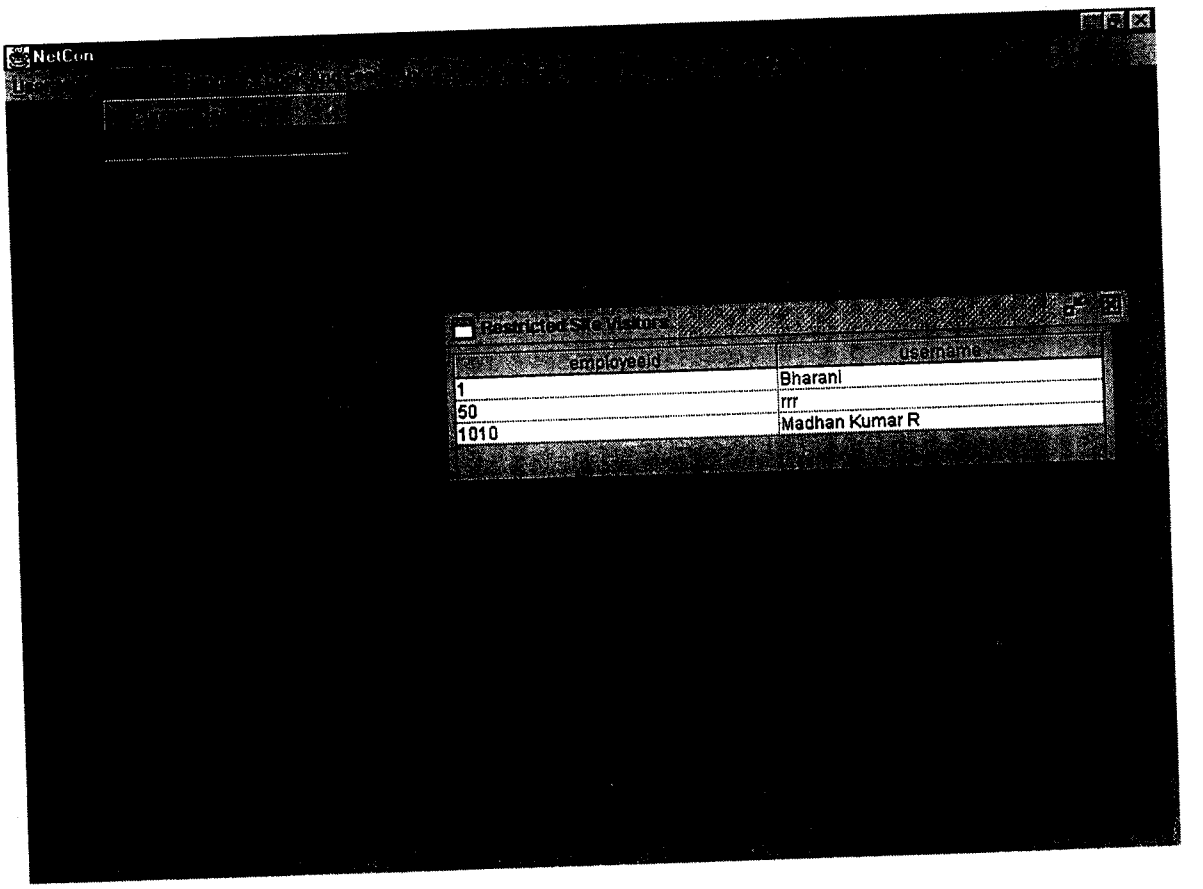


Fig. A7. Online Report - Restricted Site Visitors

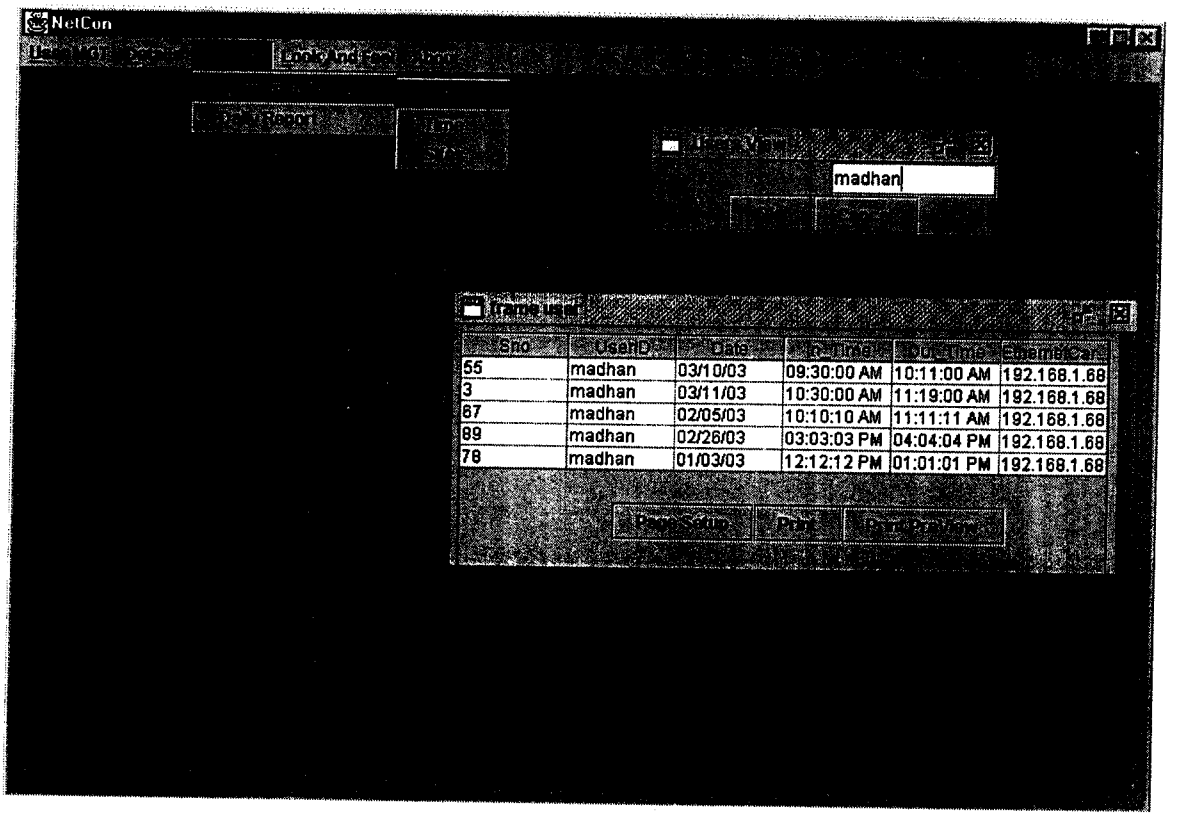


Fig. A8. Report - User Id Based

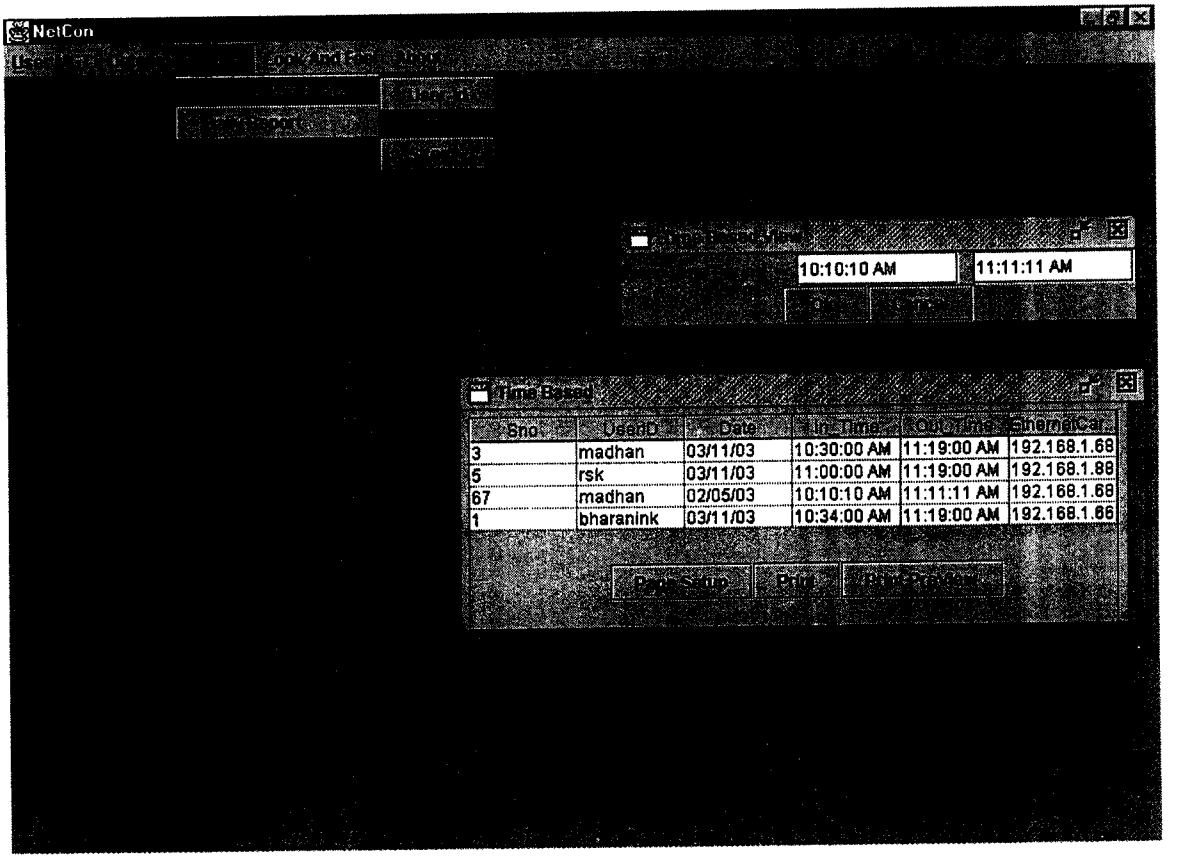


Fig. A9. Report - Time Based

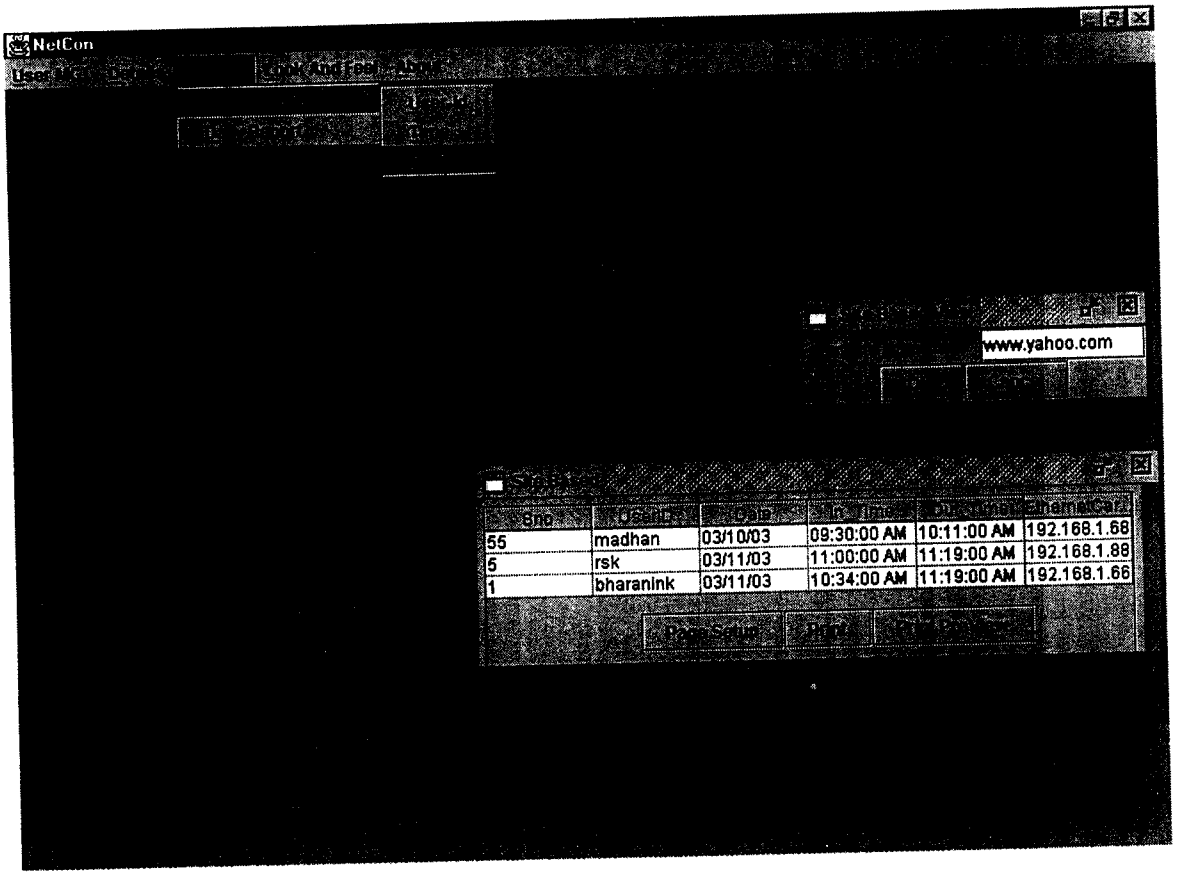


Fig. A10. Report - Site Based

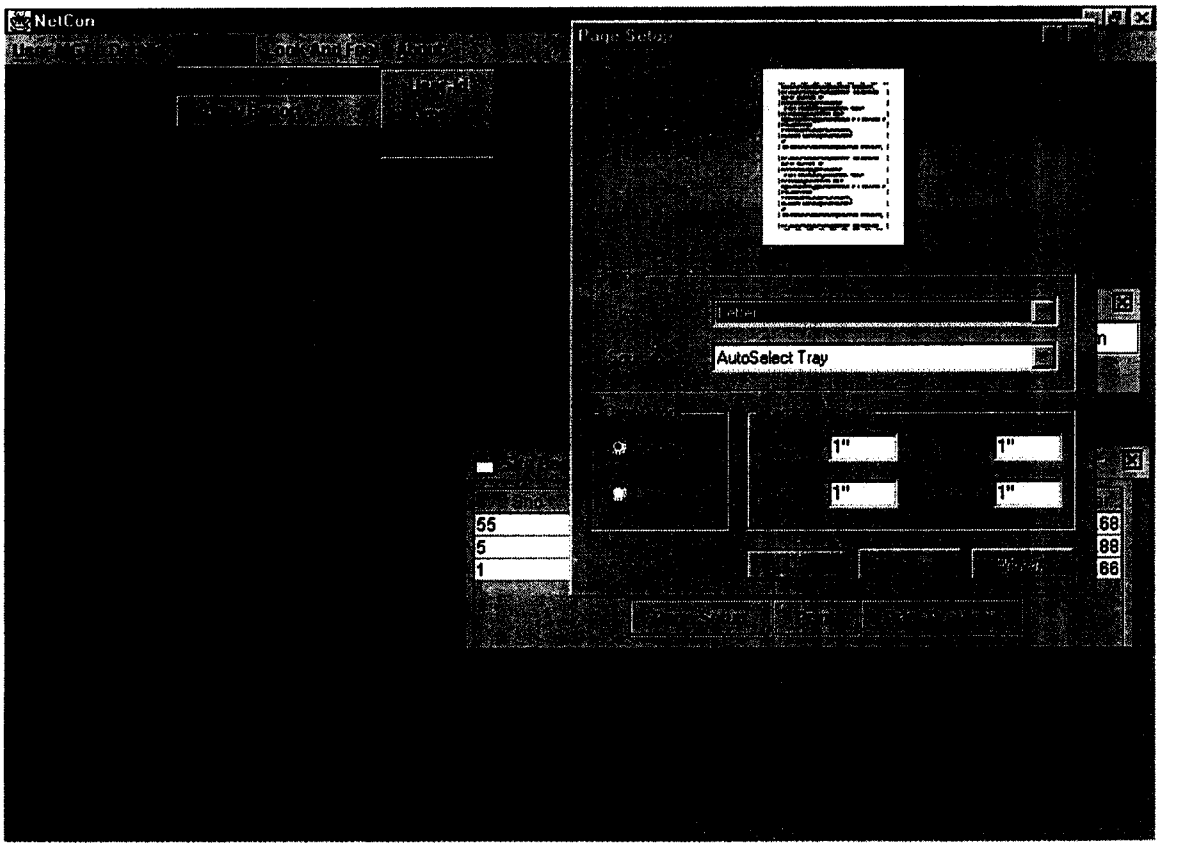


Fig. A11. Report - with access to Printer PageSetup option

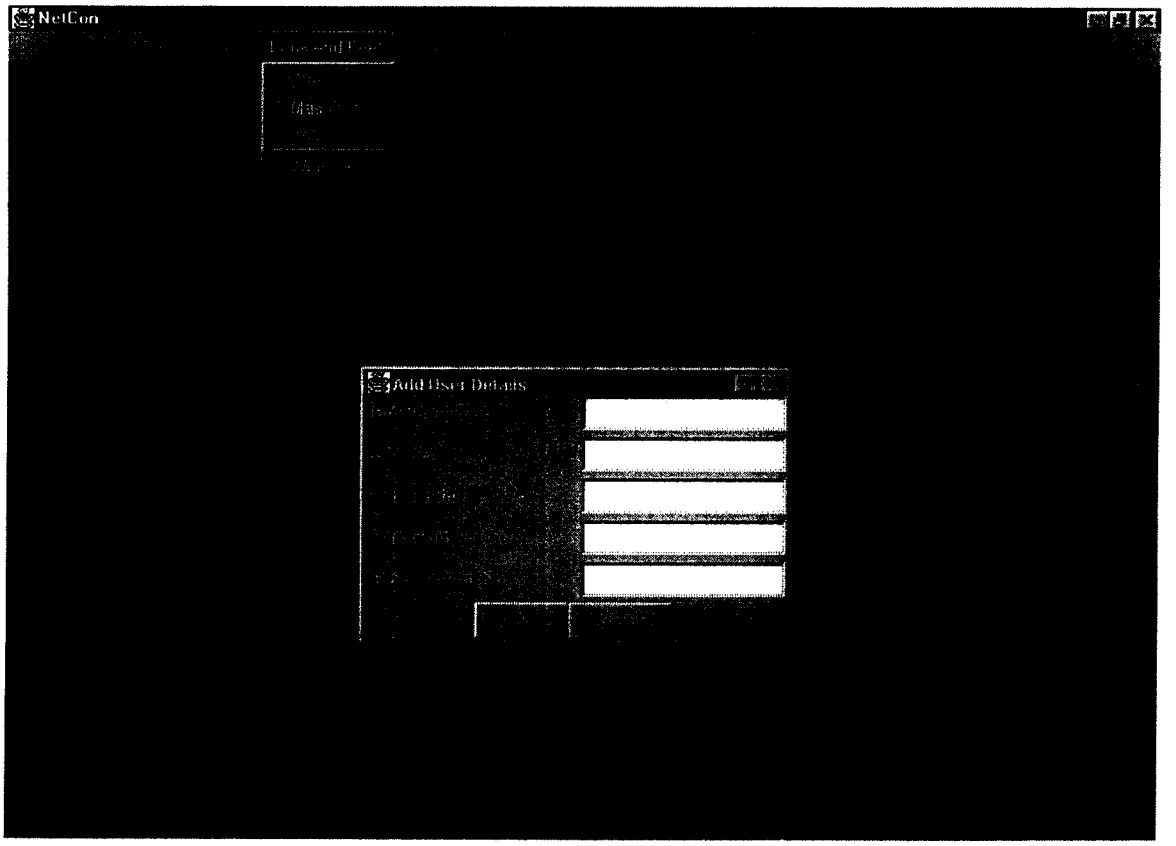


Fig. A13. Windows Look and Feel Option

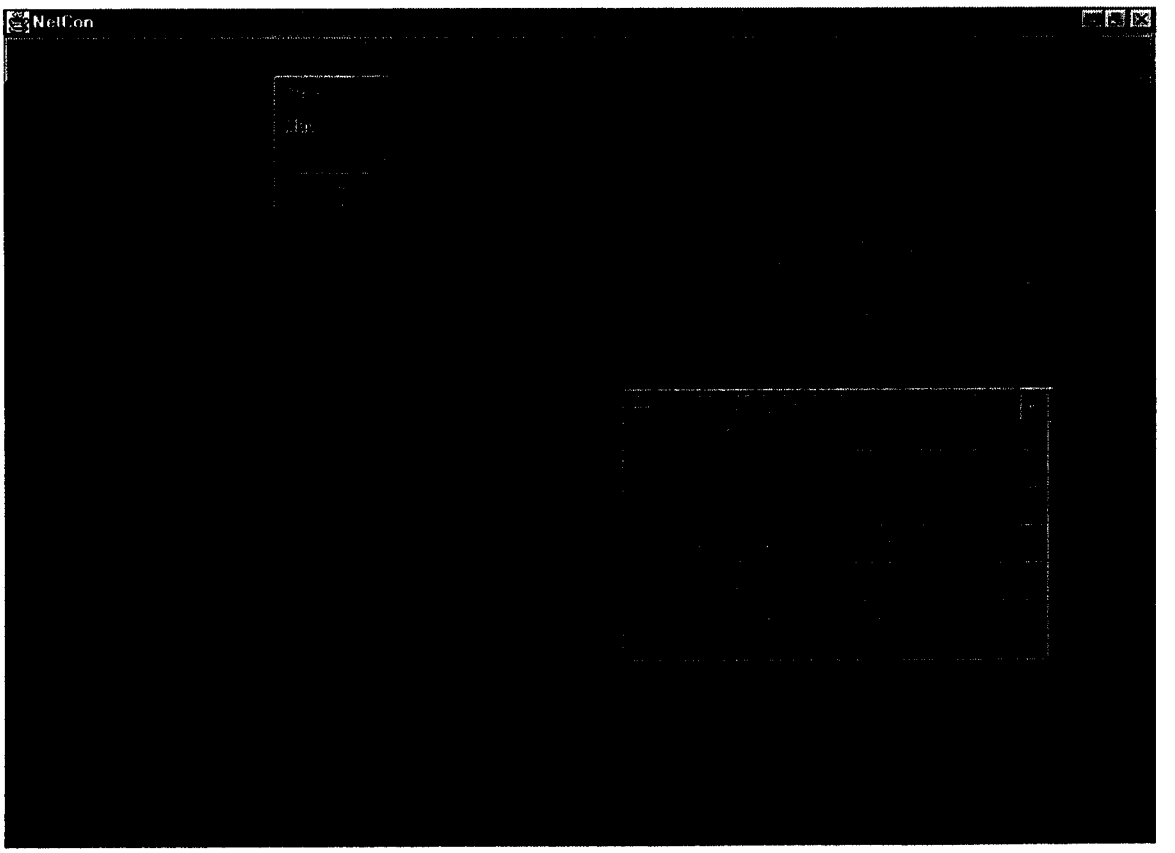


Fig. A14. Motif Look and Feel Option

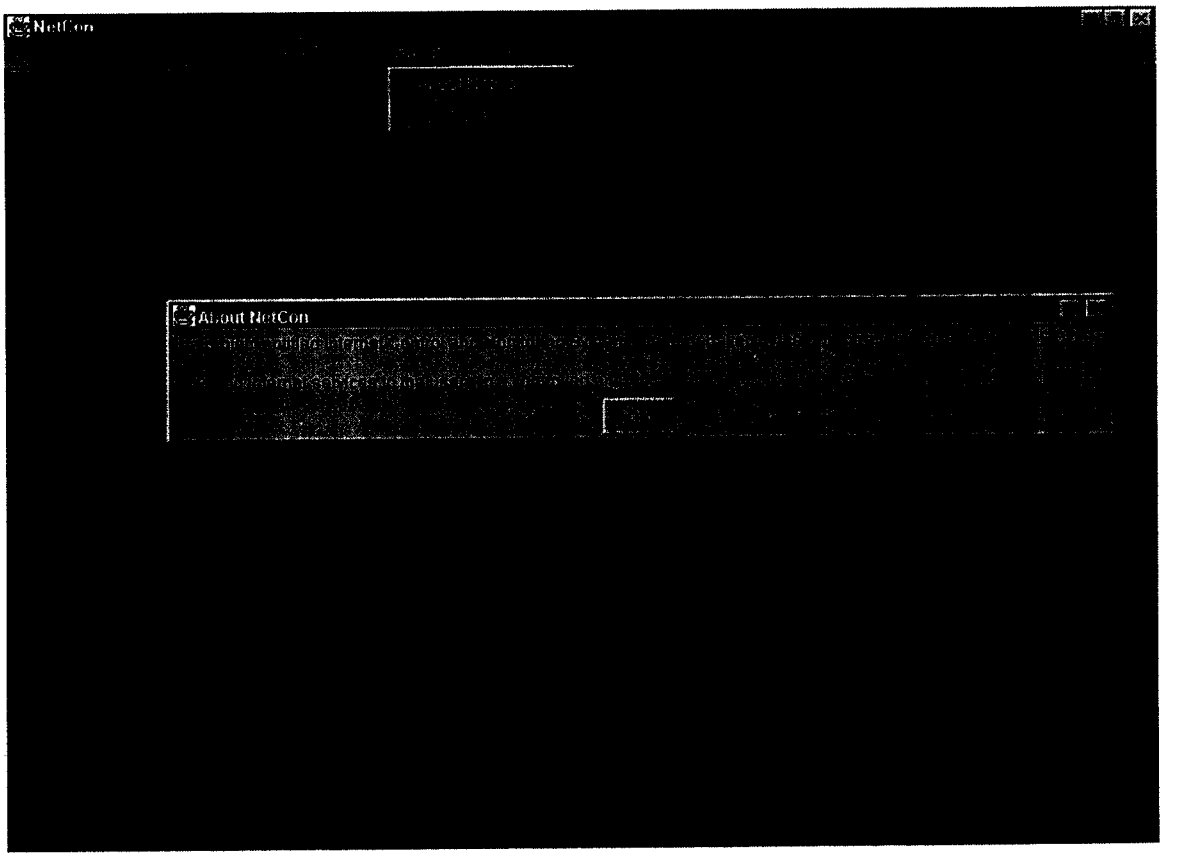


Fig. A15. About Form

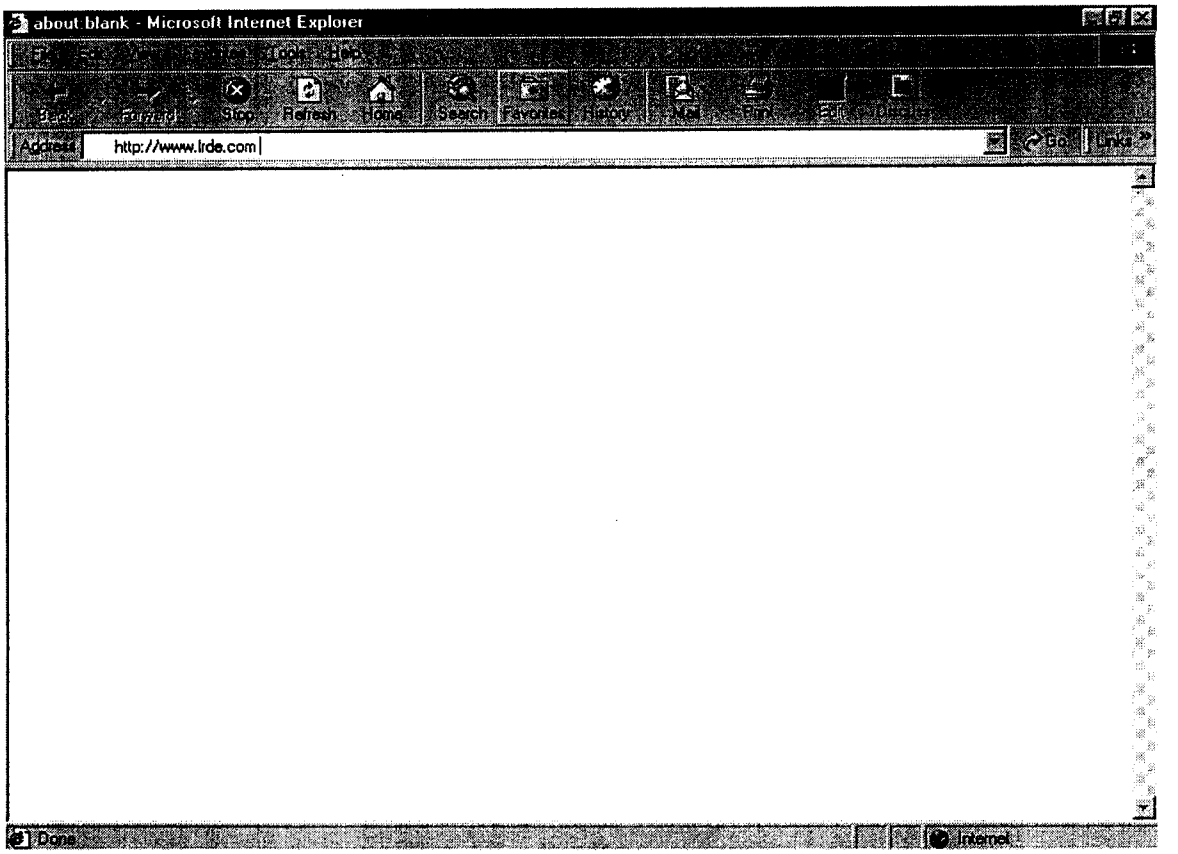


Fig. A16. User Request for lrde.com

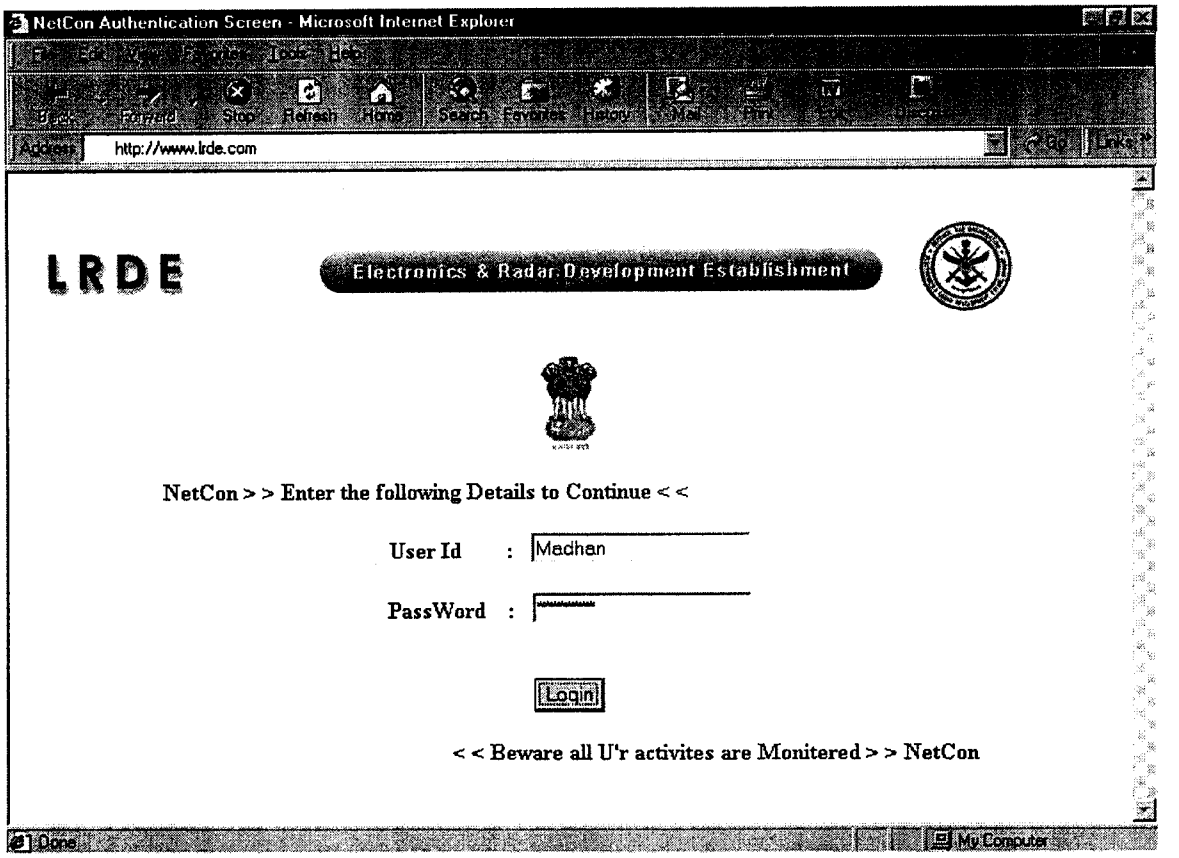


Fig. A17. Authentication Screen sent to User

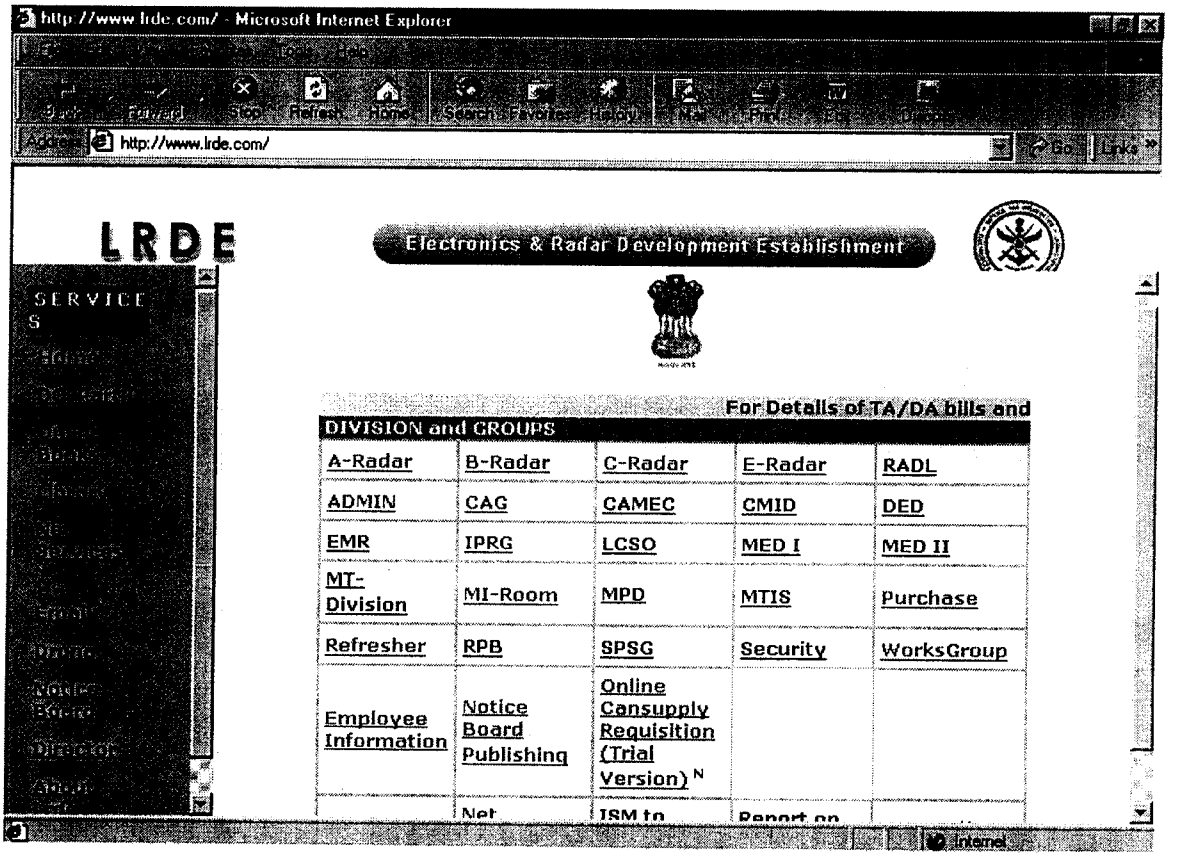


Fig. A18. User Request Satisfied

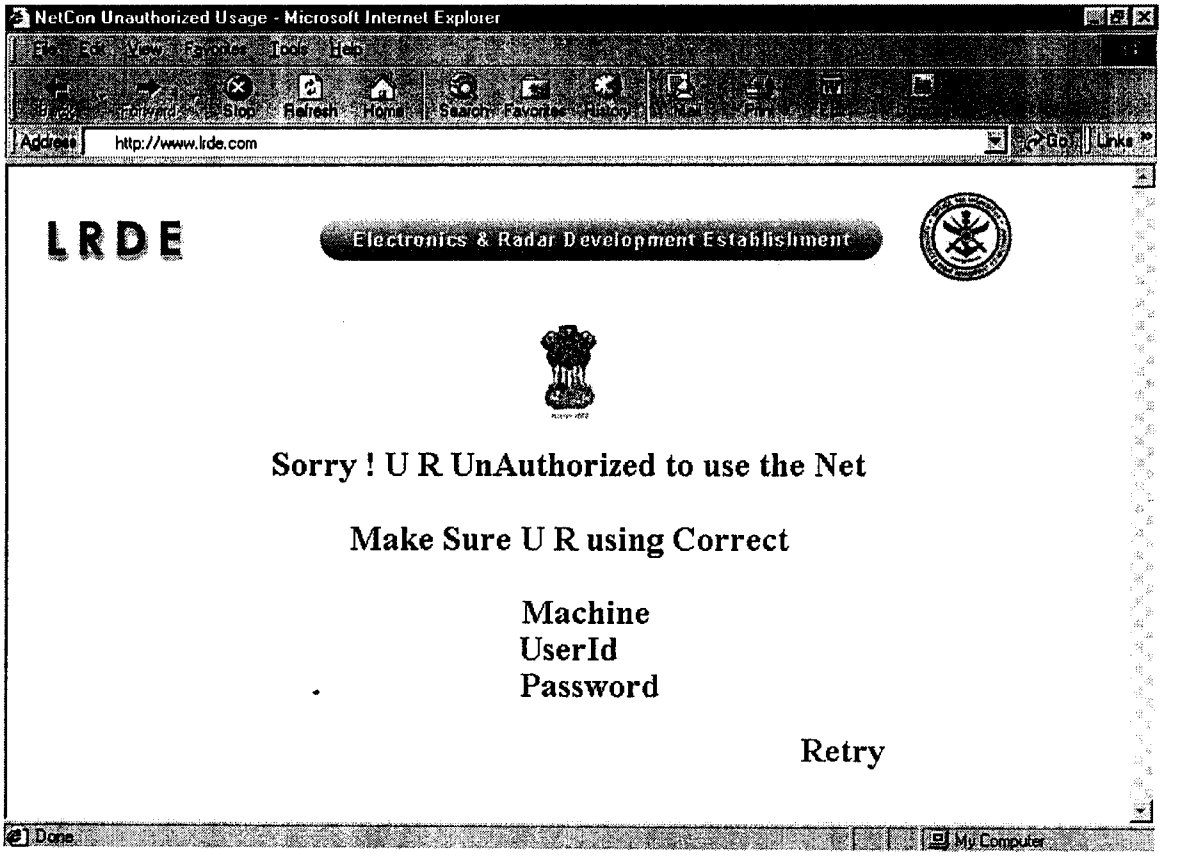


Fig. A19. Unauthorized Usage Screen

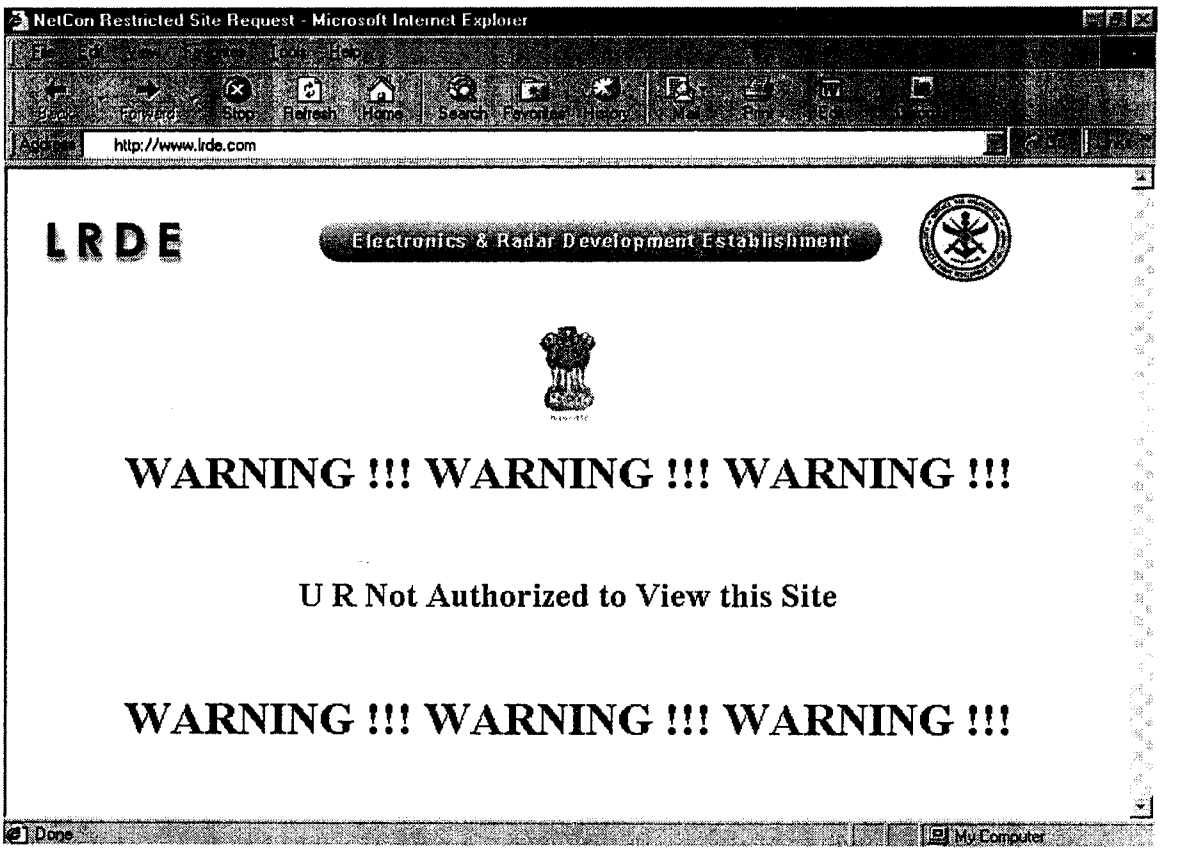


Fig. A20. URL Blocked Warning Message Screen