Network Monitoring System

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Bonafide Certificate

Certified that this project report titled **Network Monitoring System** is the bonafide work of **Mr.C.S.Naresh Kumar** who carried out the research under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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TO WHOMESOEVER IT MAY CONCERN

This is to certify that **Mr C.S. Naresh Kumar (Reg.No. 71203621029)**, final year student of Master of Computer Applications from Kumaraguru College of Technology, Coimbatore has successfully completed project titled **"NETWORK MONITORING SYSTEM"** during the period January 02, 2006 to May 31, 2006.

During this period, his work and conduct was found satisfactory. We wish him success in all his future endeavors.

The Company is not liable to provide any source code.

for **Newgen Software Technologies Ltd,**

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ABSTRACT

The Network Monitoring System enables network administrators to have online views of network activities logged into various files and enables them to take action depending on the criticality of the events recorded. The system transforms various events occuring on the network and converts them to useful information. This information is of vital importance in a corporate environment network where multiple users work across a variety of domains and access different network resources.

Network Management System retains the manual methodology followed by the administrators in analyzing network events. In the manual system, network administrators need to locate different log files and view event logs recorded by the Operating system. This requires the administrators to be thorough with the Windows OS. It is also much time consuming and needs the users to understand the terminology of the error message or the logged event information. These complex requirements may make it difficult and lead to wastage of time if the network administrators are found to be inefficient in determining the exact nature of the errors or events recorded.

The Network Management system takes care of such potential complexities that may arise, and provides easy to analyze data, to the users of the system. It provides users with reports that are easily understandable, at the click of a mouse button. The system captures remote desktops which aids the administrators to monitor activities of users. Users trying to perform illegal activities can immediately be warned. Also, it provides various other features like printer monitoring, shutting down machines remotely, monitoring internet, hard disk and database usage. It also has a sub system which enables sending of sensitive events through sms to registered network administrators.

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CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

The system titled "Network Monitoring System" offers total solution to the various network related requirements of Newgen Software Technologies, Chennai.

Network monitoring systems have always been a matter of research and development ever since the advent of networking in corporate environments where multitudes of data are transmitted over the network in relation to the job profiles of the organizations employees. Many different tools are available in the market to address the various issues involved in this domain. The tools available in the market address issues that Newgen Software Technologies face. However, the company aims at developing a Network Monitoring System exclusively for their use and plans to market the same after a period of time by enhancing the product by adding a whole lot of features to the same, hence, the evolution of this product.

The Network Monitoring System enables network administrators to have online views of network activities logged into various files and enables them to take action depending on the criticality of the events recorded.

The system begins with a user logging feature that enables to keep track of user sessions. Whenever users log in or logout of the system, it is recorded into a log file with the time and date. These details can be retrieved by the administrator to know the status of each user. The system also records the

duration for which the user has left his system in an inactive state. The administrator can log him off if the session has been inactive for long.

A printer monitoring service functions in the background which takes into account various activities performed by different users of the network upon the printer. It logs various details such as the number of documents printed, successful and unsuccessful prints issued reasons for failure, printer unavailability periods and various other details. This is then notified to the administrator by sending messages or is later available for viewing by the administrator.

The internet usage of each user is monitored by recording all the websites visited by them and also the websites blocked by the internet browser. When the user is found browsing illegal websites the administrator blocks the website and sends a warning message to the user.The desktop of any user connected under the network is captured to monitor the activities carried out by the user. When the user performs any illegal operations, either the user is sent a warning message or a call is made to warn them.

In the network, any system is called to shutdown if found not switched on by the user or for security reasons like to avoid spreading of detected virus in a network. Whenever the hard disk space or the database size allocated to the user is about to touch its maximum limit, the user of the system and the administrator is informed by sending an SMS.

The server and the internet connection are monitored for its availability .If for some reasons any of them goes down, it is intimated to the administrator by sending SMS.

1.2 COMPANY PROFILE

Newgen Software Technologies Limited is a leader in the field of Business Process Management (BPM), Document Management (DM) and Imaging solutions.

Newgen Software Technologies started in 1992. Headquartered in New Delhi, India, it has four software development centers; three located in New Delhi and one in Chennai. The development centers are seamlessly linked to its facilities in the US and other parts of the world. Newgen is an ISO 9001:2000 and CMM level 4 company. Ranked as amongst the top 10 Software Product Companies in India by Dataquest magazine in 2003, Newgen employs more than 500 people.

In the past 11 years the company has invested more than Rs.70 crores in developing Business Process & Document Management Technologies. Newgen has to its credit over 500 software installations worldwide.

The company has serviced clients in industry segments such as BPO, Insurance, Banking & Financial Services, Telecom, Governance, etc.

Newgen is India's leading product development companies with proven expertise in end-to-end solutions. It specializes in building solutions for various business verticals. With operations spread across the world, their main thrust areas are

- Business Process Management
- Workflow
- Document Management
- Imaging
- Forms processing
- Electronic bill presentment
- Onsite/off-shore software development
- Device Driver Development

CHAPTER 2

SYSTEM STUDY AND ANALYSIS

2.1 PROBLEM STATEMENT

The network administrators at Newgen Software technologies face lots of difficulty in determining the cause of failure of different devices on the network. They need to manually check out different log files, understand the error messages and determine the exact nature of the error. This is quite time consuming and a very tedious process. Lots of precious time is wasted in the activity and work gets stalled. Various services on the network like printer services, database services, and others when affected affect the users.

The organization requires a system which could help ease out the problems faced in the scenario mentioned above.

2.2 EXISTING SYSTEM

The current system in the company is a manual one. There are various different situations which the network administrators need to understand. These situations falls into the classifications like printer usage, internet usage, hard disk usage and the like. There are situation when the printer fails, users access internet unceasingly, hard disk space fills up and users are further denied permission to store more data, database gets filled up with data. All such situations need to be handled by the network administrators.

All such events need to be monitored by the network administrators. These network administrators are trained to correct and rectify such undesired events. They are also required to have a good knowledge about the OS used and various details about event capturing and the desired services that need to run so that such events are captured.

When an undesirable event occurs the users of the system make a complaint to the network administrator. The network administrator then needs to analyze the nature of the error, run to various systems, identify the log files which would contain details on the reason of the occurrence of the error. They need to read the entire description; if the message is understandable and they are familiar with it then they can go ahead and resolve the issue. If the reason cannot be determined they need to hunt through the Operating system manuals and the help system and try and resolve the errors. If the manuals also don't help in solving the situation then they need to consult the vendors and take their support.

Also they need to rely upon the operating system user logs to determine which user logged in at what time and logged off at what time. The user has to manually report to network administrators as and when they run out of disk space and database space. They then need to identify unwanted files and delete or take back ups before deleting them. Regarding database space, they need to increase the tablespace quota for the user. This rectifies such problems.

The existing system is quite time consuming and needs a lot of effort for determining the cause of errors and arriving at the proper solutions.

2.2.1 DRAWBACKS OF THE EXISTING SYSTEM

The drawbacks of the existing systems can be summarized as below:

- Determining the nature of the error is time consuming.
- Lots of analysis required.
- Complete understanding of the OS functioning is necessary.
- Lot of paperwork.
- Historical data retrieval takes a long time.
- Not easy to understand for a naïve user.
- Access and retrieval of relevant information requires considerable overhead.
- Generation of reports is difficult, since various records are to be verified.
- Miscommunication between various departments often results in chaos.

2.3 PROPOSED SYSTEM

The objective of implementing the proposed system is to reduce the overhead incurred by the colege staff and to make the whole process simple and efficient. It has been decided that the proposed system will have computerized entry for all the operations carried out in the college.

2.3.1 ADVANTAGES OF THE PROPOSED SYSTEM

The expected benefits of the Proposed System are as follows:

- Intuitive and easy to use.
- Flexible and scalable.

- Easy and quick recovery from errors.
- Data from a single source ensuring integrity.
- Various reports can be generated as and when required.
- Maintains user Logs to check on future dates.

2.4 FEASIBILITY ANALYSIS

Feasibility analysis is the measure of how beneficial or practical the development of Information System will be to the Organization. Once the problem is explained information is gathered about the system to test whether the system is viable Technically, Financially and Operationally. Thus, feasibility study is carried out in three phases as follows:

2.4.1 TECHNICAL FEASIBILITY

Technical Feasibility is the measure of practicality of a specific technical solution and the availability of technical resources and expertise. It centers on the existing computer system (hardware, software, etc.) and to what extent it can support the new addition.

The proposed system is to be developed using Java as the source for establishing socket connections and communicating with other systems on the network, JSP to view and analyze reports, Oracle as the back-end. These resources are already available with the organization along with the hardware resources that might be needed for the proposed system. Hence technically the system is feasible.

2.4.2 OPERATIONAL FEASIBILITY

Operational Feasibility asks if the system will work when it is developed and installed. It checks for the support of the management, the current business methods, user's involvement and their attitude towards the proposed system, etc.

The proposed system has found encouraging support from the management as it will be of great use to them. The network administrators of the organization are also committed to have the system operational as it will save time and reduce their workload and hence they very much favor the existence of such a system.

2.4.3 ECONOMIC FEASIBILITY

Economic Feasibility is the measure of the cost-effectiveness of the proposed system. The investment to be made in the proposed system must prove a good investment to the organization by returning benefits equal to or exceeding the costs incurred in developing the system.

The proposed benefits of the system will outweigh the costs to be incurred during system developed since the system does not require procurement of additional hardware facilities it is economically feasible. In addition capability of the system to incorporate future enhancement will improve the performance to suit the future need of the organization.

2.5 USERS OF THE SYSTEM

The users of the proposed Network Monitoring system are basically network administrators. Network administrators are more than one and each of them can use the system to rectify any of the errors that could happen at real time.

Network Administrators are authorized to query the system at any point of time and retrieve and view results presented by the system. They can also receive sms alerts from the system if their mobile numbers are registered with the system.

CHAPTER 3

DEVELOPMENT ENVIRONMENT

3.1 HARDWARE REQUIREMENTS

The hardware support required for deploying the application:-

Server Configuration

Processor:	Pentium 3 Processor or above/Athlon Processor
RAM:	Minimum 256 MB
Hard Disk:	80GB or more

Client Configuration

Processor:	Pentium 3/4 Processor/Athlon Processor
RAM:	Minimum 128 MB
Hard Disk:	20GB or more

LAN Configuration

Speed:	Minimum 100 MBPS

3.2 SOFTWARE REQUIREMENTS

The software support required for deployment is:-

Client Script:	Java script.
Web Server:	Apache Tomcat 4 & above
Database:	Oracle 9i
Software for Development:	JDK 1.4 & above, JSP, WinAPI calls
Tools used:	Win proxy for Internet connection sharing

3.3 PROGRAMMING ENVIRONMENT

3.3.1 JAVA

Java is an Object Oriented Programming language developed at Sun Microsystems in June 1995. Java is simple, secure, portable, multithreaded, interpreted, object-oriented, robust, architecture-neutral, high-performance, distributed and dynamic language. The major goal of the Java designers was "write once; run anywhere, anytime, forever". To a great extent this goal was accomplished.

Java is both compiled and interpreted language. Java has a built in compiler known as JIT (just-in-time) compiler which translates the source code to bytecode (.class files). A bytecode is a highly optimized set of instructions designed to be executed by the Java run-time system which is called the Java Virtual Machine (JVM). This JVM is the interpreter for the bytecode. This is how all the Java programs written and compiled once can be run on any machine provided that JVM is installed in that machine.

The java programming language is uniquely suited for distributing executable content over Networks. Java also offers a set of functions similar to many other programming languages. As a language for delivering information on the web, java connects to the web's hyper text markup language using a special tag called applet.

3.3.1.1 BENEFITS OF JAVA

Java programming language enables the developer to:

- Write platform independent code
- Develop secure applications that can be transmitted over various networks.
- Build applications that contain various GUI components.
- Enable access to various database and relational database management systems through JDBC (Java Database connectivity) API.

3.3.2 Oracle 9i

Oracle Corporation is the world's leading supplier of software for information management, and the world's second largest software company. Oracle was the first company to release a product that used the English-based structured query language, or SQL. This language allows the end users to extract information themselves, without using a systems group for every little report.

Oracle basically does three things

- Lets you put data into it
- Keeps the data
- Lets you get the data out and work with it

Oracle supports this keep-in-out approach and provides clear tools with considerable sophistication that allows us to find how data is captured, edited, modified and put in; how to keep it securely; and how to get it out to manipulate and how to prepare reports on it.

Object-relational management system (ORDBMS) extends the capabilities of the RDBMS to support object-oriented concepts. We can use oracle as an RDBMS or take the advantage of its object-oriented features. Oracle 8 is the first object-capable database developed by oracle. Oracle 9i, the database for internet computing, provides advanced tools to manage all types of data in web sites. Oracle 8i is an Object Relational Database Management System (ORDMS).

The Internet File System (IFS) combines the power of oracle 8i with the ease of a file system. It allows users to move all of their data into the oracle 8i database, where it can be stored and managed more efficiently. Oracle 8i intermedia allow users to web-enable their multi-media data-including image, text, audio and video data.

Oracle 8i includes a robust, integrated, and scalable Java virtual machine within the server (Jserver), thus supporting java in all tiers of applications. This eliminates of necessity of recompiling or modifying java code when it is to be developed on a different tier.

With the newly introduced resource management, the DBA can choose the best method to fit an application's profile and workload. The extended features of parallel server and networking improve ease of system administration. The extended functionality of advanced replication results in better performance and improves security.

3.3.3 JSP - Java Server Pages

Java Server Pages (JSP) is a technology for controlling the content or appearance of Web pages through the use of servlets. JSP is comparable to Microsoft's Active Server Page (ASP) technology. JSP technology allows Web developers and designers to rapidly develop and easily maintain, information – rich, dynamic Web pages that leverage existing business systems. The JSP technology enables rapid development of Web-based applications that are platform independent.

Java Server Pages is presentation layer technology that sits on top of java servlets model and makes working with Html easier. It allow you to mix static Html content with server side scripting to produce dynamic output. By default, Jsp uses Javascript as its scripting language just as Asp can use other languages. so with java will be more flexible and robust than scripting platforms based on simple languages.Jsp provides a robust web application platform and a number of server-side tags that allow developers to perform most dynamic content operations.

Java Server Pages technology is an extension of the Java Servlet API. Servlets are platform-independent, 100% pure java server-side modules that extend the capabilities of a Web server with minimal overhead, maintenance, and support. Together JSP technology and servlets provide an attractive alternative to other types of dynamic Web scripting/ programming that offers platform independence, enhanced performance, separation of logic from display, ease of administration, extensibility into the enterprise and most importantly, ease of use.

JSP pages share the "Write Once, Run Anywhere" characteristics of Java technology. There are many technologies available for the dynamic content generation on the server. They are CGI, Servlets, ASP and JSP. But JSP is advantageous over other technologies.

3.3.3.1 ADVANTAGES OF JSP

- JSP maintains state between session.
- A new thread is spawned for each request.
- JSP is loaded only once at the time of initiation.
- JSP runs in a JVM as an extension to the Web server.
- JSP provides better separation of page code and template data.
- JSP can be run on all major Web servers.
- JSP is simpler to write and provide a separation of presentation from logic.

3.3.4 JDBC

JDBC is a Java API for executing SQL statements.(As a point of interest ,JDBC is a trade marked name and is not an acronym; nevertheless, JDBC is often thought of as standing for "Java Database Connectivity").It consists of a set of classes and interfaces written in the java programming language.JDBC provides a standard API for tool/ database developers and makes it possible to write database applications using a pure Java API.

Using JDBC it is easy to send SQL statements to virtually any relational database. In other words ,with the JDBC API ,it isn't necessary to write one program to access a Sybase database, another program to access an Oracle database and so on. One can write a single program using the JDBC API, and the program will be able to send SQL statements to the appropriate database.

And, with an application written in the Java programming language, one also doesn't have to worry about writing different applications to run on different platforms. The combination of Java and JDBC lets a programmer write it once and run it anywhere.

Java being robust ,secure ,easy to use, easy to understand ,and automatically downloadable on a network, is an excellent language basis for database applications. What is needed is away for Java applications to talk to a variety of different databases.JDBC is the mechanism for doing this.

JDBC extends what can be done in java ,For example, with Java and the JDBC API it is possible to publish a web page containing an applet that uses information obtained from a remote database. Or an enterprise can use JDBC to connect all its employees (even if they are using a conglomeration 0f Windows, Macintosh and Unix machines) to one or more internal databases via intranet. With more and more programmers using Java ,the need for easy database access from Java is continuing to grow.

MIS managers like the combination for Java and JDBC because it makes disseminating information easy and economical. Businesses can continue to use their installed databases and access information easily even if it is stored on different database management systems. Development time for new applications is short. Installation and version control are greatly simplified. A programmer can write an application or an update once, put it on the server, and everybody has access to the latest version .And for businesses selling information services ,Java and JDBC offer a better way of getting out information updates to external customers.

JDBC is a "low level" interface, which means that it is used to invoke SQL commands directly .It works very well in this capacity and is easier to use than other database connectivity API's, but it was designed also to be a base upon which to build higher level interfaces and tools. A higher-level interface is "user friendly" , using a more understandable or more convenient API that is translated behind the scenes into a low -level interface such as JDBC.

CHAPTER 4

SYSTEM DESIGN AND DEVELOPMENT

4.1 ELEMENTS OF DESIGN

System Design is the most creative and challenging phase in the development of a software system. Design implies to a description of the final system and the process by which it is developed. The first step is to determine what input data is needed for the system and then to design a database that will meet the requirements of the proposed system. The next step is to determine what outputs are needed from the system and the format of the output to be produced.

During the design of the proposed system some areas where attention is required are:

- What are the inputs required and the outputs produced?
- How should the data be organized?
- What will be the processes involved in the system?
- How should the screen look?

The steps carried out in the design phase are as follows:

- Modular Design
- Input Design
- Output Design
- Database Design

4.1.1 MODULAR DESIGN

It is always difficult for any System Development team to grasp a system without breaking it into several smaller systems. These smaller systems will be a part of the original system yet they will be independent in the sense that they will incorporate within them the major functionalities of the proposed system.
A software system is always divided into several subsystems which make it easier to develop and perform tests on the whole system. The subsystems are known as the modules and the process of dividing an entire system into subsystems is known as Decomposition.

The modules identified for the proposed Balanced Scorecard system are as below:

- Remote Desktops
- Monitor Printer
- Remote Shutdown
- Internet usage
- Hard Disk usage
- Database Usage
- SMS
- User Logs

REMOTE DESKTOPS

- Two systems co-exist in this function.
- The systems are capable of capturing screens and movements on the users desktop and report it to the server system.
- The client software captures the screens as images and transmits them over the network at the specified time interval.

- The client software only transmits this information only if requested by the network administrator.

MONITOR PRINTER

- The client software on the machine to which the printers are connected queries the status of the printers from the printer specific DLLs.
- It also identifies what documents are being printed and which user on the network is responsible for the print command.
- All users entitled to query printer status information can retrieve results from the client software and view them.
- The permissions are set by the administrator.

REMOTE SHUTDOWN

- Administrators can shutdown remote machines from remote locations.
- The nature of the shutdown process can be a single machine, a group or all the machines across domains.

INTERNET USAGE

- This function queries the DLLs on the Internet proxy server and retrieves information on all the users connected to the net.
- It also retrieves information about the websites the users are surfing.

- Administrators can view the information reported by this function.

HARD DISK USAGE

- The client software monitors hard disk usage as well.
- This checks the hard disk for information on disk usage. The remaining size on the hard disk is calculated and sends to the administrators when requested by them.

DATABASE USAGE

- This system also determines the size of tables and the maximum database size and reports if at any time the size of data in various tables exceeds the Database size configured in the control files of the database.
- These details are available to the network administrators and they can pass it on to the Database administrators.

SMS

- The systems in the organization are always connected to the Internet. This allows the Network monitoring system to connect to the internet and use the services of specific websites to send sms to the concerned staff to alert him.
- This is advantageous to alert responsible users when they are not present in the office. This enables the user to take action whenever the need arises.

USER LOGS

- The system queries information from the system logs and reports them to the administrator.

4.1.2 INPUT DESIGN

The input design is the process of converting the user-oriented inputs into computer-based format. The goal of designing input data is to make sure that the automation is easy, logical and free from errors.

The input design requirements such as user friendliness, consistent format and interactive dialogue which provide users with timely help and correct messages are given high priority.

Some of the input forms for the various modules are as below:

- User Login Form
- Remote Desktop Settings Form
- Remote Desktop View Screen
- Printer Jobs Form
- Printer Status Form
- Remote Shutdown Form
- Internet User Status Form

- The User Login form is used by the various users of the system and the system restricts access to the data base on the type of user logged in.

- The Remote Desktop Settings form allows the network administrator to specify the IP address of the remote machine whose desktop needs to be viewed.

- The Remote Desktop view screen allows the Administrator to view the desktop of the remote machine and control actions or close down the remote system.

- The Printer Jobs form allows users to query the status of the jobs on a specific printer and get the status of all the jobs.

- Remote Shutdown form allows users to enter the IP address of the machine to be shutdown from the server.

- Internet user status form allows user to find users connected to the internet

4.1.3 OUTPUT DESIGN

Various reports are generated by the system which assists the network administrators in different ways. The reports presented are:

- Printer availability report
- Printer jobs report
- Internet users report
- Hard Disk Usage report
- Log in and Log out report
- Database Usage report

- Printer Availability Report shall provide details on the availability of different printers connected on the network.

- Printer jobs report shall provide details on the jobs submitted to the printer by the users.

- Internet users report lists out all the users who have connected to different websites from their systems.

- Internet website usage report lists out the users and the history of the websites they have visited.

- Hard Disk usage report lists out alert messages sent to system administrators regarding low disk space availability on systems.

- Log in and log out shall present a list of users who have logged onto a particular server on the network with various other details like log in time and log out time with the number of attempts made by the user to log in to the system.

Database usage report lists out the alerts sent to the system administrators regarding the availability of space in the database being monitored.

4.1.4 DATABASE DESIGN

A database is a collection of inter-related data stored with minimum redundancy to serve many users quickly and efficiently. The general objective of database design is to make the data access easy, inexpensive and flexible to the user. An elegantly designed database can play a strong foundation for the whole system.

The details about the relevant data for the system are first identified. According to their relationship, tables are designed through the following method.

- The data type for each data item in the table is decided.
- The tables are then normalized.

The tables are normalized so that they can provide better response time, have data integrity, avoid redundancy and be secure.

The tables for the Balanced Scorecard system have been Normalized up to the Third Normal Form (3NF).

4.2 TABLE STRUCTURE

Table 4.1: User

Column Name	Data Type	Length	Key	Allow Nulls
User_id	Varchar	25	Primary Key	-
Password	Varchar	25	-	-

Table 4.2: desktop_logs

Column Name	Data Type	Length	Key	Allow Nulls
Log_id	Number	6	Primary key	-
Ip_address	Varchar	20	-	-
Captured_date	Date	8	-	-
Action_performed	Varchar	20	-	Allow
Status	Char	1	-	-

Table 4.3: printer_logs

Column Name	Data Type	Length	Key	Allow Nulls
Log_id	Number	6	Primary Key	-
Printer_ip	Varchar	20	-	-
Printer_id	Varchar	20	-	-
Printer_name	Varchar	30	-	-
Status	Char	1	-	-
From_time	Date	8	-	-
To_time	Date	8	-	-
Captured_date	Date	10	-	-

Table 4.4: printer_jobs

Column Name	Data Type	Length	Key	Allow Nulls
Job_id	Varchar	20	Primary Key	-
No_of_pages	Number	6	-	-
Printer_ip	Varchar	20	-	-
Client_ip	Varchar	20	-	-
User_id	Varchar	25	-	-
Job_date	Date	8	-	-
Status	Char	1	-	-

Table 4.5: shutdown_logs

Column Name	Data Type	Length	Key	Allow Nulls
Log_id	Number	6	Primary Key	-
Ip_address	Varchar	20	-	-
Shutdown_date	Date	8	-	-
Status	Char	1	-	-

Table 4.6: internet_users

Column Name	Data Type	Length	Key	Allow Nulls
Internet_user_id	Number	6	Primary Key	-
Client_ip	Varchar	20	-	-
Connected_date	Date	8	-	-
Conn_From_time	Date	8	-	-
Conn_To_time	Date	8	-	-

4.3 DATA FLOW DIAGRAMS

Data flow diagrams are graphical representation depicting information regarding the flow of control and the transformation of data from input to output. The DFD may be used to represent the system or software at any level of abstraction. In fact, DFD can be partitioned into levels. A Level 0 DFD called Context Level Diagram represents the entire software system as a single bubble with its interactions. As we go further into the levels the

The Context level diagram shows the overall system with the users who will be interacting with it, being Management, Reviewers, normal users and administrator.

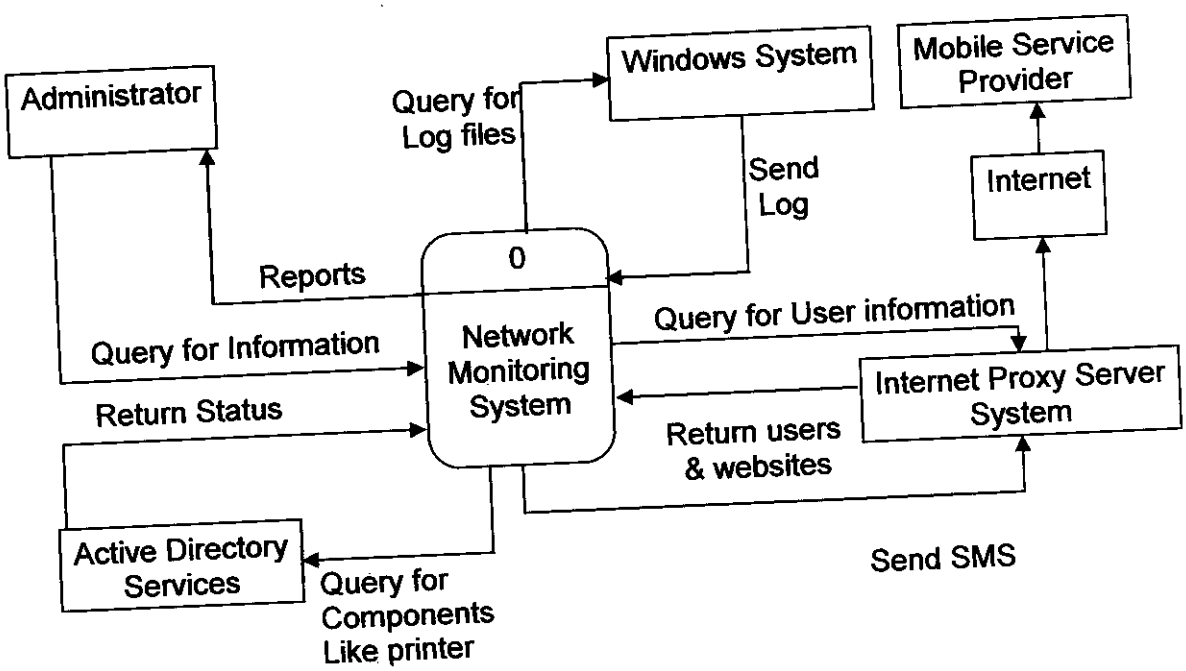


FIGURE 4.1: CONTEXT LEVEL DIAGRAM

The Level 1 DFD will explain the major modules in the whole system, i.e., how the data flow between each of these modules.

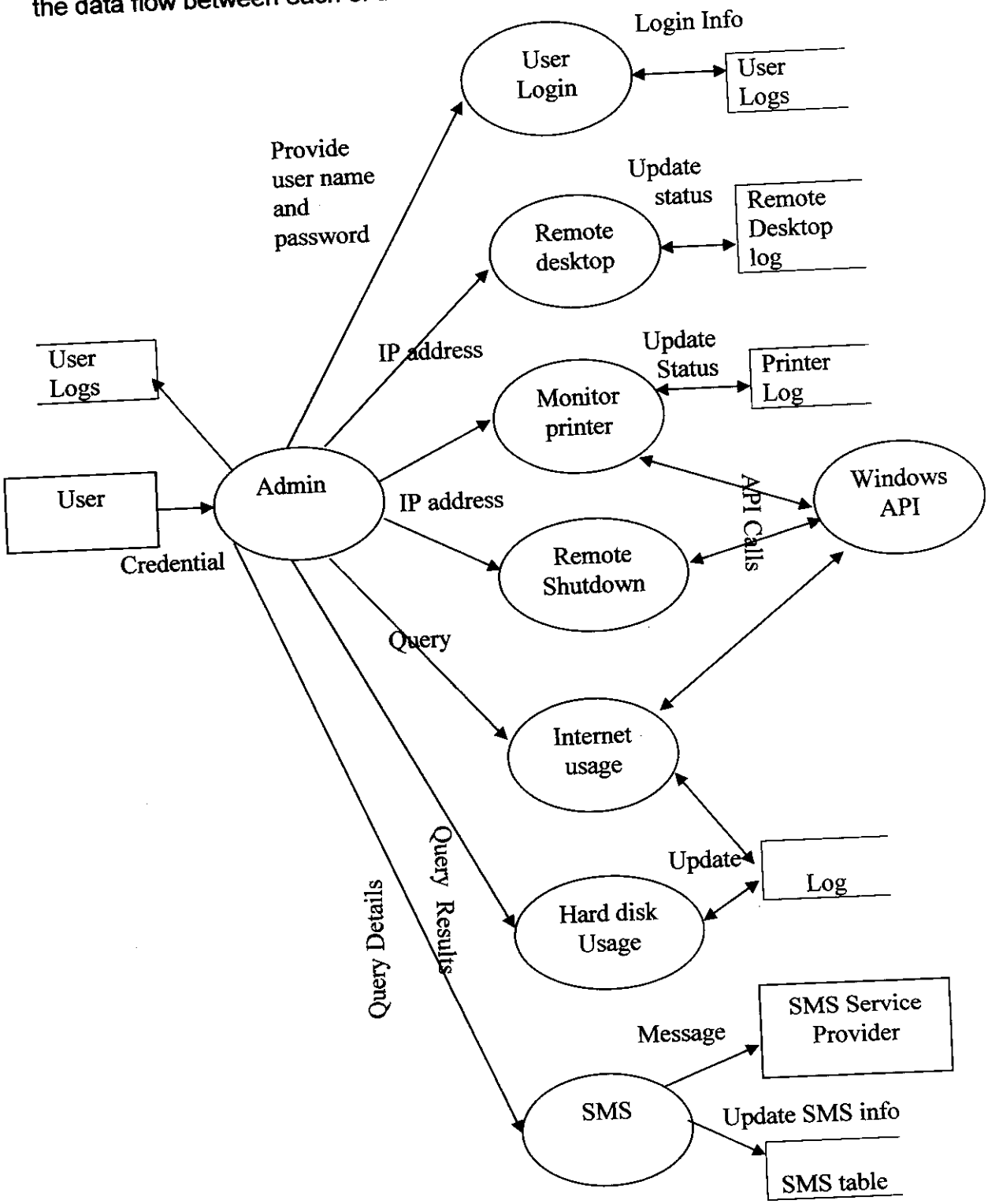


FIGURE 4.2: LEVEL 1 DIAGRAM

The level 2 of data flow diagram shows the detailed processing in these modules. The Remote desktop and Printer module has been depicted in the level 2 Data flow diagram.

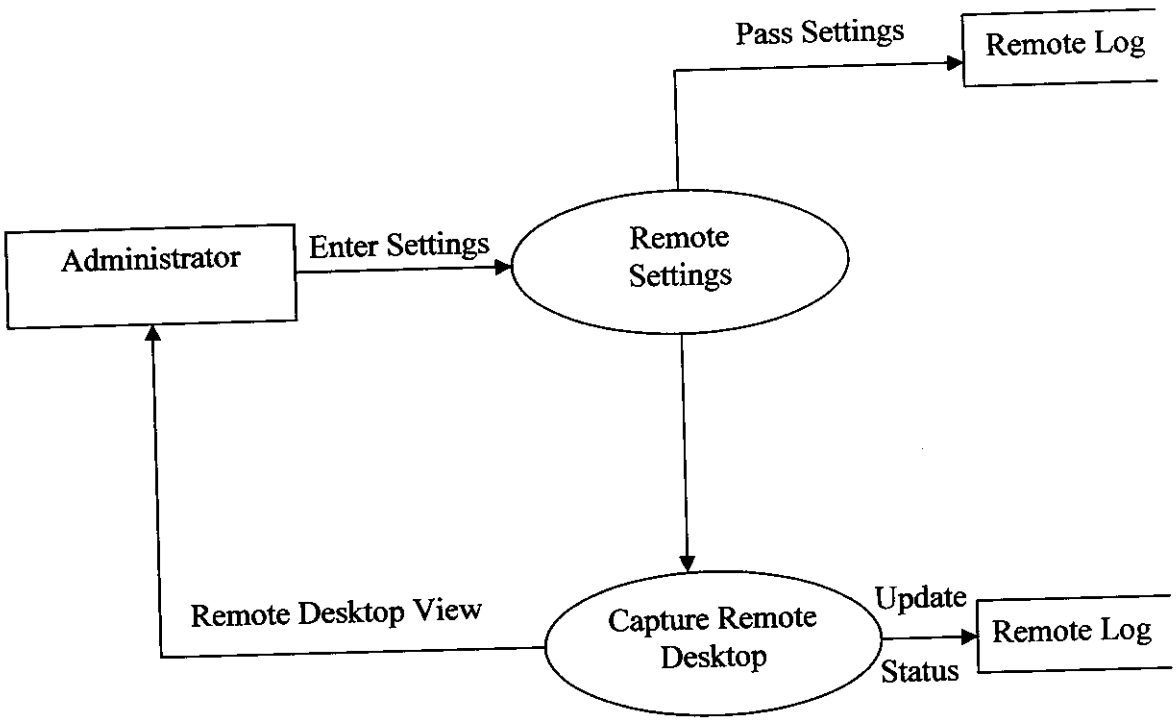


FIGURE 4.3: LEVEL 2.1 DIAGRAM

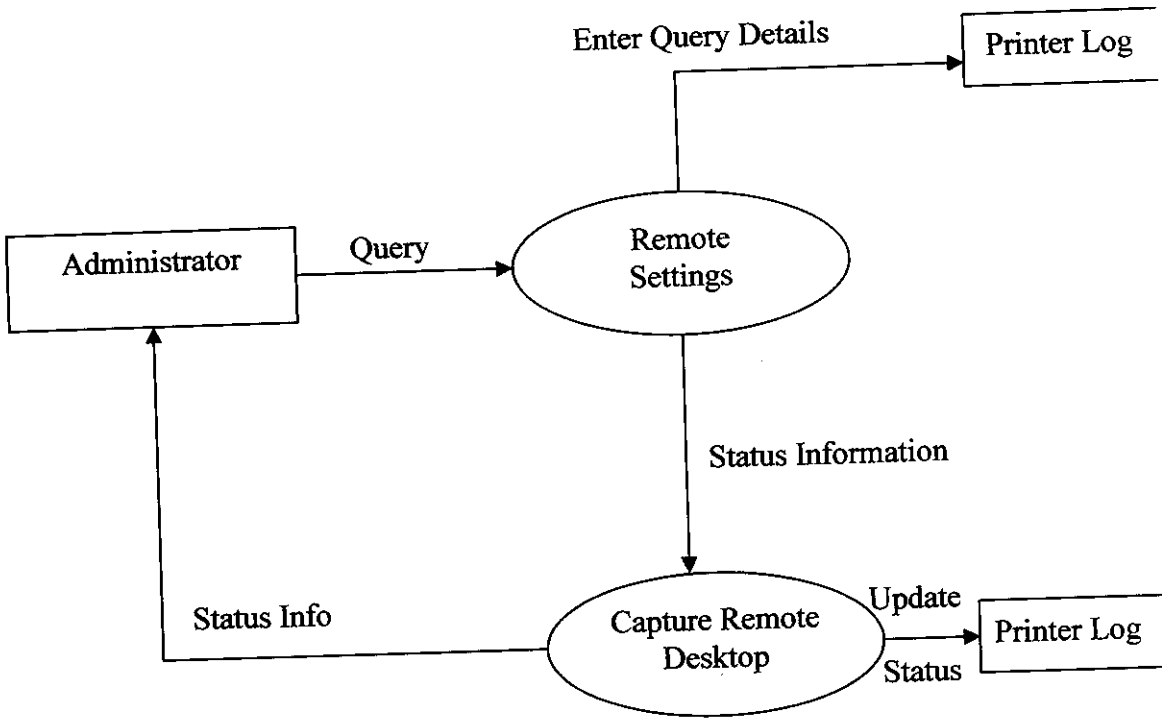


FIGURE 4.4: LEVEL 2.2 DIAGRAM

CHAPTER 5

IMPLEMENTATION

System Implementation is the part of the software engineering life cycle, where, the design artifacts are converted to a working application. Coding is done in this stage using an apt framework and programming language, which would solve the specific problem the best way. Once the design is coded into a working application, it has to be verified, validated and tested in detail. The tested product if successful is deployed in the user environment.

5.1 SYSTEM VERIFICATION

System Verification answers the question "Am I building the product right?" It includes the review of interim work steps and interim deliverables during a project to ensure they are acceptable. Verification also determines if the system is consistent, adheres to standards, uses reliable techniques and prudent practices, and performs the selected functions in the correct manner. In data access, it verifies whether the right data is being accessed, in terms of the right place and in the right way.

For e.g., the drop downs gather data from the database, so each dropdowns should be verified whether they are bound to the correct database field. It is done during development of the key artifacts. Verification is a demonstration of consistency, completeness, and correctness of the software at each stage and between each stage of the development life cycle. In Network Monitoring System, verification is done during the development itself. Each database bindings are verified after binding to test whether the right data fields are listed on the Internet pages.

5.2 SYSTEM VALIDATION

Validation answers the question "Am I building the right product?" This checks whether the developer is moving towards the right product, whether the development is moving towards the actual intended product that was agreed upon in the beginning. Validation also determines if the system complies with the requirements and performs functions for which it is intended and meets the organization's goals and user needs. It is traditional and is performed at the end of the project. In data access, it checks whether we are accessing the right data, in terms of data required to satisfy the requirement.

Validation is performed after a work product is produced against established criteria ensuring that the product integrates correctly into the environment. It determines the correctness of the final software product by a development project with respect to the user needs and requirements.

Functional validation is done in Network Monitoring System to check whether each of the functions is done correctly as expected in every page. Each control in a Screen is designed to do some function. These functions are checked against the requirements stated for them. For e.g., clicking 'View' button should take the corresponding action of bringing the details into the users page for viewing. Clicking the 'Back' button should take the user back to the previous page. This checking is usually done after the system is developed so that all activities that are affected can be checked.

Field level validation is done in Network Monitoring System to check whether each of the fields either accepts the data as expected and do the client side validation of data entered. For e.g. a field level validation on a text box would check against the type of data entered and follow rules such as length of entry, data type etc.

The validation is done in a step by step process. When the user moves between controls on the screen, the validation events for the control that lost the focus are fired and appropriate error messages (if any) are displayed.

5.3 TESTING

Testing is a critical element of software quality and assurance and represents the ultimate review of specification design and coding. It is a vital activity that has to be enforced in the development of any system. This could be done in parallel during all the phases of system development. The feedback received from these tests can be used for further enhancement of the system under consideration. The testing phase conducts test using the Software Requirement Specification as a reference and with the goal to see whether the system satisfies the specified requirements.

Standard procedures have been followed in testing Network Monitoring System. Test cases are generated for each screen. These test cases will cover every possibility which could result in both positive and negative results. These test plans are maintained for any further testing done on the system. The test plan stores information such as, the test script/input, expected output, actual output, comments and the name of the tester. This plan will be followed for all types of testing done in the system.

The main types of tests carried out on Network Monitoring System are:

- Unit Test
- Integration Test
- System Test

5.3.1 UNIT TESTING

Module or Unit Testing is the process of testing all the program units that make up a system. Unit testing focuses on an individual module thus allowing one to uncover all the errors made logically and while coding in the module.

In Network Monitoring System each page is tested separately as a unit. Initially the flow of control and data through that page is checked. When considering a module as a unit, the flow of data and control through the whole module is tested. The result is stored in the test plan. The process is done in all the pages of the system. Once the errors are rectified, the testing procedure is repeated with same test cases to ensure this hasn't produced new errors. Hence this is a continuous process.

5.3.2 INTEGRATION TESTING

Integration testing tests the process of integrating the various modules to form the completed system. Integration starts with a set of units each individually tested in isolation and ends when the entire application has been built. Integration testing verifies that the combined units function together correctly. It facilitates in finding problem that occur at interface or communication between the individual parts.

Network Monitoring System follows a top down approach. The menus are assembled and they are linked one by one to the appropriate pages. All errors are then recorded.

5.3.3 SYSTEM TESTING

System testing is actually a serious of different tests, whose primary purpose is to fully exercise the computer-based system. This helps in verifying that all the system elements have been properly integrated and perform the allocated functions. It verifies the entire product after having integrated all software and hardware components, and validates it according to the original project requirement. The system testing takes into consideration the hardware, and the software. That is, Network Monitoring system should be able to be run on the specified hardware for variety of cases.

CONCLUSION

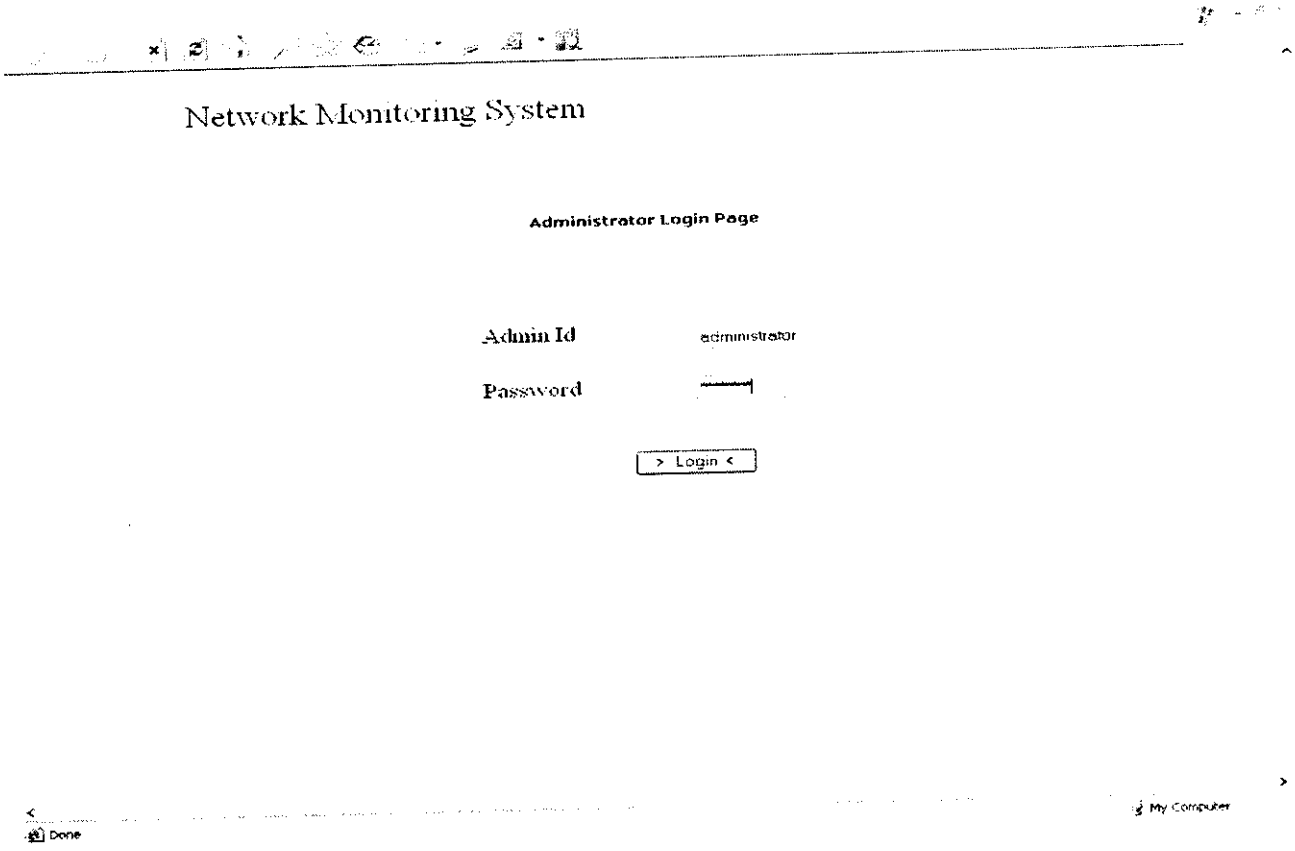
The Network Monitoring system enables network administrators to capture Network related events and handle errors in an efficient way. It provides user friendly messages that enable these administrators to handle errors and rectify them within a short period of time.

SMS feature enables network administrators to be alerted even if they are away from the work environment and provide help at the earliest possible time.

APPENDIX

Front Page

Admin Login Page



Admin View Page

Network Monitoring System

Services

Capture Desktop

Monitor Printer

Shutdown PC

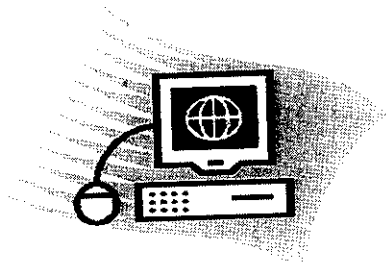
Internet Usage

Hard Disk Usage

Database

Send Message (SMS)

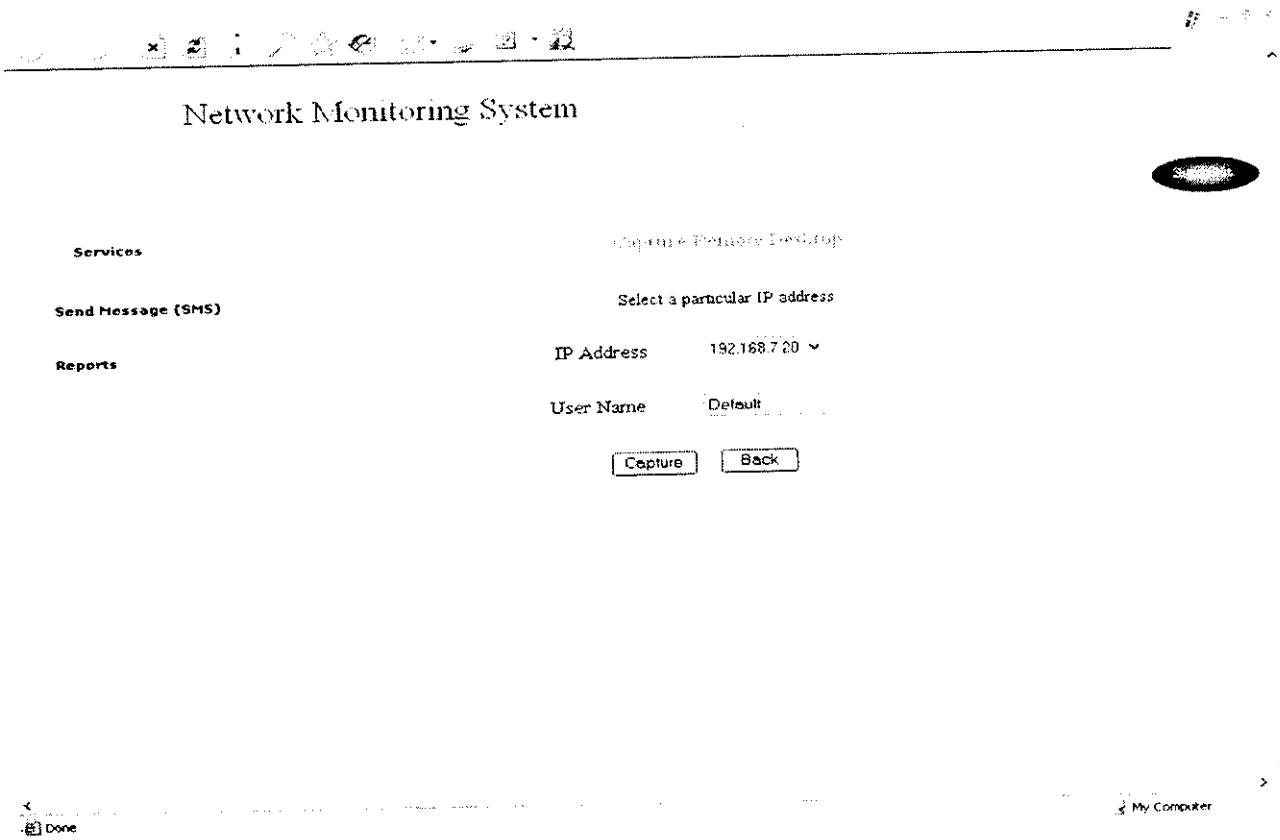
Reports



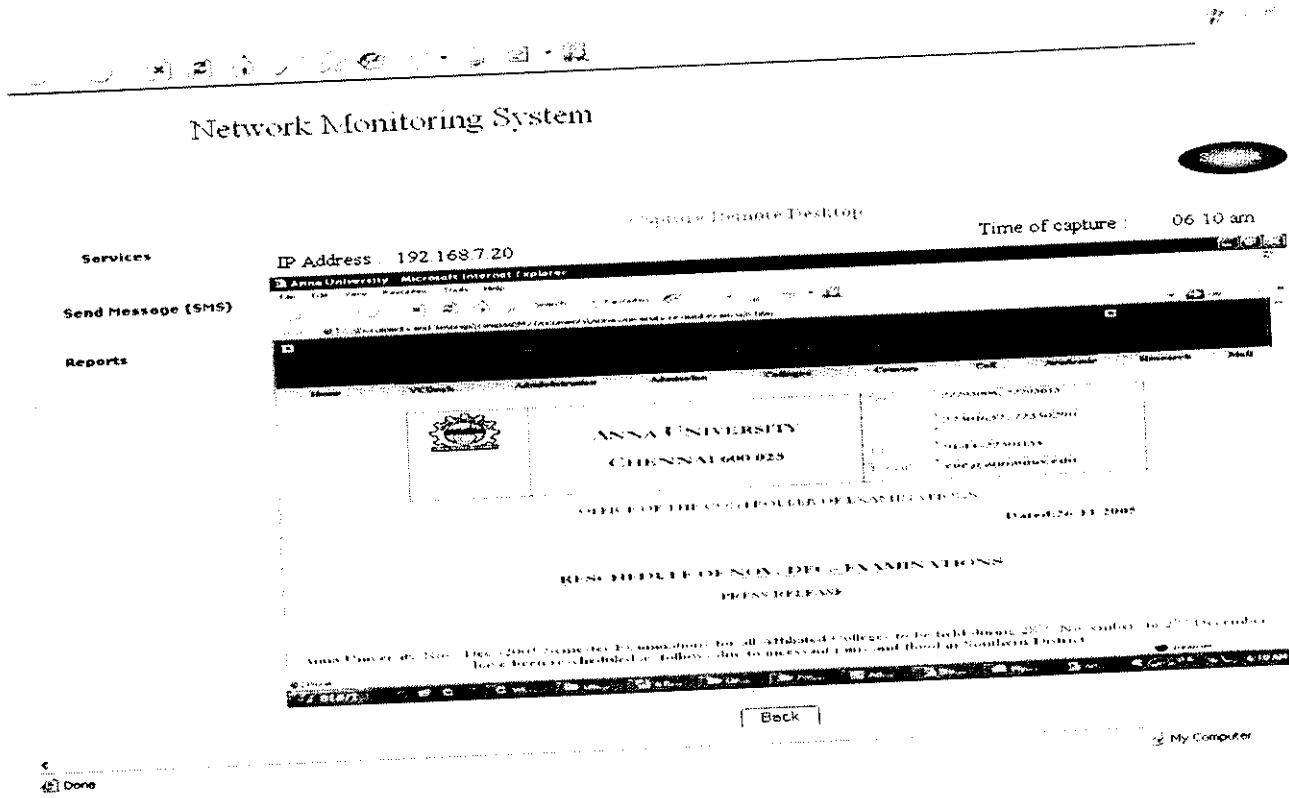
My Computer

Done

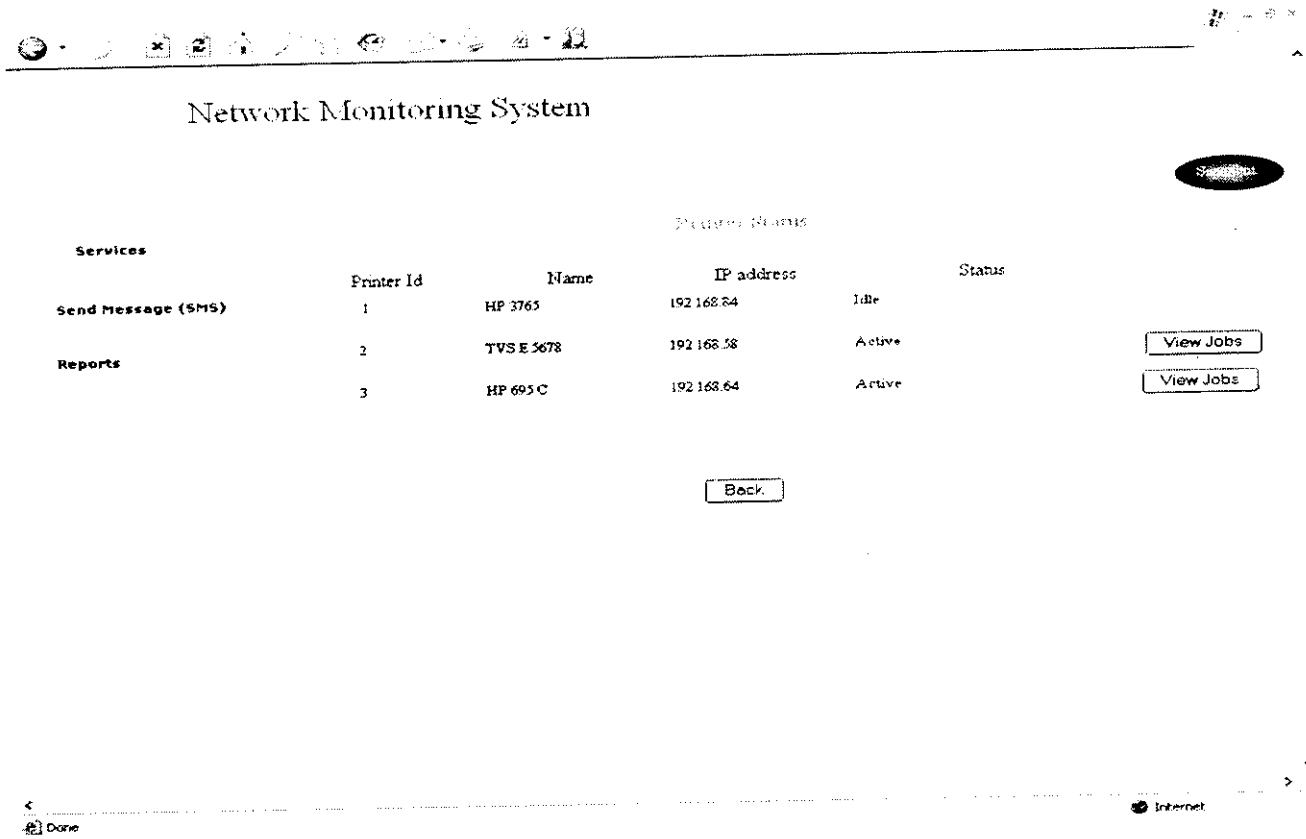
Admin – Remote Desktop Settings page



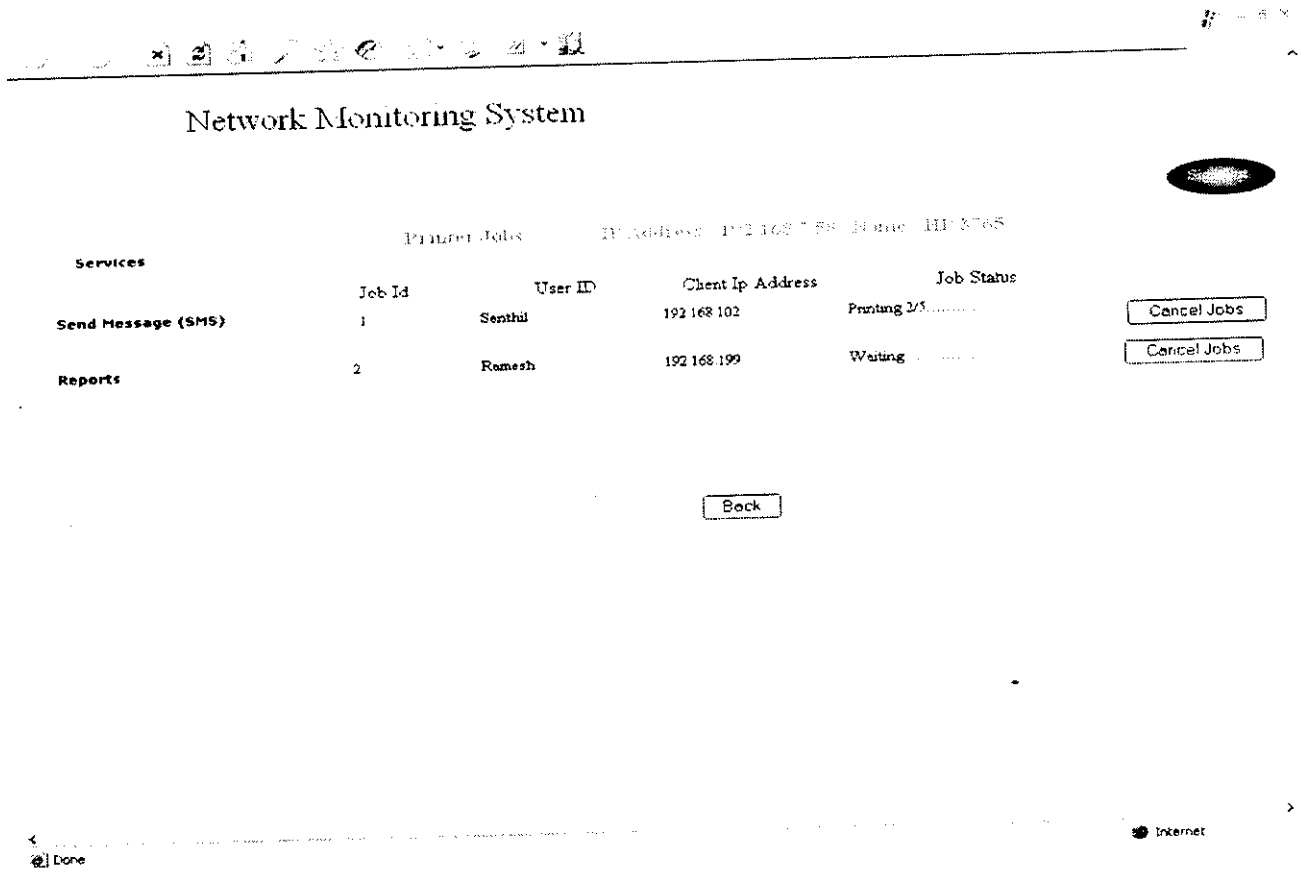
Admin – Remote Desktop Result Page



Admin – Printer Status Page

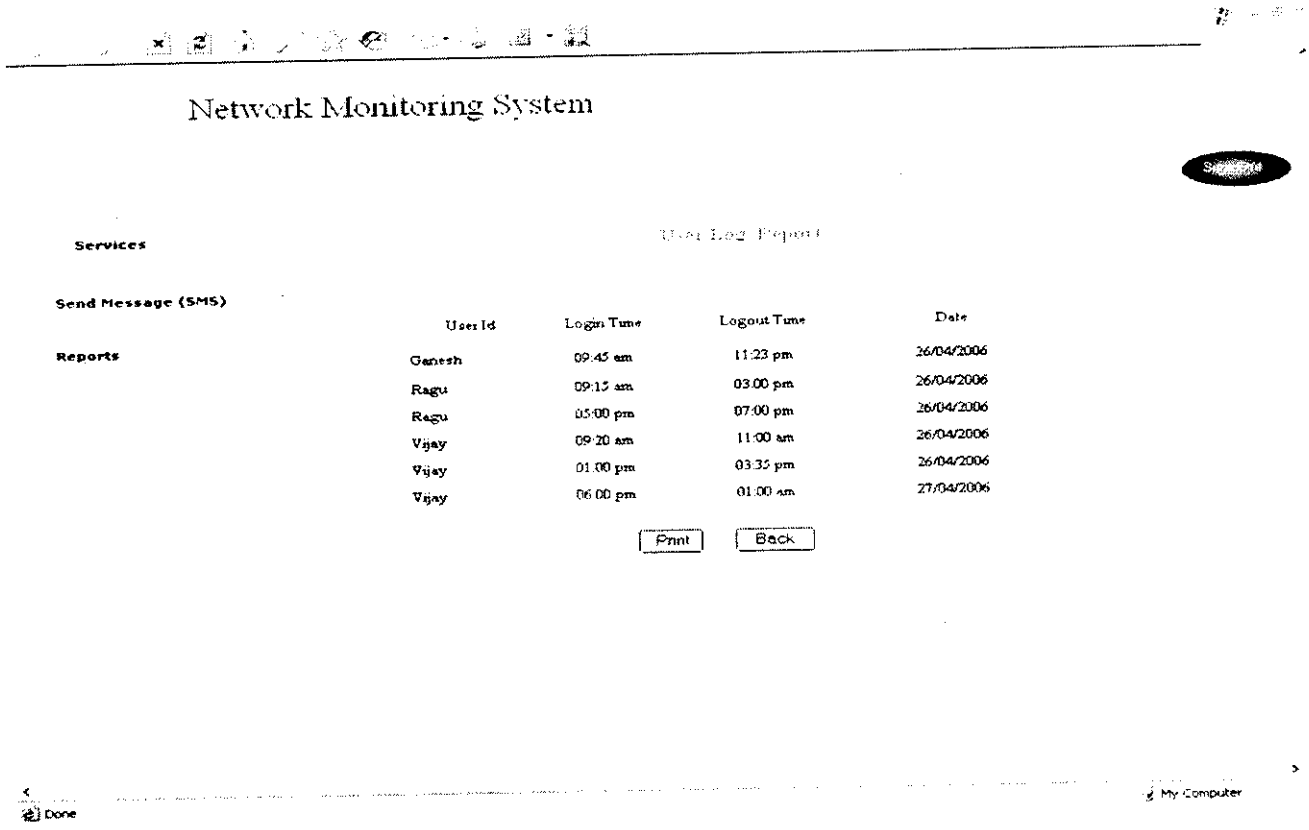


Admin – Printer View Jobs Page

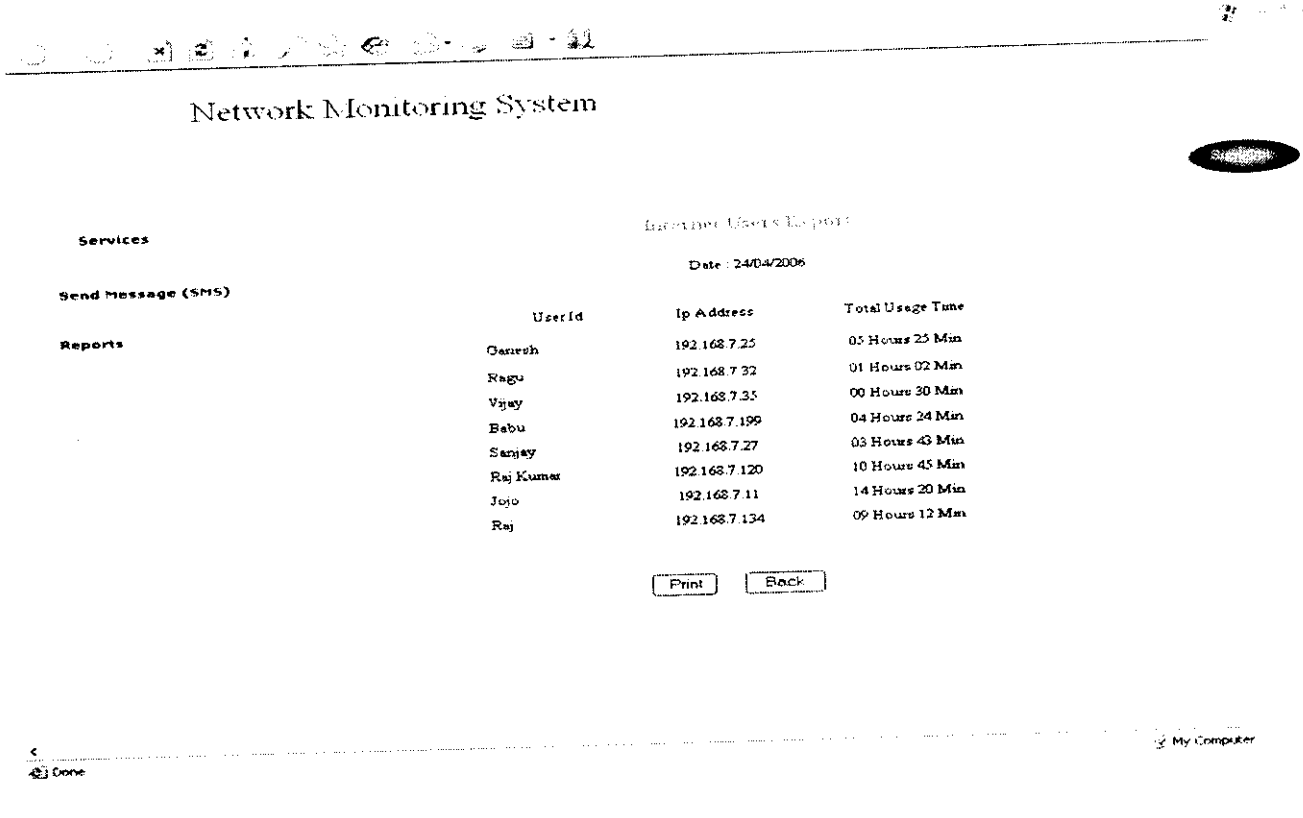


REPORTS

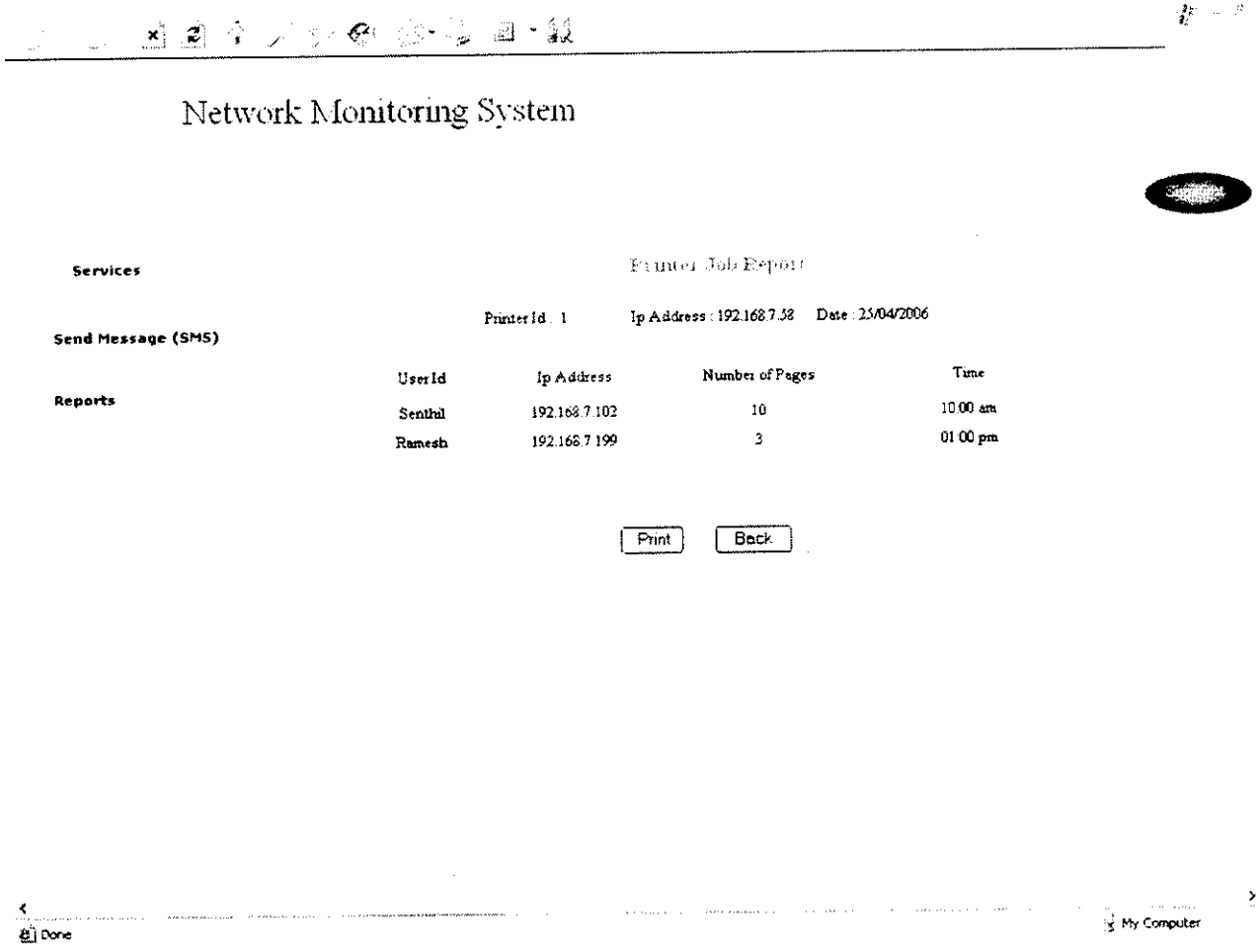
Admin - User Log Report



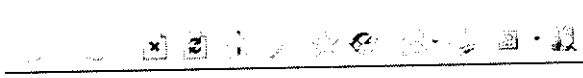
Admin – Internet User Report



Admin – Printer Job Report



Admin – Database Usage Report



Network Monitoring System

Services

Database Usage Report

Send Message (SMS)

Reports

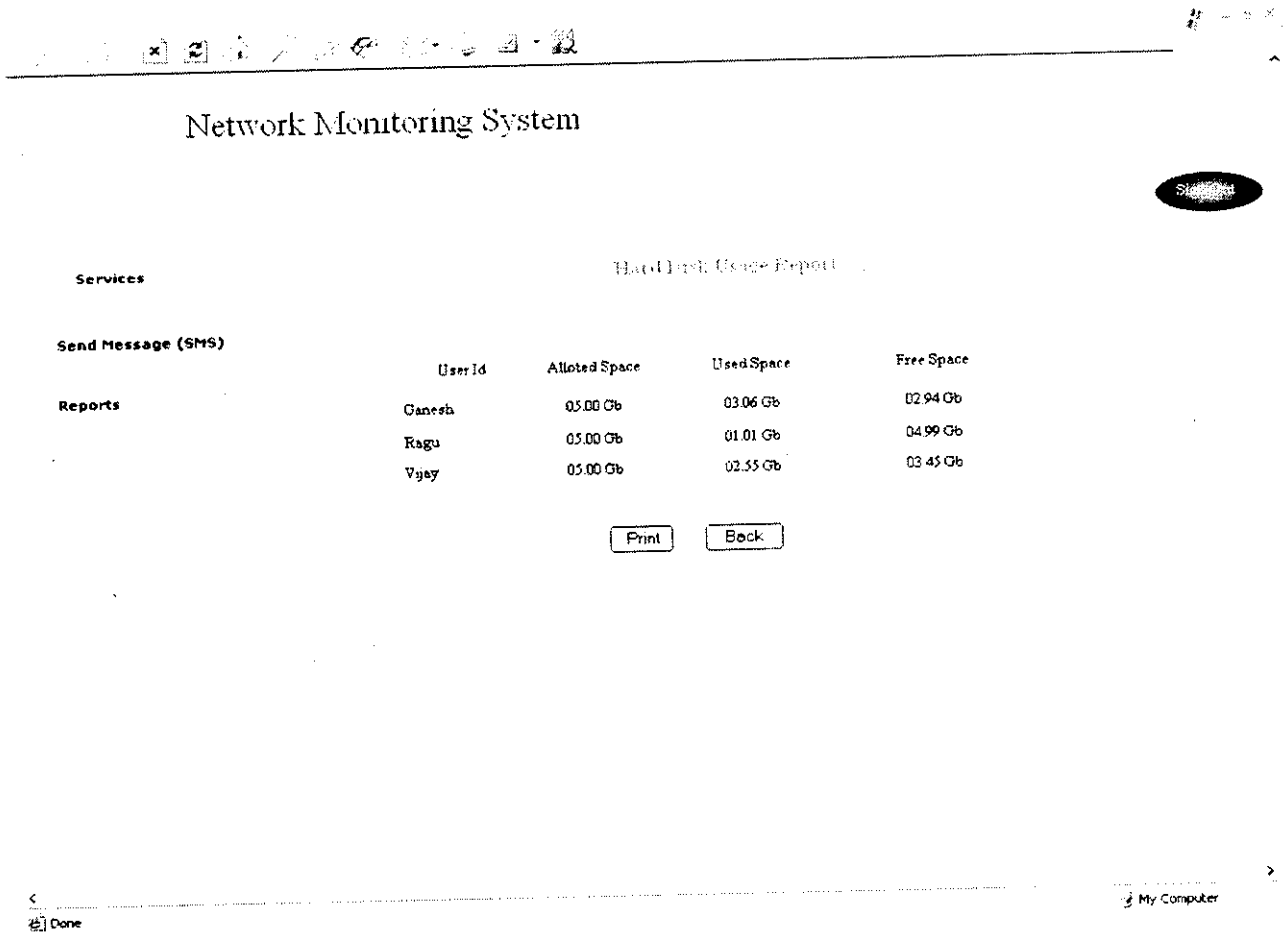
User Id	Alloted Space	Used Space	Free Space
Ganesh	01.00 Gb	00.56 Gb	00.44 Gb
Ragu	01.00 Gb	00.00 Gb	01.00 Gb
Vijay	01.00 Gb	0.22 Gb	00.78 Gb

Print Back

Done

My Computer

Admin – Hard Disk Usage Report



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