



P-2268

## NUMERIC NETWORK TRACER

By

S. KAVITHA

Reg. No. 71205621019

Of



**KUMARAGURU COLLEGE OF TECHNOLOGY, COIMBATORE**

**A PROJECT REPORT**

**Submitted to the**

**FACULTY OF INFORMATION AND COMMUNICATION ENGINEERING**

*In partial fulfillment of the requirements*

*for the award of the degree*

*of*

**MASTER OF COMPUTER APPLICATION**

**June 2008**

## **BONAFIDE CERTIFICATE**

Certified that this project report titled “**NUMERIC NETWORK TRACER**” is the bonafide work of **Ms. S. Kavitha (Reg No: 71205621019)** 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.



**Supervisor**

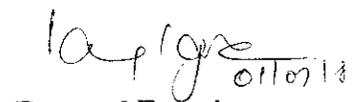


**Head of the Department**

Submitted to Project and Viva Examination held on 01-07-08



**Internal Examiner**



**External Examiner**



31-May-2008

**TO WHOMSOEVER IT MAY CONCERN**

This is to certify that **Ms. S. Kavitha**, Registration No. 71205621019, a student of Kumaraguru College of Technology - Coimbatore, doing her Final Year M.C.A (Master of Computer Applications) course, had undertaken the project entitled "**Numeric Network Tracer**" in our company from December 2007 to May 2008. She has completed the project in all aspects on 31-May-2008.

Her work involvement is highly appreciable. We wish her all the best in her future endeavours.

For Numeric Power Systems Limited,

**V. C. RAGHUNATH**



31-May-2008

To  
The Coordinator,  
Department of Computer Applications,  
Kumaraguru College of Technology,  
Coimbatore – 641 006.

Dear Sir,

**Sub:** Non-disclosure of source code and application for project reports and demo

**Ms. S. Kavitha** (Reg. No: 71205621019), the final year student of MCA, Kumaraguru College of Technology was involved actively in the project "**Numeric Network Tracer**" in our company as a part of her curriculum.

While Ms. Kavitha's efforts, involvement and commitment in the project are recognized and appreciated, it would not be possible for us to release the source code and application of her work to be added in her reports or for showing in software demonstration, as the above-mentioned project is of commercial value and hence is a property of Numeric Power Systems Limited.

However, it would be possible for us to only permit certain screen shots and sample codes of the software to be added in her reports.

For Numeric Power Systems Limited,

  
V. C. RAGHUNATH



## ABSTRACT

**“Numeric Network Tracer”** is an application designed and developed to monitor the network status. The system checks for the status of the routers, switches and servers. It detects the various states of the above equipments and logs them. Separate log files are maintained for alerts, failures and recovery.

The system keeps track of the connectivity of the routers, switches and servers in Numeric group and it intimates the status of the network breaks or failures in these equipments. The failures are notified by means of alerts through an Email or an SMS to the concerned IT person automatically.

By means of providing various reports as per the network status, users are allowed to view the failure time, recovery time, total down time of the network equipments. These reports can be generated in a daily, weekly, monthly or yearly basis. Thus the system is meritorious by allowing the user to identify the down times and to reduce them. The system also provides a ping option for viewing the packets transmission.

The front end used in this application is JSP (Java Server Pages) and Backend tool used is Oracle 9i.

## ACKNOWLEDGEMENT

I sincerely thank the Almighty God for his shower of blessings, which has enabled me to attain success in this endeavor.

My Sincere and special acknowledgment goes to our Principal **Dr.Joseph.V.Thanikal**, Kumaraguru College of Technology, Coimbatore who has motivated me in doing this project.

I sincerely thank to **Dr.M.Gururajan**, HOD, Department of Computer Applications for his encouragement during the project.

I am grateful to **Mr.M.Manikantan**, Senior Lecturer, Department of Computer Applications, for his guidance and encouragement regarding my project.

I am very much grateful to **Mr.V.C.Ragunath**, Executive – Resources Planning and Development, Numeric Technologies Private Limited, Chennai for his kind support and guidance.

I express my thanks and gratitude to my parents and friends for their selfless support in time.

**TABLE OF CONTENTS**

<b><i>TOPIC</i></b>	<b><i>PAGE NO</i></b>
<b>ABSTRACT</b>	v
<b>ACKNOWLEDGEMENT</b>	vi
<b>LIST OF TABLES</b>	ix
<b>LIST OF FIGURES</b>	x
<b>I INTRODUCTION</b>	1
1.1 ORGANISATION PROFILE	1
1.2 PROJECT OVERVIEW	2
<b>II SYSTEM ANALYSIS</b>	4
2.1 EXISTING SYSTEM ARCHITECTURE	4
2.2 PROPOSED SYSTEM ARCHITECTURE	4
<b>III DEVELOPMENT ENVIRONMENT</b>	5
3.1 H/W ENVIRONMENT	5
3.2 S/W ENVIRONMENT	6
3.3 SOFTWARE OVERVIEW	6
<b>IV SYSTEM DESIGN</b>	10
4.1 DATA MODEL	10
4.1.1 ENTITY RELATIONSHIP DIAGRAM	10
4.1.2 TABLE STRUCTURE	11

4.2	PROCESS MODEL	16
4.2.1	USE CASE DIAGRAM	16
4.2.2	DATA FLOW DIAGRAM (DFD)	20
<b>V</b>	<b>ARCHITECTURAL DETAILS</b>	23
5.1	N-TIER ARCHITECTURE	23
<b>VI</b>	<b>SYSTEM IMPLEMENTATION</b>	24
6.1	SERVER SIDE CODING	24
<b>VII</b>	<b>TESTING</b>	27
7.1	UNIT TESTING	27
7.2	INTEGRATION TESTING	27
7.3	ACCEPTANCE TESTING	28
7.4	TEST CASE REPORT	28
<b>VIII</b>	<b>PERFORMANCE AND LIMITATIONS</b>	29
8.1	MERITS OF THE SYSTEM	29
8.2	DEMERITS OF THE SYSTEM	31
8.3	FUTURE ENHANCEMENT AND CONCLUSION	32
<b>IX</b>	<b>APPENDICES</b>	33
9.1	SAMPLE SCREENS	33
<b>X</b>	<b>REFERENCES</b>	53

**LIST OF TABLES**

<i>TABLE DESCRIPTION</i>	<i>PAGE NO</i>
4.1.2.1 M_PROD_DET	11
4.1.2.2 M_ALERT_EMAIL	12
4.1.2.3 M_FAILURE_RECOVERY_LOG	12
4.1.2.4 M_USER_DET	13
4.1.2.5 M_LOCATION	13
4.1.2.6 M_DEPARTMENT	13
4.1.2.7 T_ALERT_EMAIL_LOG	14
4.1.2.8 T_USER_LOG_DET	14
4.1.2.9 B_PROD_BKUP	15
4.1.2.10 REFRESH_RUN	15

## LIST OF FIGURES

<i>FIGURE DESCRIPTION</i>	<i>PAGE NO</i>
<b>4.1.1 ENTITY RELATIONSHIP DIAGRAM</b>	
4.1.1 ENTITY RELATIONSHIP DIAGRAM	10
<b>4.2.1 USECASE DIAGRAM</b>	
4.2.1.1 USECASE DIAGRAM FOR OVERALL SYSTEM	16
4.2.1.2 USECASE DIAGRAM FOR NETWORK MONITORING	17
4.2.1.3 USECASE DIAGRAM FOR SENDING ALERT	18
4.2.1.4 USECASE DIAGRAM FOR PRODUCT ADMINISTRATION	19
<b>4.2.2 DATA FLOW DIAGRAM</b>	
4.2.1 LEVEL 0	20
4.2.2 LEVEL 1	21
4.2.3 LEVEL 2	22
<b>5.1 ARCHITECTURAL DETAILS</b>	
5.1.1 N TIER ARCHITECTURE	23

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 ORGANIZATION PROFILE**

##### **ABOUT NUMERIC**

Numeric Power Systems Ltd, a corporate house with established nationwide presence, is the single largest source for a wide range of UPS systems. Ever since its advent in 1984, NUMERIC's focus has always been the excellence in quality of products and dedication in service. And this has facilitated NUMERIC to carve a niche for itself in the Indian UPS market and has made the brand NUMERIC a legend in the country. NUMERIC has been the "No.1 Online UPS Manufacturer in India" for the Fourteenth consecutive year.

##### **NUMERIC MISSION**

NUMERIC will continue to strive towards excellence in Power Quality Management solutions and is the One-Stop-Solution provider in the field of Power conditioning, through:

- Offering comprehensive solutions in conditioning
- Closeness to customers through offices all over the country
- Dedicated and trained human resources for efficient support
- Transparency in all transactions
- Pro-active and Cost effective services
- Tailor-made solutions for unique applications

## **1.1 PROJECT OVERVIEW**

The system is developed to monitor the status of Routers, Switches and Servers in Numeric Power Systems. Nearly there are 12 Routers in the Numeric group, when there is a failure in any of the site, the status has been checked only one at a time manually. This leads to less productivity and the total downtime of the network is high. Detecting the problem of the network failure is time consuming.

An automatic system needs to be developed to monitor the status of the network at each site and to escalate the network breaks if any to the concerned authority through an E-Mail or SMS automatically.

The project includes the following modules:

### **Monitoring**

Monitoring module includes three main sub modules

1. Classical
2. Modern
3. Pictorial

The purpose of this module is to monitor the Servers, Routers, and Switches. When there is a failure, the system intimates the user with the E-Mail or SMS alert.

### **Product Administration**

This module includes the insertion of new products, new E-Mail ID's, locations and the department. This module helps the user to modify and update the product details.

## **View**

View module includes the view of

- Lists of products
- Lists of E-Mail ID
- Lists of Locations
- Lists of Departments

## **History**

This module is used to maintain the following log files

- Alert Sent Log
- Failure and Recovery Log
- Application Log
- Product Back up Log
- User Log

## **Report**

This module describes the total down time for weekly, monthly or yearly reports.

## **Help**

This module provides support to the user thereby describing the purpose and usage of the application.

## **CHAPTER 2**

### **SYSTEM ANALYSIS**

The existing system is analyzed for its features and shortcomings. The proposed system is developed with advanced features and as per the requirements. These details are described under this section.

#### **2.1 EXISTING SYSTEM**

Initially the network status was manually monitored in the organization. This consumes more time to identify the problem. Routers were monitored using third parties which was much expensive.

The downtime of the network was not calculated and the systems present in the network were not efficient to be determined.

#### **2.2 PROPOSED SYSTEM**

An automatic system was developed to monitor the status of the network at each site and to escalate the network breaks if any to the concerned authority through an E-Mail or SMS automatically. The system serves beneficial since it includes functionalities such as

- Classic Monitoring
- Modern Monitoring
- Pictorial Monitoring
- Email and SMS alert
- Downtime Calculation
- Log Maintenance

## **CHAPTER 3**

### **DEVELOPMENT ENVIRONMENT**

The hardware and software components with which the application was developed are described as follows.

#### **3.1 HARDWARE ENVIRONMENT**

This section describes the hardware components with which the application was developed and the minimum hardware configuration with which the system operates best.

- **PROCESSOR** : Intel Pentium 4
- **RAM** : 1 GB
- **MOTHER BOARD** : Intel Board
- **HARD DISK** : 40 GB Hard Disk
- **MONITOR**: 17" Dell Monitor
- **KEYBOARD** : Multimedia Keyboard
- **MOUSE** : Logitech

## 3.2 SOFTWARE ENVIRONMENT

This section describes the software in which the application was developed and using the same software would make it more compatible.

- OPERATING SYSTEM : Windows XP,  
Windows 2000 Advanced Server
- FRONT END : Java Server Pages
- VERSION : 2.0
- PROGRAMMING LANGUAGE : Java, HTML, Java script
- IDE : NETBEANS 6.0
- WEB SERVER : APACHE TOMCAT 6.0.14
- RUNTIME ENVIRONMENT : JRE 6.0
- BACK END : Oracle 9i

## 3.2 SOFTWARE OVERVIEW

This section describes the features of the software used to develop the application.

### 3.4.1 JSP

Java Server Pages (JSP) technology is the Java platform technology for delivering dynamic content to web clients in a portable, secure and well-defined way. The Java Server Pages specification extends the Java Servlet API to provide web application developers with a robust framework for creating dynamic web content on the server using

HTML, and XML templates, and Java code, which is secure, fast, and independent of server platforms. JSP has been built on top of the Servlet API and utilizes Servlet semantics.

JSP has become the preferred request handler and response mechanism. Although JSP technology is going to be a powerful successor to basic Servlets, they have an evolutionary relationship and can be used in a cooperative and complementary manner.

Servlets are powerful and sometimes they are a bit cumbersome when it comes to generating complex HTML. Most servlets contain a little code that handles application logic and a lot more code that handles output formatting. This can make it difficult to separate and reuse portions of the code when a different output format is needed. For these reasons, web application developers turn towards JSP as their preferred servlet environment.

### **3.4.2 COMPONENTS OF JSP**

JSP syntax is almost similar to XML syntax. The following general rules are applicable to all JSP tags.

1. Tags have either a start tag with optional attributes, an optional body, or a matching end tag or they have an empty tag possibly with attributes.
2. Attribute values in the tag always appear quoted. The special strings &apos; and “ can be used if quotes are a part of the attribute value itself.

Any whitespace within the body text of a document is not significant, but is preserved, which means that any whitespace in the JSP being translated is read and preserved during translation into a servlet.

The character \ can be used as an escape character in a tag, for instance, to use the % character, \% can be used.

JavaServer Pages are text files that combine standard HTML and new scripting tags. JSPs look like HTML, but they get compiled into Java servlets the first time they are invoked. The resulting servlet is a combination of HTML from the JSP file and embedded dynamic content specified by the new tags.

Everything in a JSP page can be divided into two categories:

1. Elements that are processed on the server
2. Template data or everything other than elements, that the engine processing the JSP engines.

Element data or that part of the JSP which is processed on the server, can be classified into the following categories:

1. Directives
2. Scripting elements
3. Standard actions

JSP directives serve as messages to the JSP container from the JSP. They are used to set global values such as class declaration, methods to be implemented, output content type, etc. They do not produce any output to the client. All directives have scope of the entire JSP file. That is, a directive affects the whole JSP file, and only that JSP file. Directives are characterized by the @ character within the tag and the general syntax is:

Scripting elements are used to include scripting code (Java code) within the JSP. They allow declaring variables and methods include arbitrary scripting code and evaluate an expression. The three types of scripting element are: Declaration, Scriptlets and Expressions.

A declaration is a block of Java code in a JSP that is used to define class-wide variables and methods in the generated class file. Declarations are initialized when the JSP

page is initialized and have class scope. Anything defined in a declaration is available throughout the JSP, to other declarations, expressions or code.

A scriptlet consists of one or more valid Java statements. A scriptlet is a block of Java code that is executed at request-processing time. A scriptlet is enclosed between "<%>" and "%>". What the scriptlet actually does depends on the code, and it can produce output into the output stream to the client. Multiple scriptlets are combined in the compiled class in the order in which they appear in the JSP. Scriptlets like any other Java code block or method, can modify objects inside them as a result of method invocations.

Standard actions are specific tags that affect the runtime behavior of the JSP and affect the response sent back to the client. The JSP specification lists some standard action types to be provided by all containers, irrespective of the implementation. Standard actions provide page authors with some basic functionality to exploit; the vendor is free to provide other actions to enhance behavior.

### **3.4.3 BENEFITS OF JSP**

One of the main reasons why the JavaServer Pages technology has evolved into what it is today and it is still evolving is the overwhelming technical need to simplify application design by separating dynamic content from static template display data. Another benefit of utilizing JSP is that it allows to more cleanly separating the roles of web application/HTML designer from a software developer.

The JSP technology is platform independent, in its dynamic web pages, its web servers, and its underlying server components. That is, JSP pages perform perfectly without any hassle on any platform, run on any web server, and web-enabled application server. The JSP pages can be accessed from any web server. The JSP technology emphasizes the use of reusable components. These components can be combined or manipulated towards developing more purposeful components and page design.

## CHAPTER 4

### SYSTEM DESIGN

#### 4.1 DATA MODEL

##### 4.1.1 ENTITY RELATIONSHIP DIAGRAM

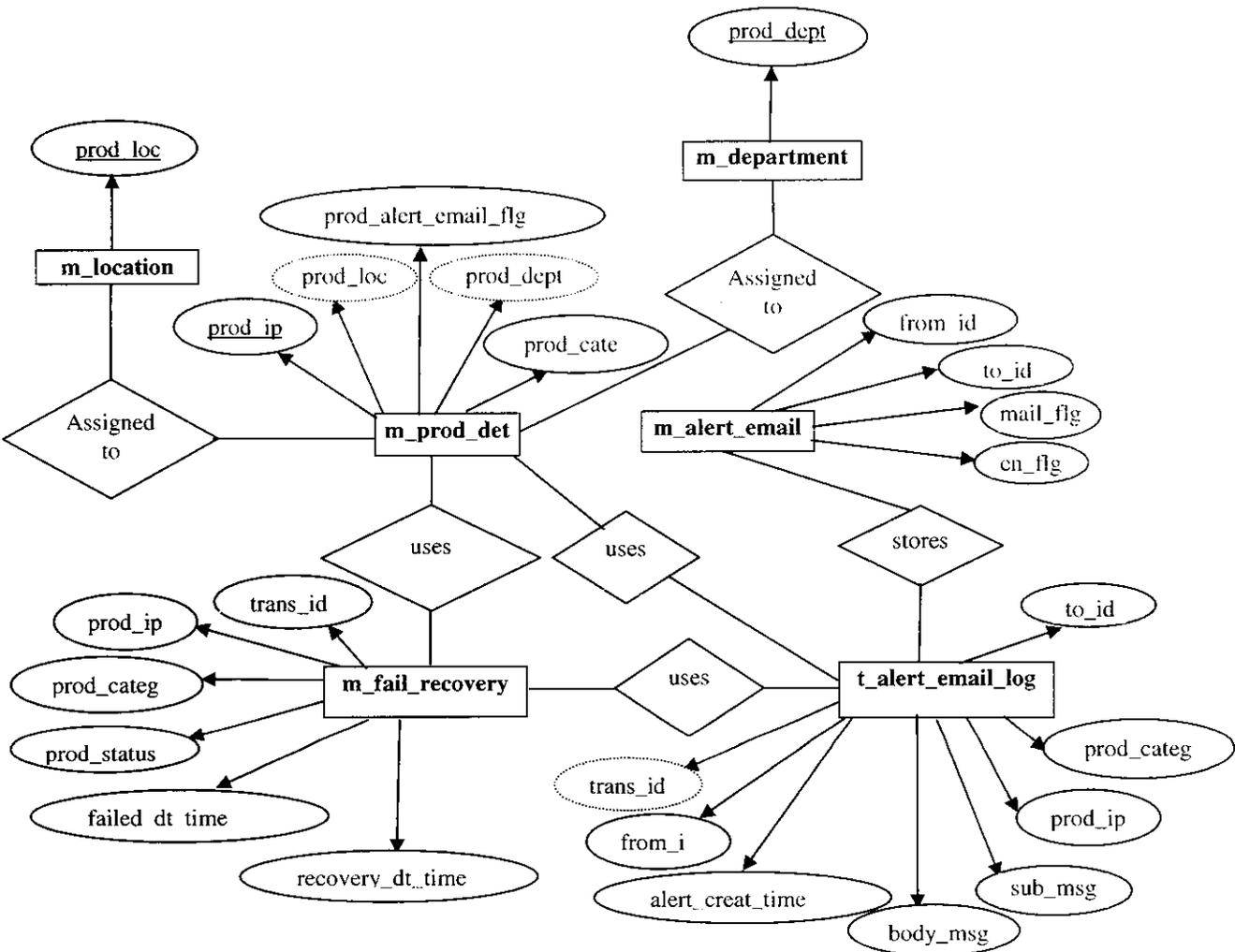


Figure 4.1.1 Entity Relationship Diagram

## 4.1.2 TABLE STRUCTURE

**Table 4.1.2.1: M\_PROD\_DET**



*P-2268*

Used to store the product details

S. No.	Field Name	Data Type	Permit Nulls? (Y/N)	Constraint
1.	PROD_ID_SEQ	NUMBER	N	Unique
2.	PROD_IP	VARCHAR2	N	Primary Key
3.	PROD_CATEG	VARCHAR2	N	
4.	PROD_LOC	VARCHAR2	N	
5.	PROD_DEPT	VARCHAR2	Y	
6.	PROD_STATE	CHAR	N	
7.	PROD_MAKE	VARCHAR2	Y	
8.	PROD_DESC	VARCHAR2	Y	
9.	PROD_MAINT_BY	VARCHAR2	Y	
10.	PROD_MAINTAIN_PH	VARCHAR2	Y	
11.	PROD_SERVPRO	VARCHAR2	Y	
12.	PROD_HELP_PH	VARCHAR2	Y	
13.	PROD_PUR_DT	DATE	Y	
14.	PROD_SECU	VARCHAR2	N	
15.	PROD_CONTRACT_DT	DATE	Y	
16.	PROD_ADD_DT	DATE	N	
17.	PROD_ALERT_FLG	CHAR	N	

**Table 4.1.2.2: M\_ALERT\_EMAIL**

Used to store the list of Email Ids to which the alert is to be sent

S. No.	Field Name	Data Type	Permit Nulls? (Y/N)	Constraint
1	FROM_ID	VARCHAR2	N	
2	TO_ID	VARCHAR2	N	Unique
3	MAIL_FLG	CHAR	N	
4	EN_FLG	CHAR	N	

**Table 4.1.2.3: M\_FAIL\_RECOVERY\_LOG**

Used to logs the failures and recoveries of products with date and time

S. No.	Field Name	Data Type	Permit Nulls? (Y/N)	Constraint
1	TRANS_ID	NUMBER	N	Primary key
2	PROD_IP	VARCHAR2	N	
3	PROD_CATEG	VARCHAR2	N	
4	PROD_STATUS	VARCHAR2	N	
5	FAILED_DT_TIME	TIMESTAMP	N	
6	RECOVERY_DT_TIME	TIMESTAMP	Y	

**Table 4.1.2.4: M\_USER\_DET**

Used to store the list of users and their details

S. No.	Field Name	Data Type	Permit Nulls? (Y/N)	Constraint
1	EMP_CODE	VARCHAR2	N	Primary Key
2	USER_NAME	VARCHAR2	N	Unique
3	PASSWORD	VARCHAR2	N	
4	USER_CATEG	VARCHAR2	N	
5	DESIGNATION	VARCHAR2	Y	
6	DEPARTMENT	VARCHAR2	Y	
7	CREATE_DT	DATE	N	
8	ENABLE_DISABLE_FLG	CHAR	N	

**Table 4.1.2.5: M\_LOCATION**

Used to store the list of locations of the product

S. No.	Field Name	Data Type	Permit Nulls? (Y/N)	Constraint
1	PROD_LOC	VARCHAR2	N	Primary Key

**Table 4.1.2.6: M\_DEPARTMENT**

Used to store the list of departments of the product

S. No.	Field Name	Data Type	Permit Nulls? (Y/N)	Constraint
1	PROD_DEPT	VARCHAR2	N	Primary Key

**Table 4.1.2.7: T\_ALERT\_EMAIL\_LOG**

Used to log the mail alert details with alert created and sent time

S. No.	Field Name	Data Type	Permit Nulls? (Y/N)	Constraint
1	TRANS_ID	NUMBER	N	Foreign key references m_fail_recovery_ log
2	SEQ_TRANS	NUMBER	N	Unique
3	PROD_IP	VARCHAR2	N	
4	PROD_CATEG	VARCHAR2	N	
5	FROM_ID	VARCHAR2	N	
6	TO_ID	VARCHAR2	N	
7	SUB_MSG	VARCHAR2	N	
8	BODY_MSG	VARCHAR2	N	
9	ALERT_CREAT_TIME	TIMESTAMP	N	
10	ALERT_SENT_TIME	TIMESTAMP	N	

**Table 4.1.2.8: T\_USER\_LOG\_DET**

Used to log the Login and Logout time of the application users

S. No.	Field Name	Data Type	Permit Nulls? (Y/N)	Constraint
1	USER_NAME	VARCHAR2	N	
2	LOGIN_TIME	TIMESTAMP	N	
3	LOGOUT_TIME	TIMESTAMP	N	
4	USER_CATEGORY	VARCHAR2	N	
5	IP_ACCESSED	VARCHAR2	N	

**Table 4.1.2.9: B\_PROD\_BKUP**

Used to store the product edit and delete details.

S. No.	Field Name	Data Type	Permit Nulls? (Y/N)	Constraint
1	PROD_ID_SEQ	NUMBER	N	
2	PROD_IP	VARCHAR2	N	
3	PROD_CATEG	VARCHAR2	N	
4	PROD_LOC	VARCHAR2	N	
5	PROD_DEPT	VARCHAR2	Y	
6	PROD_STATE	CHAR	N	
7	PROD_MAKE	VARCHAR2	Y	
8	PROD_DESC	VARCHAR2	Y	
9	PROD_MAINT_BY	VARCHAR2	Y	
10	PROD_MAINTAIN_PH	VARCHAR2	Y	
11	PROD_SERVPRO	VARCHAR2	Y	
12	PROD_HELP_PH	VARCHAR2	Y	
13	PROD_PUR_DT	DATE	Y	
14	PROD_SECU	VARCHAR2	N	
15	PROD_CONTRACT_DT	DATE	Y	
16	PROD_ADD_DT	DATE	N	
17	PROD_ALERT_FLG	CHAR	N	
18	PROD_CHANGE_DT	DATE	N	
19	PROD_CHANGE_FLG	VARCHAR2	N	

**Table 4.1.2.10: REFRESH\_RUN**

Used to store the Database Start time, Database Shut down time, Application Running Status

S. No.	Field Name	Data Type	Permit Nulls? (Y/N)	Constraint
1	REF_SEQ	NUMBER	N	Unique
2	REF_STATE	VARCHAR2	N	
3	REF_TIME	TIMESTAMP	N	
4	FLAG	VARCHAR2	N	

## 4.2 PROCESS MODELS

### 4.2.1 USECASE DIAGRAMS

Use cases are scenarios for understanding the system requirements. A use case is an interaction between users and a system. Actors are users playing a role with respect to the system.

#### 4.2.1.1 OVERALL SYSTEM

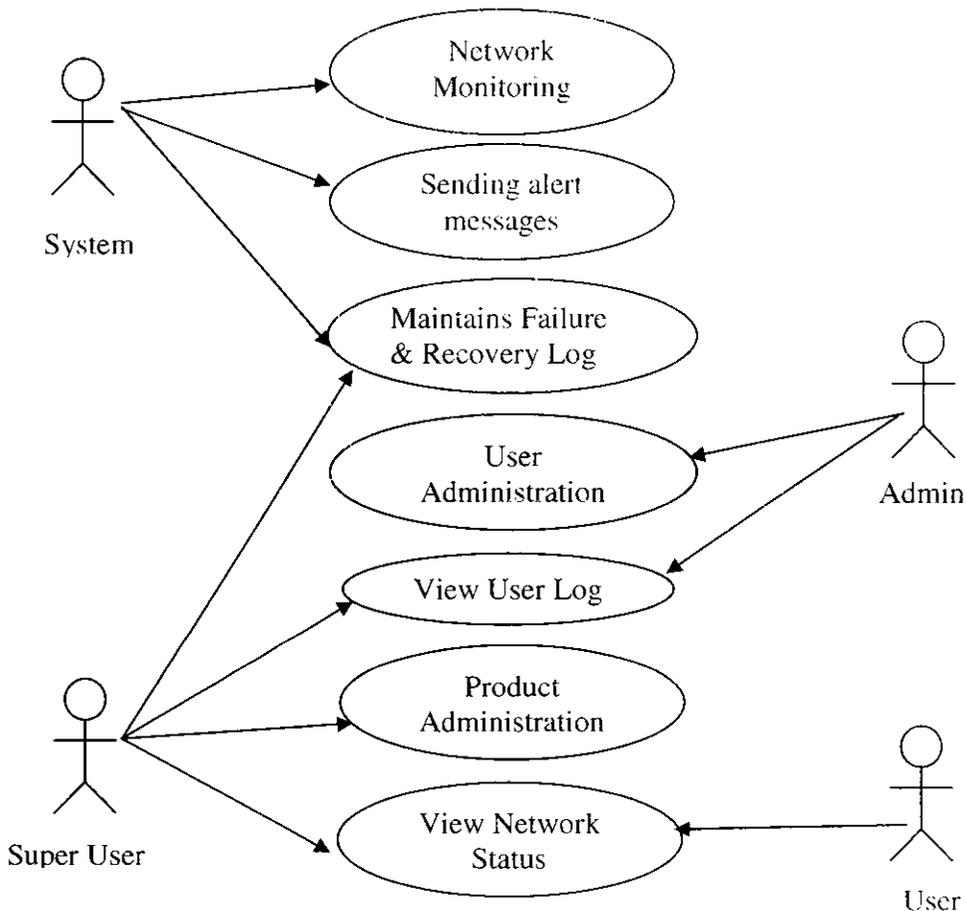
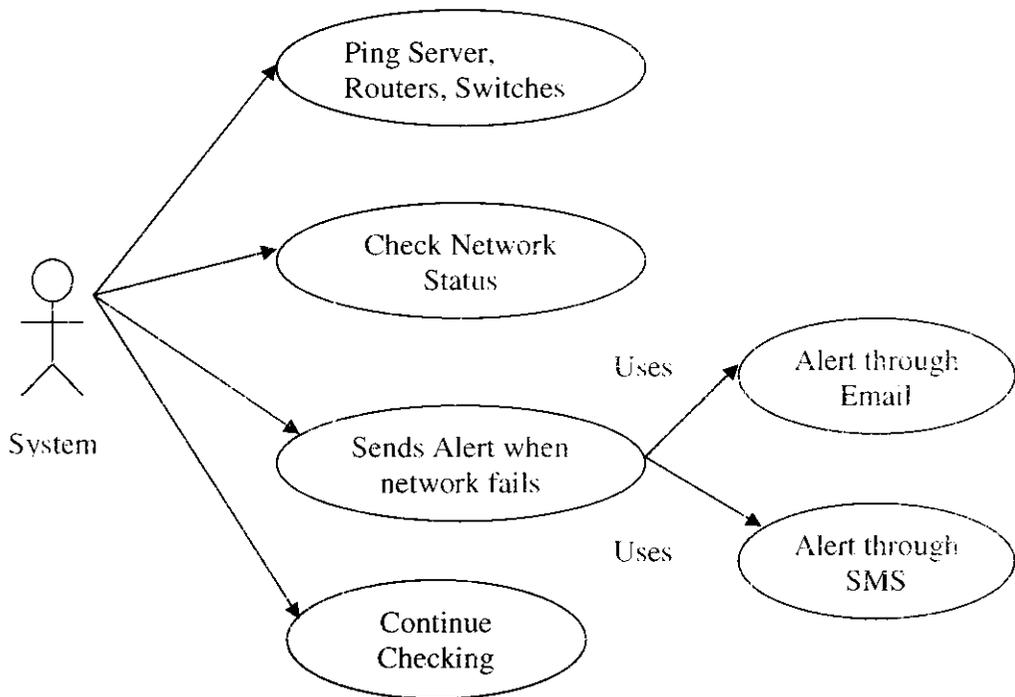


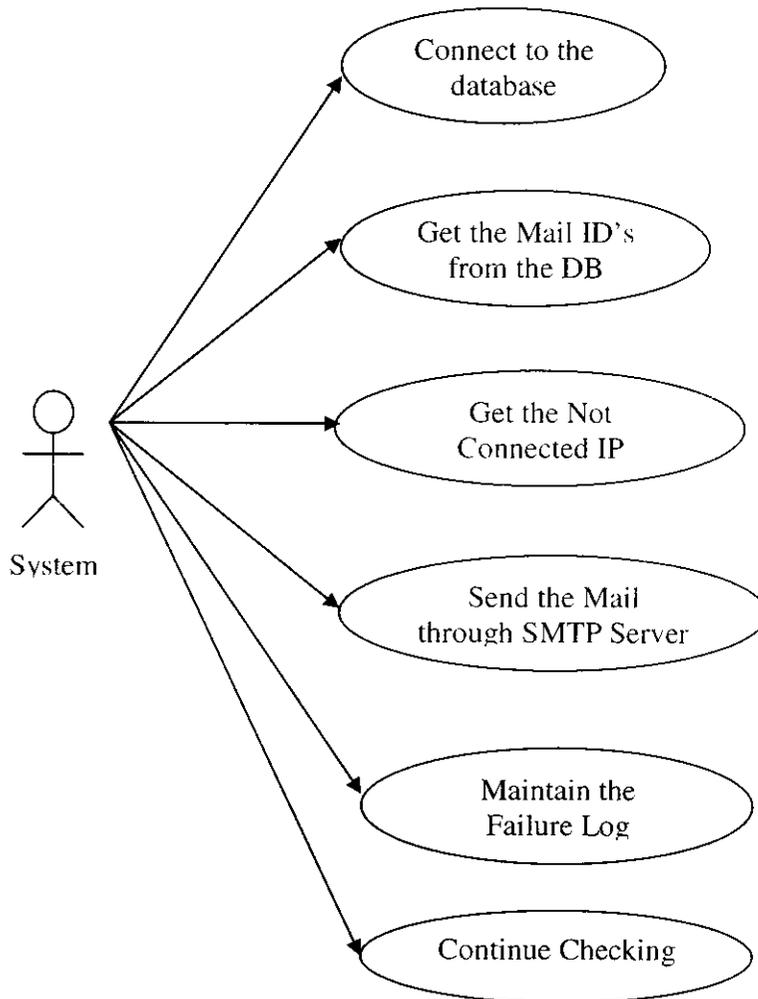
Figure 4.2.1.1 Usecase for Overall System

#### 4.2.1.2 NETWORK MONITORING



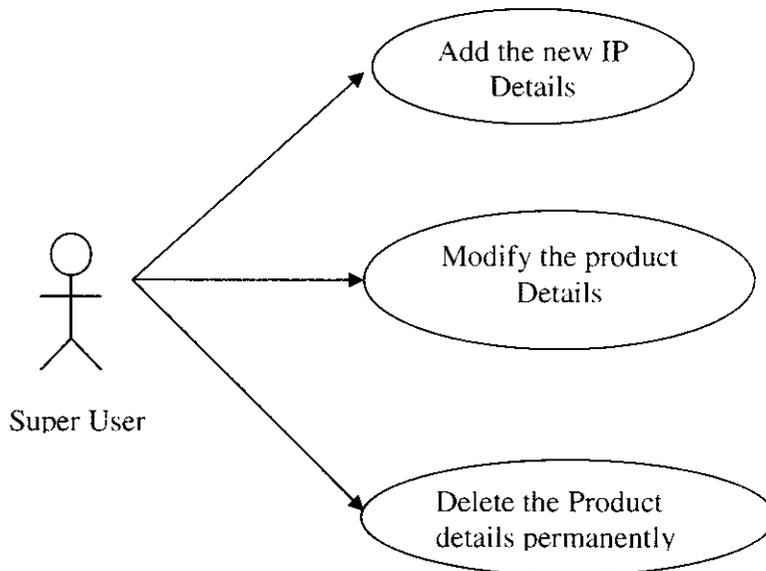
**Figure 4.2.1.2 Usecase for Network Monitoring**

### 4.2.1.3 SENDING ALERT



**Figure 4.2.1.3 Usecase for Sending Alert**

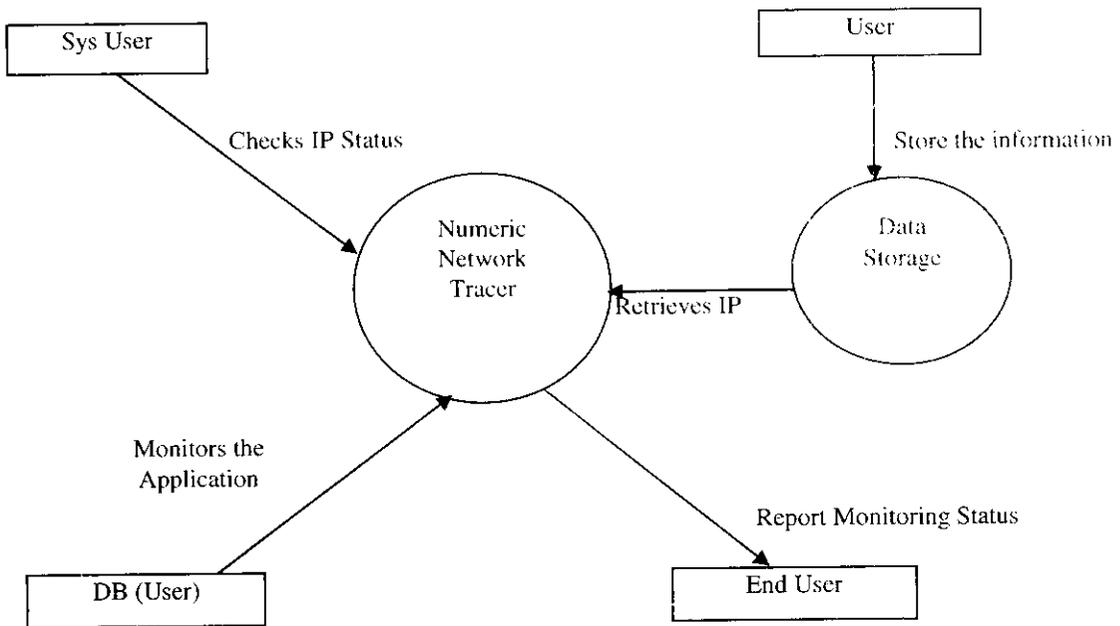
#### 4.2.1.4 PRODUCT ADMINISTRATION



**Figure 4.2.1.4 Usecase for Product Administration**

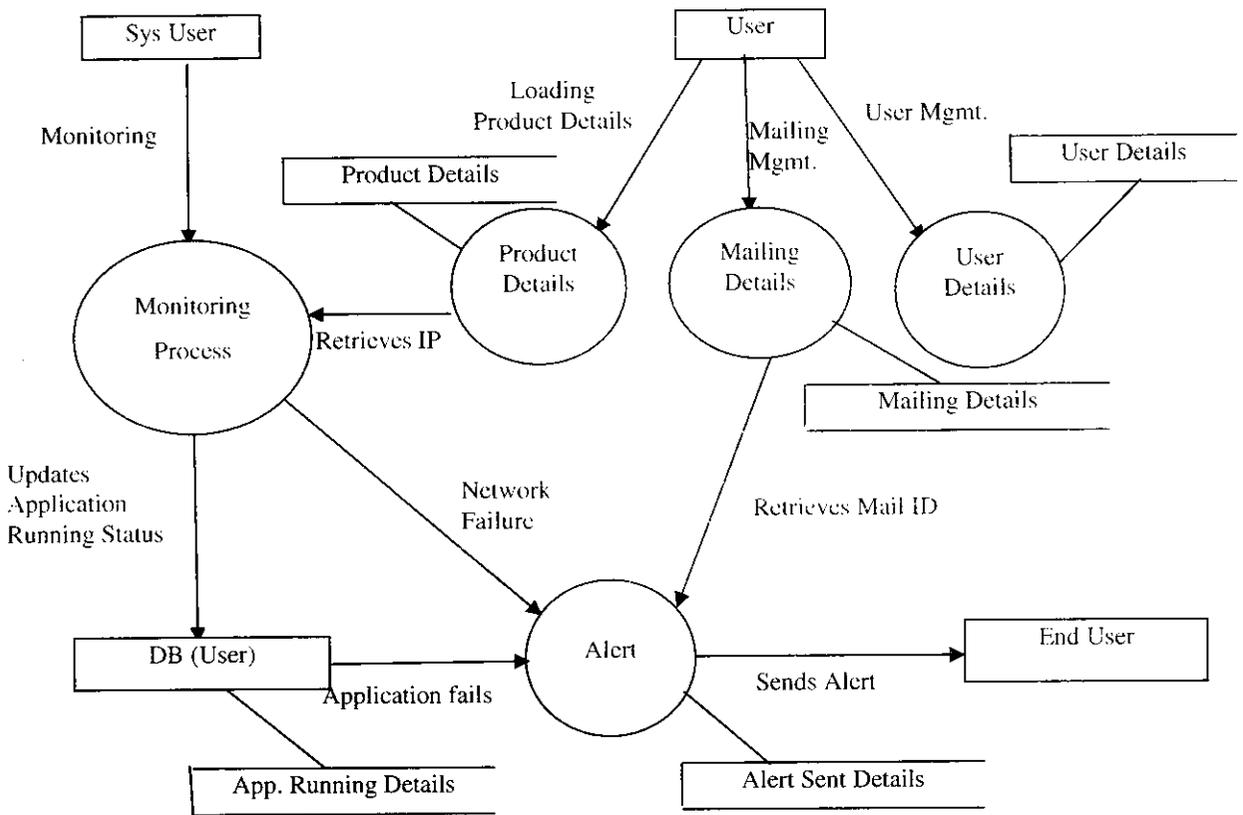
### 4.2.2 DATA FLOW DIAGRAM (DFD)

#### 4.2.2.1 DFD – LEVEL 0



**Figure 4.2.2.1 : DFD - LEVEL 0**

**4.2.2.2 DFD – LEVEL 1**



**Figure 4.2.2.2 : DFD - LEVEL 1**

4.2.2.3 DFD – LEVEL 2

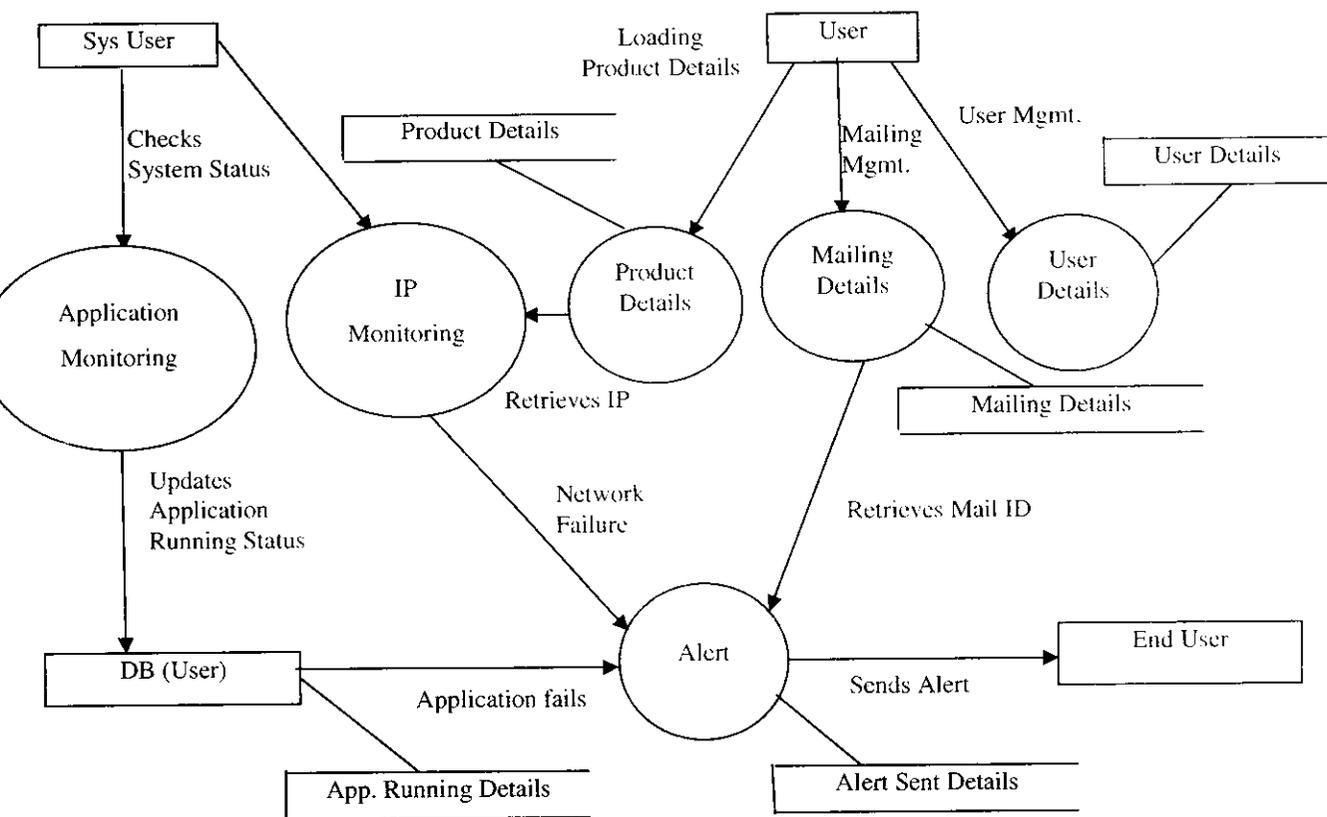


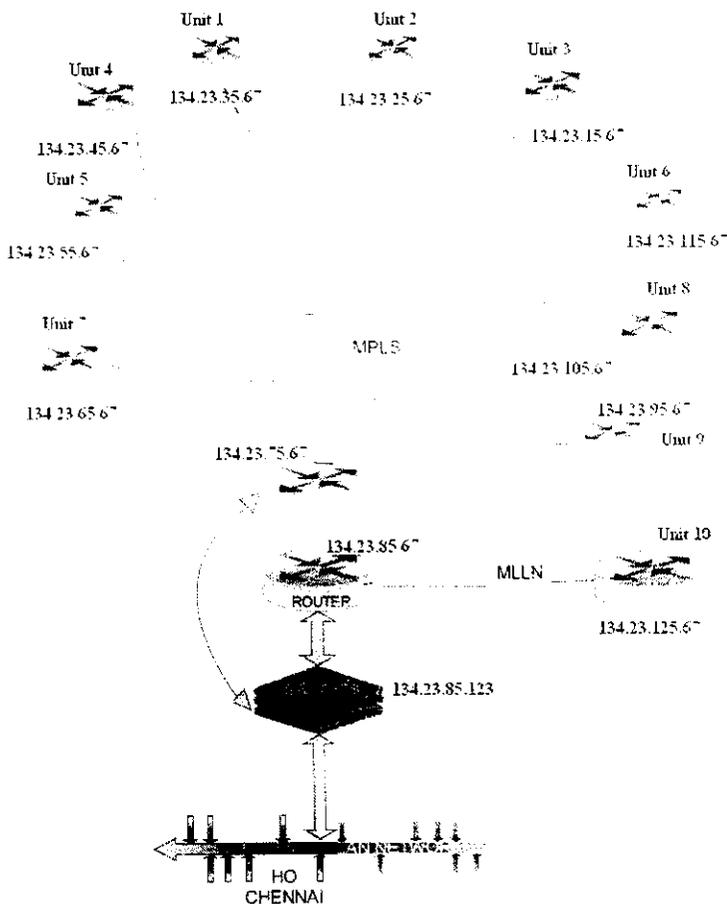
Figure 4.1.5.3 : DFD - LEVEL 2

## CHAPTER 5

### ARCHITECTURAL DETAILS

#### 5.1 N TIER ARCHITECTURE

Numeric Network Tracer has n tier architecture and the pictorial representation is given below



**Figure 5.1.1 N –Tier Architecture**

## CHAPTER 6

### IMPLEMENTATION

Implementation is the most important part of software development. After the coding phase, the system is implemented. During this phase the application is tested for validity and performance in the real time environment.

#### 6.1 SERVER SIDE CODING

##### Network Monitoring Code

```
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<%@page language="java" import="java.sql.*" %>
<html>
<head>
    <%response.setHeader("Cache-Control","pre-check=0,post-check=0,must-revalidate,s-
maxage=0,max-age=0,no-cache");
response.setHeader("Pragma","no-cache");
response.setDateHeader("Expires", -1);
String username_sess_value=(String)session.getValue("username");
session.setAttribute("username",username_sess_value);
String userName = (String) session.getAttribute("username");
if (null == userName) {
    request.setAttribute("Error", "Session has ended. Please login.");
    RequestDispatcher rd = request.getRequestDispatcher("../session_exp.jsp");
    rd.forward(request, response);
}
```

```

%>
<title>Monitoring</title>
</head>
<body>
<%
    try
    {
        // Get the IP lists from the database and store it in string variable
        String ip=192.168.134.54;
        String line=null;
        Process p = Runtime.getRuntime().exec("ping "+ip );
        BufferedReader in = new BufferedReader
            (new InputStreamReader(p.getInputStream()));
        while ((line = in.readLine()) != null)
        {
            if(line.lastIndexOf("Reply from")!=-1)
            {
                con++;
            }
            else if(line.lastIndexOf("Request timed out")!=-1)
            {
                notc++;
            }
            else if(line.lastIndexOf("Hardware error")!=-1)
            {
                System.out.println("Hardware error");
                break;
            }
            else if (line.lastIndexOf("
Destination Host unreachable")!=-1)
            {

```

```

        System.out.println("Destination Host unreachable");
        break;
    }
    else if(line.lastIndexOf("
Destination specified is invalid")!=-1)
    {
        System.out.println("Destination specified is invalid");
        break;
    }
    else if(line.lastIndexOf("Unknown Host")!=-1)
    {
        System.out.println("Unknown Host");
        break;
    }
}
}Catch(Exception e) {
%>
    <p border="0" cellpadding="0" cellspacing="0" width="58%"
height="23" style="border-collapse: collapse" bordercolor="#696969"
width="58%" height="10">
    <p width="100%" height="23" bordercolor="#696969" align="center"
bgcolor="#FF4646">
        <p align="center"><b><font color="#FFFFFF">
            ERROR MESSAGE</font></b></td>
    <p width="100%" height="200" bgcolor="#EEEEEE"
bordercolor="#696969" align="center">
        <b><%=e %></b>
    <%
} %>
</body>
</html>

```

## **CHAPTER 7**

### **TESTING**

Testing plays a major part in software development. Once the customer has specified the requirements the system has to be developed so as to satisfy those requirements and this is ensured by means of testing. The following testing was done in this system to provide a quality system to the user.

#### **7.1 UNIT TESTING**

Unit testing focuses verification effort on the smallest unit of software design such as the software component or the module. By means of unit testing the input, Interfaces and output of each module is checked for bugs.

There are six modules and each of them is tested individually to determine errors. The boundary conditions of the modules are tested to ensure that the module operates properly.

#### **7.2 INTEGRATION TESTING**

Integration Testing is a systematic technique for constructing the software architecture while at the same time it uncovers the errors associated with interfacing. All components are combined into a single unit and tested as a whole.

Bottom up Integration testing is used where in the modules are combined one by one and tested and finally tested as a whole. The interdependencies between the modules are tested and the bugs are traced and corrected.

### 7.3 ACCEPTANCE TESTING

Acceptance Testing is done by the customer. It focuses on overall features and functionalities of the system that are visible and reviewable by the customer.

The application is executed by the customer and each of the functionality has been accepted by the customer. The system is accepted by the customer when it satisfies the requirements.

### 7.4 TEST CASE REPORT

The test case report for the Numeric Network Tracer application is as follows

<i>TESTCASE</i>	<i>DESCRIPTION</i>	<i>PREREQUISITE</i>	<i>EXPECTED RESULT</i>	<i>PASS/FAIL</i>
1.1	Inserting the IP address within Range	NIL	The IP Address should be within 0 to 255. No Special IP Address should be inserted like 0.0.0.0.	PASS
1.2	Insertion of E-Mail ID	NIL	The mail ID should of the format Abcd12@xx.xx No white Space is allowed in front or at the back of the ID.	PASS

## **CHAPTER 8**

### **PERFORMANCE AND LIMITATIONS**

The Numeric Network Tracer overcomes the major issues in the existing system and includes many additional features in it, which makes the system to perform faster.

#### **8.1 MERITS OF THE SYSTEM**

##### **8.1.1 NETWORK MONITORING:**

There are three possible utilities to view the network status of Routers, Switches and Servers.

- Modern view
- Pictorial view
- Classical view

##### **8.1.1.1 Modern View**

This utility enables the user to view the network connectivity of all the Routers, Switches, Servers and Hosts within 90 seconds. The user can identify the particular state of the network such as connected, critical, trouble, not connected. In this view, the states are depicted as icons. Red Icon refers to the failure of the network and Green Icon refers that network is in connected state.

### **8.1.1.2 Pictorial View**

This utility enables the user to view the connectivity of WAN (Wide Area Network) and LAN (Local Area Network) networks. It helps the user to know where the network failure takes place in LAN or WAN.

### **8.1.1.3 Classical View**

This utility is designed for the user to ping the network equipments IP as same as in the command prompt. By using this utility, the users can ping more than one IP at a time or ping all the IP's simultaneously. The user can also break and continue pinging again.

## **8.1.2 E-Mail and SMS Alert**

When there is any failure in Routers, Switches and Servers, the system automatically intimates the concerned IT person through E-Mail and SMS for every 120 minutes. The super user can disable any recipient mail ID temporarily from receiving the notification or delete the recipient mail ID permanently. Each failure of the network is considered as one transaction and the Transaction ID is sent in the E-Mail notification. The system uses the same Transaction ID till the network recovers.

## **8.1.3 Log Maintenance**

The separate log is for alert sent details, failure and recovery, user login and logout details and application log. The failure and recovery log maintains the failure and recovery fields with date and time. This log helps the user to trace the failure details. The user can also refer the particular details with the Transaction ID that was sent in the specific E-Mail. The application log helps the user to trace the application running status, database start time and shut down time.

#### **8.1.4 Downtime Calculation**

The total downtime of the network is calculated in terms of hours and minutes. This helps the user to know the total downtime and to find which particular network needs an appropriate recovery. The system also calculates the business downtime hours and non business downtime hours.

## **8.2 DEMERITS OF THE SYSTEM**

The following are the limitations of this application

- This system cannot monitor the unmanaged switches since the unmanaged switch do not have the IP address to ping.
- Pictorial view is only static. If any change is made to the Virtual Private Network (VPN), then it is redesigned according to the modification in the network.

## **8.3 CONCLUSION AND FUTURE ENHANCEMENTS**

### **8.3.1 CONCLUSION**

Numeric Power Systems spent most of the resources in determining the network status and its downtime was very expensive. This necessitated the development of a new system to track the network failures and thus the system was developed so as to solve the specified problem.

### **8.3.2 FUTURE ENHANCEMENT**

- A System Tray Icon can be designed to instantly pop up an alert to the user at the time of network failures during the business hours.
- Calculating the total network bandwidth and maintain the special log during the network down time can be done.
- Network monitoring can be extended by including the UPS monitoring with it.



NUMERIC NETWORK TRACER User: test

MONITOR MASTER VIEWS HISTORY ADMINISTRATION REPORT HELP LOGOUT

31-May-2008 10:51:31 AM

- Monitoring
- Problems
- Classes
- Classroom
- Classroom
- Classroom
- Failure & Incident Log
- Alerting System
- Ping Utility
- Data Report

**DASH BOARD**

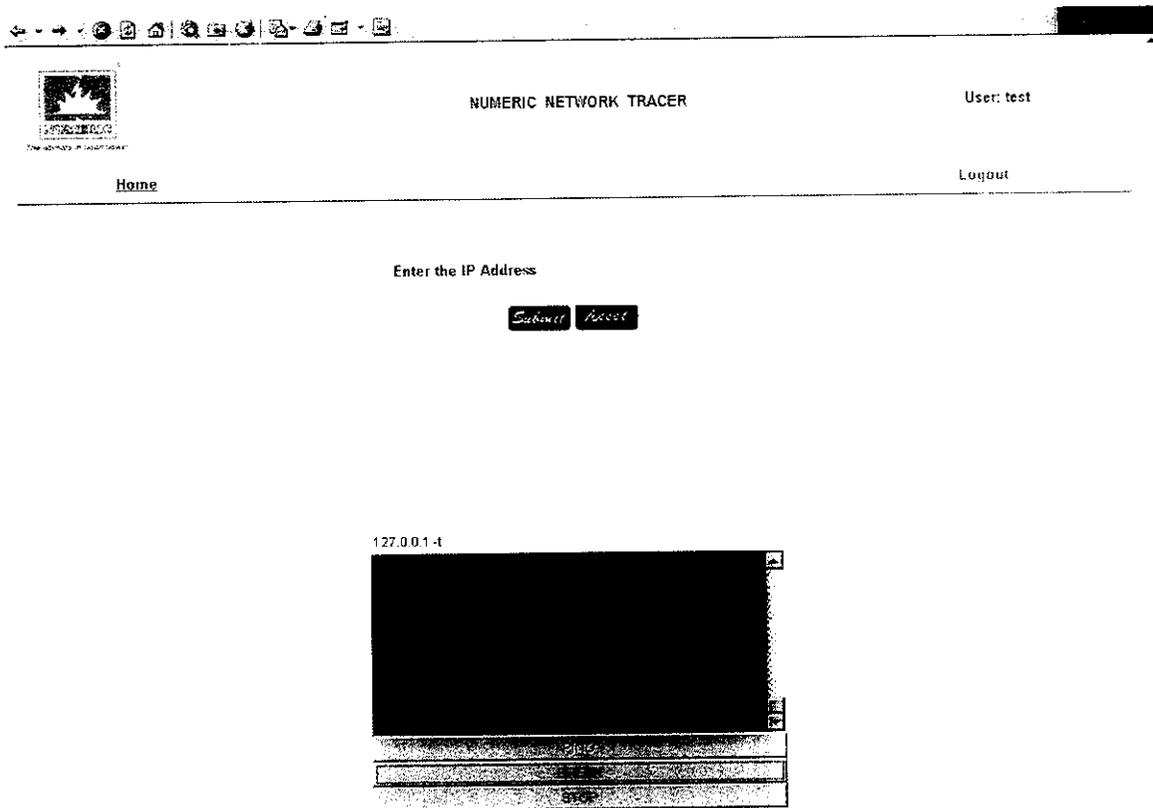
Recent Failures

ID	IP Address	Fail Time	Recover Time
28	192.168.90.254	31-MAY-2008 09:41	31-MAY-2008 09:42
27	192.168.90.254	31-MAY-2008 09:41	31-MAY-2008 09:46
26	192.168.90.254	31-MAY-2008 09:28	31-MAY-2008 09:29
25	192.168.90.254	31-MAY-2008 08:30	31-MAY-2008 08:35
24	192.168.90.254	31-MAY-2008 05:52	31-MAY-2008 05:54
23	192.168.90.254	31-MAY-2008 05:49	31-MAY-2008 05:50
22	192.168.90.254	31-MAY-2008 05:29	31-MAY-2008 05:30
21	192.168.90.254	31-MAY-2008 05:13	31-MAY-2008 05:14

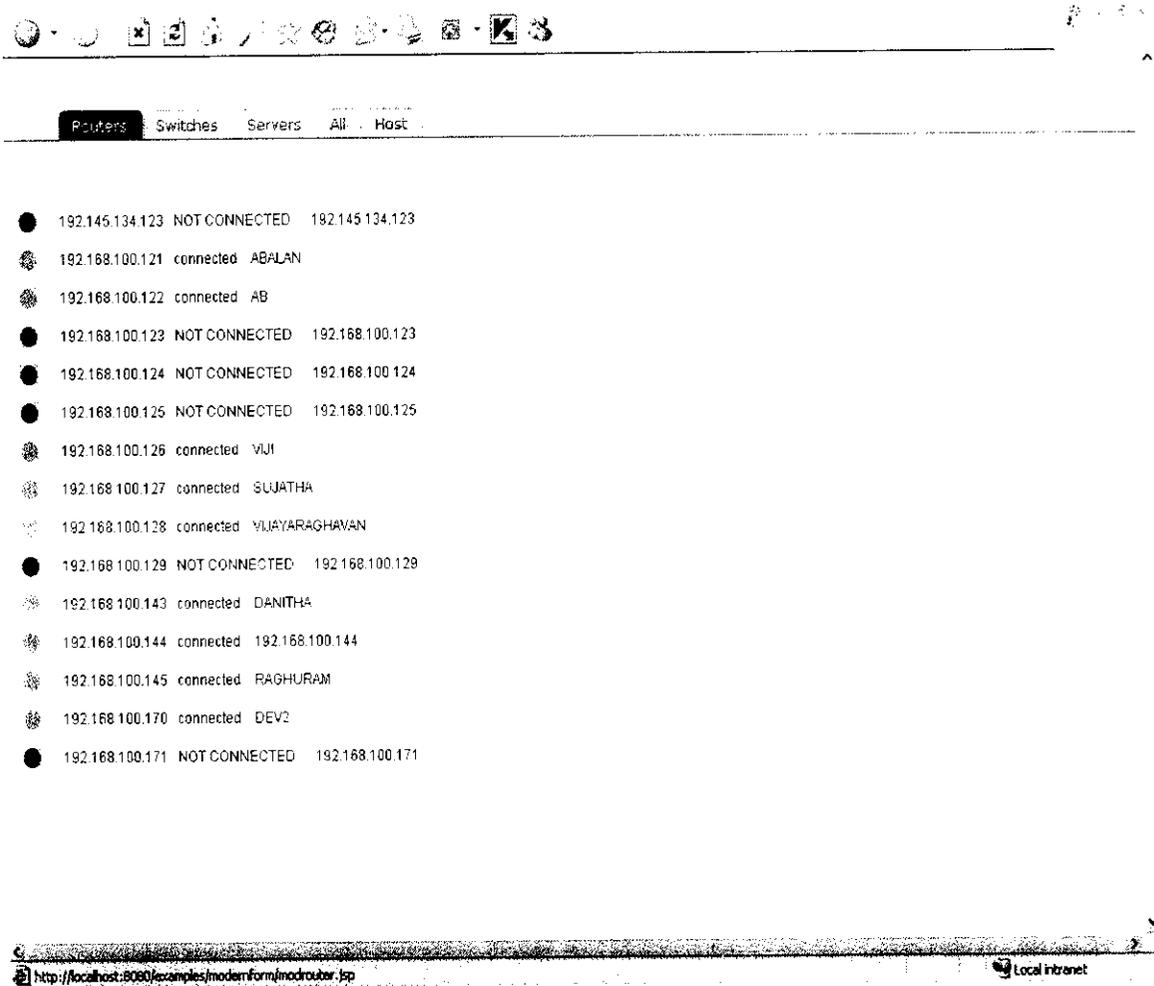
Search

©Copyrights Reserved To M's Numero Technologies Private Limited.

Screen Shot 9.1.2: Home Page



Screen Shot 9.1.3: Ping Utility



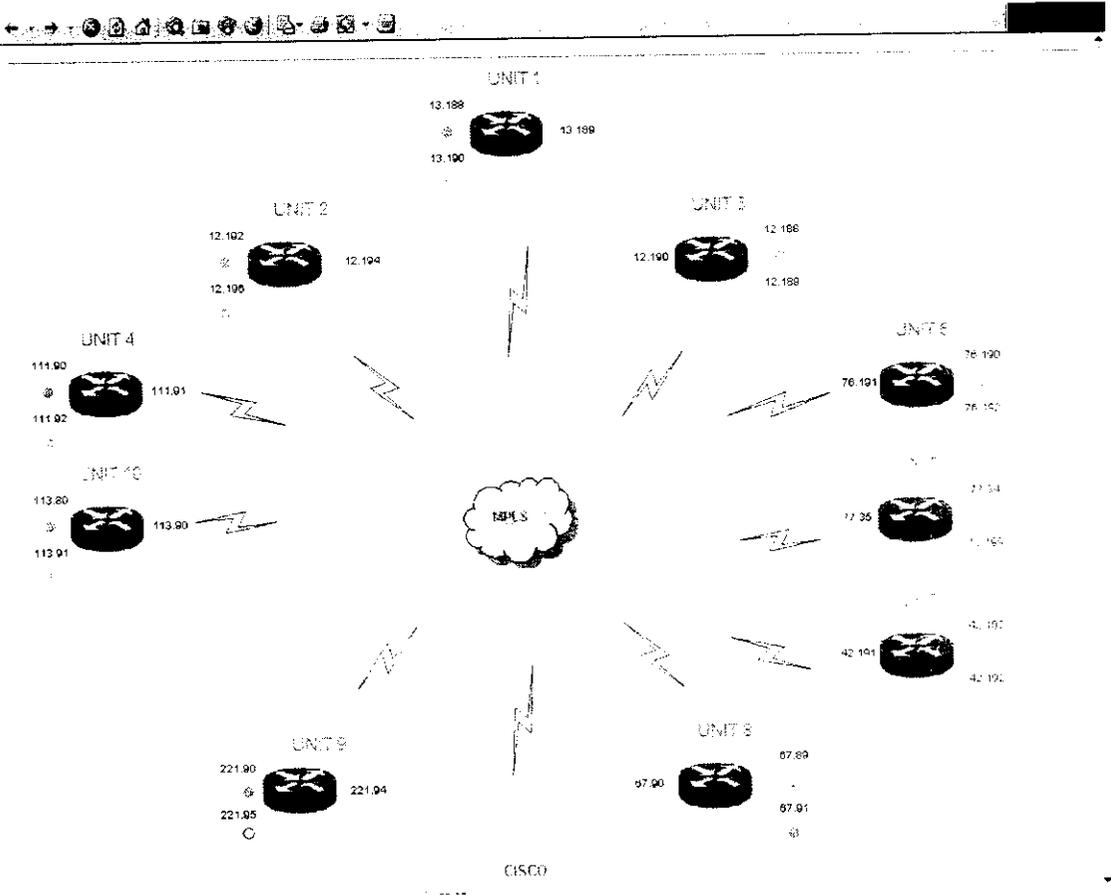
**Screen Shot 9.1.4: Modern View**

The screenshot shows a web-based network monitoring application. At the top, there is a navigation menu with options: HOME, MONITORING, MASTER, VIEWS, HISTORY, ADMINISTRATION, REPORTS, HELP, SUPPORT, and LOG OUT. Below the menu is a 'Classic View' section with a 'To Ping & Stop' button. The main content area is titled 'Router' and displays a table of ping results for various IP addresses.

192.145.134.123-1	192.168.100.121-1	192.168.100.122-1	192.168.100.123-1
	Reply from 192.168.100.121: bytes=32	Reply from 192.168.100.122: bytes=32	Pinging 192.168.100.123 with 32 byte
	Reply from 192.168.100.121: bytes=32	Reply from 192.168.100.122: bytes=32	
	Reply from 192.168.100.121: bytes=32	Reply from 192.168.100.122: bytes=32	Request timed out
	Reply from 192.168.100.121: bytes=32	Reply from 192.168.100.122: bytes=32	Request timed out
PING			
STOP	STOP	STOP	STOP
192.168.100.124-1	192.168.100.125-1	192.168.100.126-1	192.168.100.127-1
Pinging 192.168.100.124 with 32 byte:	Pinging 192.168.100.125 with 32 byte:	Reply from 192.168.100.126: bytes=32	Reply from 192.168.100.127: bytes=32
Request timed out	Request timed out	Reply from 192.168.100.126: bytes=32	Reply from 192.168.100.127: bytes=32
		Reply from 192.168.100.126: bytes=32	Reply from 192.168.100.127: bytes=32
		Sent=47	Reply from 192.168.100.127: bytes=32
		Received=47	Reply from 192.168.100.127: bytes=32
		Lost=0	Reply from 192.168.100.127: bytes=32
		PING	PING
STOP	STOP	STOP	STOP

At the bottom of the interface, there are status messages: 'Applet classicstop started' on the left and 'Local intranet' on the right.

Screen Shot 9.1.5: Classical View



Screen Shot 9.1.6: Pictorial View

The screenshot shows the NUMERIC NETWORK TRACER application interface. At the top, there is a navigation bar with buttons for HOME, MONITOR, VIEWS, HISTORY, ADMINISTRATION, REPORT, HELP, and LOGOUT. The user is logged in as 'test'. Below the navigation bar, the page title is 'NUMERIC NETWORK TRACER' and the user name is 'User: test'. The main content area is titled '\* Mandatory Fields' and contains a form for adding a product. The form fields are: IP Address\* (192 . 192 . 256 . 129), Category\* (HOST), Location\* (HO CHENNAI), Department (ACCOUNTS), State\* (radio buttons for Enabled and Disabled), Staff Incharge, Staff Phone No, and Description. On the right side, there are fields for Purchase Date, Warranty / AMC\* (dropdown), Contract Date, and Help Line No. A validation error message is displayed in a dialog box: 'Microsoft Internet Explorer Invalid IP Address 256 OK'. At the bottom of the form, there are 'Submit' and 'Reset' buttons.

© Copyrights Reserved to M8, Numeric Technologies Private Limited

Screen Shot 9.1.7: Product Add Form - Validation

Microsoft Internet Explorer

Address: http://localhost:8084/network/Administration/Product\_Edit\_Rep.jsp

HOME MONITOR CHARACTER VIEWS HISTORY ADMINISTRATION REPORT HELP/SUPPORT LOGOUT

Product Edit Form Welcome test

SERVERS			ROUTERS			SWITCHES			HOSTS		
S.No	IP Address	Change	S.No	IP Address	Change	S.No	IP Address	Change	S.No	IP Address	Change
1	192.168.100.50	Edit	1	192.145.134.120	Edit	1	192.168.100.146	Edit	1	192.168.100.192	Edit
2	192.168.100.51	Edit	2	192.168.100.121	Edit	2	192.168.100.147	Edit	2	192.168.100.243	Edit
3	192.168.100.52	Edit	3	192.168.100.122	Edit	3	192.168.100.148	Edit	3	192.168.100.191	Edit
4	192.168.100.53	Edit	4	192.168.100.123	Edit	4	192.168.100.149	Edit	4	192.168.100.180	Edit
5	192.168.100.54	Edit	5	192.168.100.124	Edit	5	192.168.100.150	Edit	5	192.168.100.182	Edit
6	192.168.100.55	Edit	6	192.168.100.125	Edit	6	192.168.100.151	Edit	6	192.168.100.183	Edit
7	192.168.100.134	Edit	7	192.168.100.126	Edit						
8	192.168.100.135	Edit	8	192.168.100.127	Edit						
9	192.168.100.136	Edit	9	192.168.100.128	Edit						
10	192.168.100.137	Edit	10	192.168.100.145	Edit						
11	192.168.100.138	Edit	11	192.168.100.129	Edit						
12	192.168.100.139	Edit	12	192.168.100.170	Edit						
13	192.168.100.186	Edit	13	192.168.100.171	Edit						
14	192.168.100.181	Edit	14	192.168.100.143	Edit						
15	192.168.100.140	Edit	15	192.168.100.144	Edit						
16	192.168.100.141	Edit									
17	192.168.100.142	Edit									

Done Local intranet

Screen Shot 9.1.8: Product Edit Form

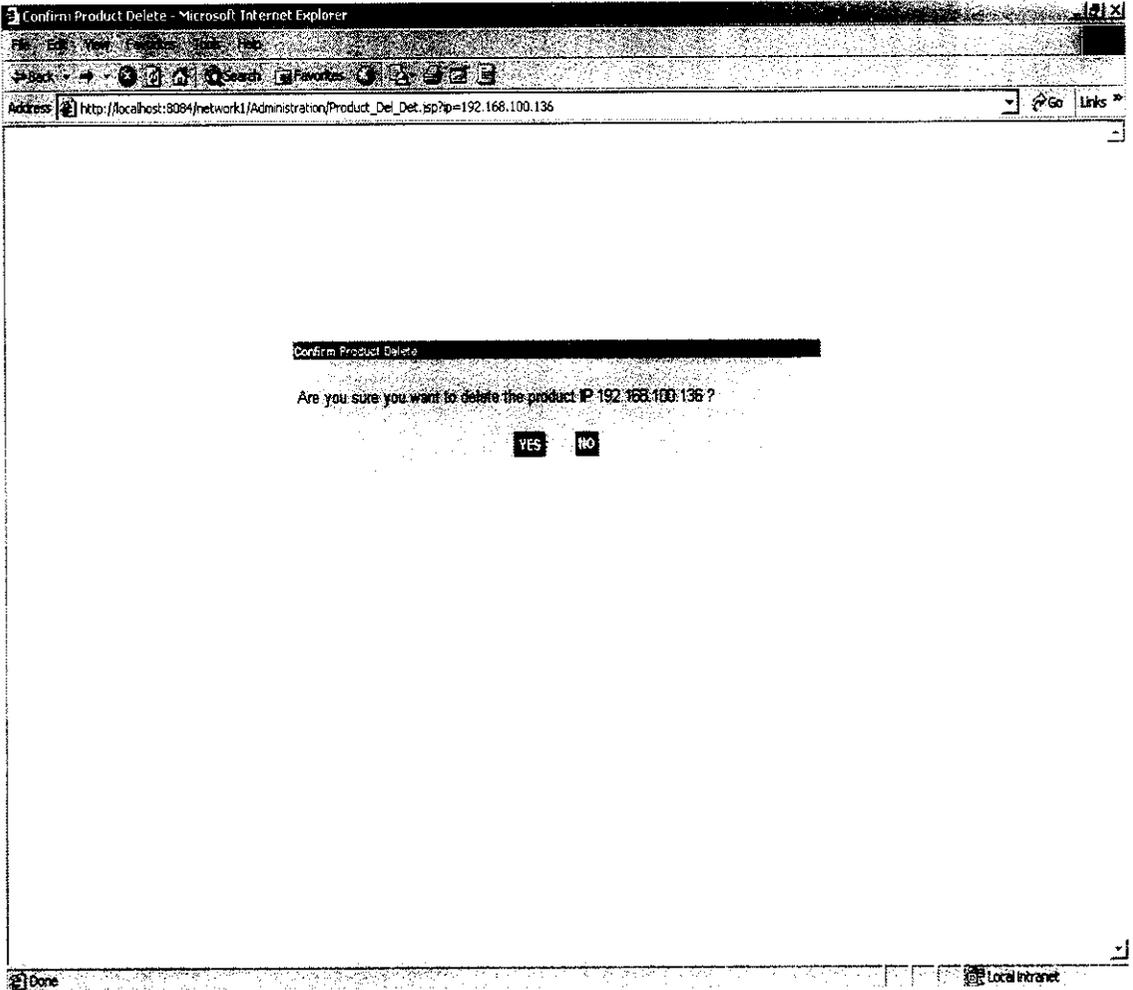
Product Delete Form Welcome test

SERVERS			ROUTERS			SWITCHES			HOSTS		
S.No	IP Address	Delete	S.No	IP Address	Delete	S.No	IP Address	Delete	S.No	IP Address	Delete
1	192.168.100.50	Delete	1	192.145.134.123	Delete	1	192.168.133.145	Delete	1	192.168.100.132	Delete
2	192.168.100.51	Delete	2	192.168.100.121	Delete	2	192.168.133.147	Delete	2	192.168.100.140	Delete
3	192.168.100.52	Delete	3	192.168.100.122	Delete	3	192.168.133.148	Delete	3	192.168.100.141	Delete
4	192.168.100.53	Delete	4	192.168.100.123	Delete	4	192.168.133.149	Delete	4	192.168.100.142	Delete
5	192.168.100.54	Delete	5	192.168.100.124	Delete	5	192.168.133.150	Delete	5	192.168.100.143	Delete
6	192.168.100.55	Delete	6	192.168.100.125	Delete	6	192.168.133.151	Delete	6	192.168.100.144	Delete
7	192.168.100.134	Delete	7	192.168.100.126	Delete						
8	192.168.100.135	Delete	8	192.168.100.127	Delete						
9	192.168.100.136	Delete	9	192.168.100.128	Delete						
10	192.168.100.137	Delete	10	192.168.100.129	Delete						
11	192.168.100.138	Delete	11	192.168.100.130	Delete						
12	192.168.100.139	Delete	12	192.168.100.131	Delete						
13	192.168.100.140	Delete	13	192.168.100.132	Delete						
14	192.168.100.141	Delete	14	192.168.100.133	Delete						
15	192.168.100.142	Delete	15	192.168.100.134	Delete						
16	192.168.100.143	Delete									
17	192.168.100.144	Delete									

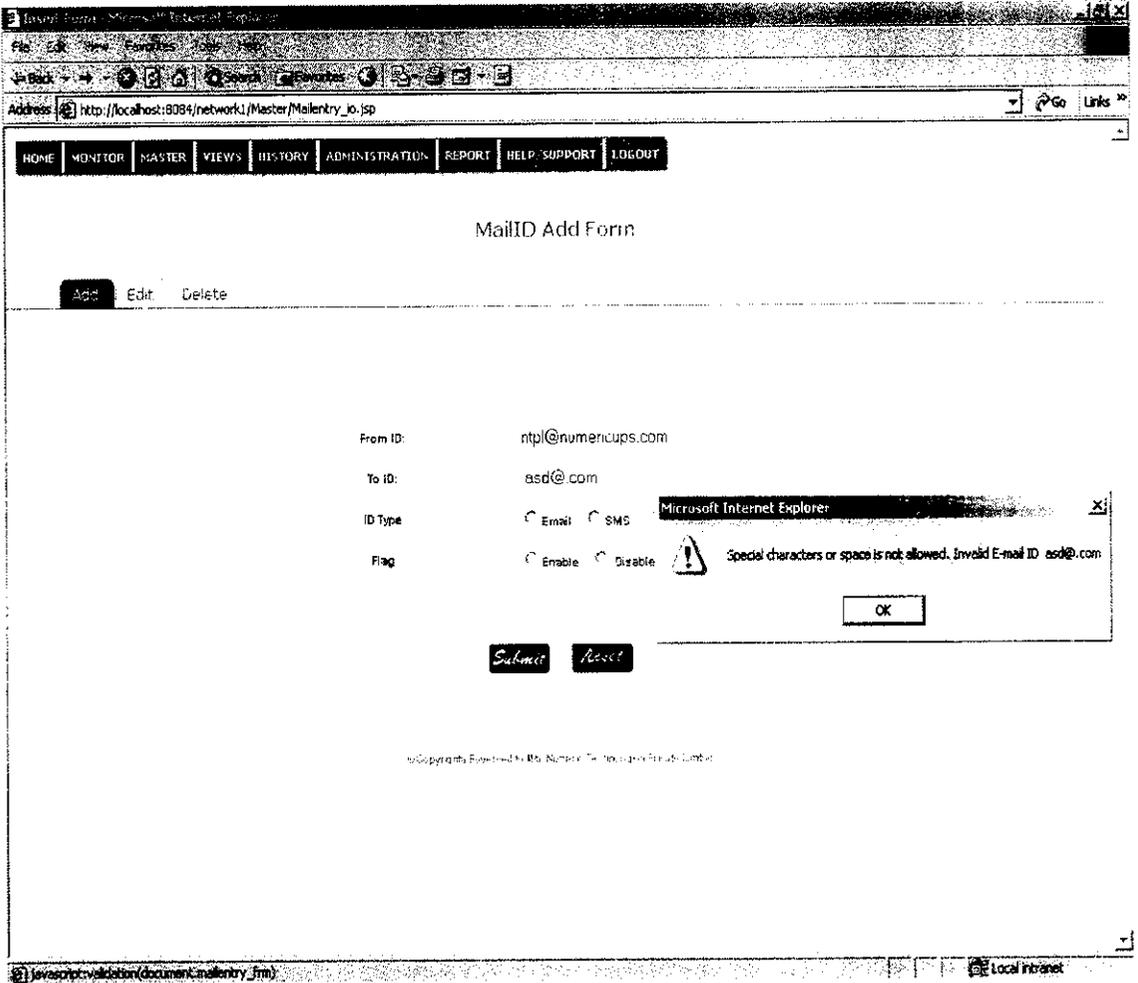
© Copyrights Reserved by M/s. Numenc Technologies Private Limited

Local Intranet

Screen Shot 9.1.9: Product Delete Form



**SCREEN SHOT 9.1.10: Product Delete Confirmation**



Screen Shot 9.1.11: Mail Add Form



NUMERIC NETWORK TRACER

User: test

HOME MONITOR MASTER VIEWS ADMINISTRATION REPORT HELP LOGOUT

### FAILURE AND RECOVERY DETAILS

S.No	Transaction ID	IP Address	Category	Status	Fail Time	Recover Time
1	47	192.168.58.100	ROUTER	Not Connected	31-may-2008 11:48:00 AM	31-may-2008 11:50:20 AM
2	46	192.168.58.101	ROUTER	Not Connected	31-may-2008 11:38:05 AM	31-may-2008 11:40:11 AM
3	45	192.168.58.102	ROUTER	Not Connected	31-may-2008 11:38:09 AM	31-may-2008 11:40:11 AM
4	44	192.168.58.102	ROUTER	Not Connected	31-may-2008 11:35:05 AM	31-may-2008 11:35:08 AM
5	43	192.168.58.100	ROUTER	Not Connected	31-may-2008 11:35:15 AM	31-may-2008 11:37:04 AM
6	42	192.168.58.100	ROUTER	Not Connected	31-may-2008 11:24:54 AM	31-may-2008 11:25:52 AM
7	38	192.168.58.100	ROUTER	Not Connected	31-may-2008 09:41:18 AM	31-may-2008 09:42:10 AM
8	37	192.168.58.100	ROUTER	Not Connected	31-may-2008 09:41:17 AM	31-may-2008 09:46:10 AM
9	26	192.168.58.100	ROUTER	Not Connected	31-may-2008 08:28:00 AM	31-may-2008 08:29:04 AM
10	25	192.168.58.100	ROUTER	Not Connected	31-may-2008 08:30:58 AM	31-may-2008 08:35:03 AM
11	24	192.168.58.100	ROUTER	Not Connected	31-may-2008 05:53:01 AM	31-may-2008 05:54:02 AM
12	23	192.168.58.100	ROUTER	Not Connected	31-may-2008 05:49:57 AM	31-may-2008 05:50:56 AM
13	22	192.168.58.100	ROUTER	Not Connected	31-may-2008 05:29:34 AM	31-may-2008 05:30:36 AM
14	21	192.168.58.100	ROUTER	Not Connected	31-may-2008 05:12:15 AM	31-may-2008 05:14:19 AM

Screen Shot 9.1.13: Failure and Recovery Log

Numeric Network Tracer Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Stop Home Search Favorites

Address http://localhost:8080/examples/history/alert\_email\_log.jsp

Go

**EMAIL SENT DETAILS**

S.No	Transaction ID	IP Address	Category	From ID	To ID
1	23	192.168.50.254		ntp@numericups.com	ntp
2	14	192.168.80.254		ntp@numericups.com	ntp
3	18	192.168.200.254		ntp@numericups.com	ntp
4	24	192.168.50.254		ntp@numericups.com	ntp
5	10	192.168.80.254		ntp@numericups.com	ntp
6	7	192.168.80.254		ntp@numericups.com	ntp@numericups.com;ntp@numericups.com
7	22	192.168.80.254		ntp@numericups.com	ntp
8	8	192.168.80.254		ntp@numericups.com	ntp@numericups.com;ntp@numericups.com
9	1	192.168.100.254		ntp@numericups.com	ntp
10	6	192.168.200.254		ntp@numericups.com	ntp@numericups.com;ntp@numericups.com
11	9	192.168.80.254		ntp@numericups.com	ntp

Done Local intranet

**Screen Shot 9.1.14: Alert Sent Log**

NUMERIC NETWORK TRACER - Microsoft Internet Explorer

Address [http://192.168.100.192:8080/examples/history/applic\\_log.jsp](http://192.168.100.192:8080/examples/history/applic_log.jsp) Go Links



NUMERIC NETWORK TRACER User: test

HOME MONITOR MASTER VIEWS ADMINISTRATION REPORT HELP LOGOUT

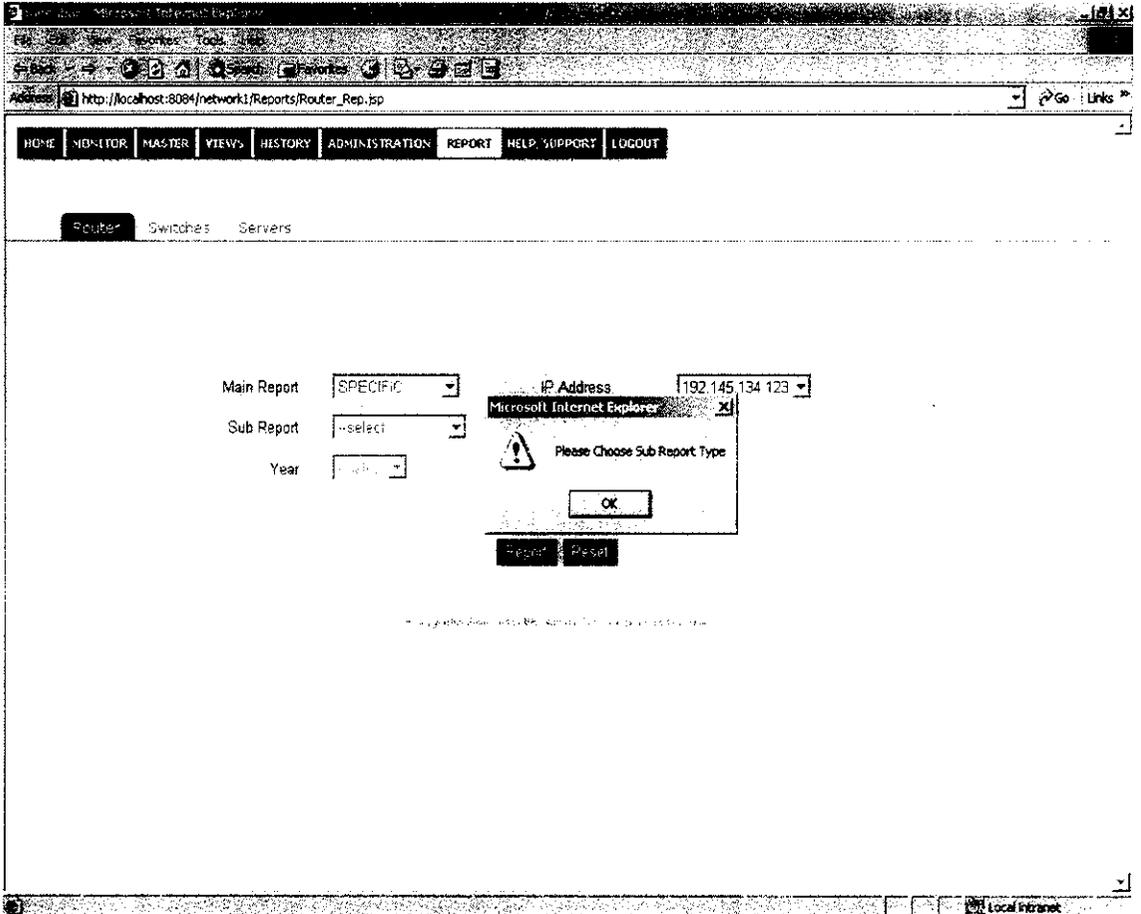
### System Status Details

S.No	System Status	Status Time
1	Application Running	31 may 2008 12:27:58

Copyright © 2008 NUMERIC NETWORK TRACER. All Rights Reserved.

Internet

**Screen Shot 9.1.15: System Status Details**



Screen Shot 9.1.16: Report Form Validation

JSP Page - Microsoft Internet Explorer

Address: http://localhost:8084/network1/Reports/Rou\_Specific\_Date.jsp

 **Down Time Report Specific Date** Welcome test

S.No	Transaction ID	IP Address	Category	Location	Department
1	24	192.168.100.240	ROUTER	HO CHENNAI	NTFL
2	23	192.168.100.192	ROUTER	HO CHENNAI	NTFL
3	22	192.168.100.156	ROUTER	HO CHENNAI	NTFL
4	20	192.168.100.156	ROUTER	HO CHENNAI	NTFL
5	19	192.168.100.156	ROUTER	HO CHENNAI	NTFL
6	15	192.168.100.154	ROUTER	HO CHENNAI	NTFL
7	11	192.168.100.188	ROUTER	HO CHENNAI	NTFL

Base Local Intranet

**Screen Shot 9.1.17: Specific Date Downtime Report**

JSP Page - Microsoft Internet Explorer

Address: http://localhost:8084/network1/Reports/Router\_Report.jsp

Department	Failure Time	Recovery Time	Total Down Time	Business Down Time	Non Business Down Time
NTFL	06-may-2008 16:16		67hr 6min	31hr 6min	36hr 0min
NTFL	02-may-2008 18:30	03-may-2008 15:10	20hr 46min	8hr 46min	12hr 0min
NTPL	02-may-2008 19:08	03-may-2008 15:18	21hr 8min	9hr 8min	12hr 0min
NTPL	16-may-2008 12:31	02-may-2008 16:59	196hr 26min	600hr 26min	579hr 0min
NTFL	26-apr-2008 12:31	02-may-2008 16:59	146hr 26min	76hr 26min	70hr 0min
NTPL	25-feb-2008 11:18	25-feb-2008 10:12	6hr 54min	3hr 54min	3hr 0min
NTFL	24-feb-2008 11:18	24-feb-2008 20:12	8hr 54min	5hr 42min	3hr 12min
NTFL	15-jan-2008 04:35	15-jan-2008 18:34	13hr 59min	13hr 34min	3hr 25min
NTFL	10-apr-2008 06:19	10-apr-2008 21:10	14hr 51min	12hr	2hr 51min
NTFL	10-apr-2008 10:14	13-apr-2008 10:20	14hr 6min	14hr 6min	0hr 0min

Done

localhost

**Screen Shot 9.1.18: Past Year Downtime Report**

JSP Page - Microsoft Internet Explorer

Address: http://localhost:8084/network1/Reports/Router\_Report.jsp

Down Time Report-Past Month

Welcome test

IP	Category	Location	Department	Failure Time	Recovery Time	Total f
8.100.240	ROUTER	HO CHENNAI	NTP	06-may-2008 16:16		
8.100.192	ROUTER	HO CHENNAI	NTP	02-may-2008 16:30	03-may-2008 16:16	
8.100.158	ROUTER	HO CHENNAI	NTP	02-may-2008 16:36	03-may-2008 16:16	
8.100.166	ROUTER	HO CHENNAI	NTP	15-may-2008 12:31	03-may-2008 16:59	
8.100.165	ROUTER	HO CHENNAI	NTP	06-apr-2008 12:31	03-may-2008 16:59	
8.100.154	ROUTER	HO CHENNAI	NTP	13-apr-2008 06:19	16-apr-2008 21:10	
8.100.163	ROUTER	HO CHENNAI	NTP	13-apr-2008 16:14	17-apr-2008 08:19	

Done Local intranet

Screen Shot 9.1.19: Past Month Downtime Report

ISP Page Microsoft Internet Explorer

Address http://localhost:8084/network/Reports/Router\_Report.jsp

 **Down Time Report-Monthly** Welcome test

S.No	IP Address	Category	Location	Department	Month	Total Down Time	Bl
1	192.168.100.189	ROUTER			DEC-2008*	552hr 5min	
2	192.168.100.180	ROUTER	HO CHENNAI	NTPL	NOV-2008*	76hr 56min	
3		ROUTER	HO CHENNAI	NTPL	DEC-2008*	744hr 0min	
4	192.168.100.188	ROUTER	HO CHENNAI	NTPL	NOV-2008*	51hr 5min	
5		ROUTER	HO CHENNAI	NTPL	DEC-2008*	744hr 0min	
6	192.168.100.156	ROUTER	HO CHENNAI	NTPL	MAY-2008	21hr 3min	
7	192.168.100.192	ROUTER	HO CHENNAI	NTPL	MAY-2008	70hr 48min	
8	192.168.100.240	ROUTER	HO CHENNAI	NTPL	MAY-2008*	19hr 10min	
9	192.168.100.154	ROUTER	HO CHENNAI	NTPL	APR-2008	14hr 51min	
10	192.168.100.156	ROUTER	HO CHENNAI	NTPL	APR-2008*	107hr 25min	
11		ROUTER	HO CHENNAI	NTPL	MAY-2008*	40hr 59min	
12	192.168.100.168	ROUTER	HO CHENNAI	NTPL	APR-2008	14min	
13	192.168.100.156	ROUTER	HO CHENNAI	NTPL	MAR-2008*	395hr 29min	
14		ROUTER	HO CHENNAI	NTPL	APR-2008*	720hr 0min	
15		ROUTER	HO CHENNAI	NTPL	MAY-2008*	40hr 59min	
16	192.168.100.160	ROUTER	HO CHENNAI	NTPL	FEB-2008	15hr 49min	
17	192.168.100.166	ROUTER	HO CHENNAI	NTPL	JAN-2008	13hr 59min	

Done Local intranet

**Screen Shot 9.1.20: Monthly Downtime Report**

## CHAPTER 10

### REFERENCES

#### 10.1 REFERENCE BOOKS

1. Larry L. Peterson, Bruce S. Davie, "Computer networks", Morgan Kaufmann Publishers, 1999.
2. Patrick Naughton, Herbert Schildt, "Java 2: The Complete Reference ", Third Edition, Tata McGraw-Hill Publishing Company Limited.
3. Karl Avedal et. al. , "Professional JSP", Wrox Press Inc., 2001.
4. Kevin Loney, George Koch . "Oracle 8i: The Complete Reference", Tenth Edition, Tata McGraw-Hill Publishing Company Limited.

#### 10.2 WEBSITES

1. [www.Google.co.in](http://www.Google.co.in)
2. [www.quest.b4.com](http://www.quest.b4.com)
3. [www.sun.forums.com](http://www.sun.forums.com)
4. [www.roseindia.net](http://www.roseindia.net)