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APPLICATION DEVELOPMENT FOR
NETWORK SIMULATOR

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COIMBATORE

A PROJECT REPORT

Submitted to the

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for the award of the degree
of*

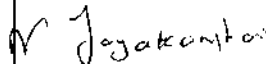
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Bonafide Certificate

Certified that this project report titled **Application Development For Network Simulator** is the bonafide work of **Mr. N. Senthil Raja** 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.


Project Guide


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Submitted for the University Examination held on 3-7-2007


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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr.N.Senthil Raja** Final year M.C.A student bearing the Register No.71204621045 of Kumaraguru College Of Technology, Coimbatore has successfully completed the project titled "**Application Development for Network Simulator**" for the period from **03.01.2007 to 08.06.2007**. He completed the project under the supervision and guidance of **Mr.S.Sankar**, at **tetcos, Bangalore**. During this period his conduct and work was good.

ABSTRACT

The main aim of this project is to build an application for NetSim software. The project deals with software security, data generator, packet level tracing, performance metrics and themes.

The Network will be configured by defining the properties of its components. The NetSim will get the following properties from the user.

- Traffic Generator properties
- Trace Values

The "**Application Development for Network Simulator**" will be a core system which gets the input from the user and send the inputs to the business logic which is part of the NetSim.

The output got by business logic is analyzed based on the protocol and the output is displayed to the user. Configured network can be saved by the user. User can get the saved network scenario at any time.

NetSim security is the major part in this project. Based on the license agreement it provides authorization to the users.

Theme is used for giving more attraction to the NetSim. Theme can be changed according to the user wish. User can change background color.

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CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

The main aim of this project is to build an application for NetSim software. The project deals with software security, data generator, packet level tracing, performance metrics and themes.

The Network will be configured by defining the properties of its components. The NetSim will get the following properties from the user.

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1.2 ORGANIZATION PROFILE

The Education Training and Consulting (TETCOS) incorporated and headquartered in Bangalore, provides hardware and software utilities for domains spanning networking, instrumentation, electronics and communications. Tetcos have been playing the role of a trusted IT service to clients since 1981. It has opened a new branch in USA recently.

Tetcos products include Network Simulation software – NetSim, DAC communication trainers and LAN Trainer. Tetcos offers cost-effective and intelligent IT products to clients. NetSim version 2.0 is one of the successful products of tetcos and around 140 Engineering colleges in Tamil Nadu are using NetSim for training & to learn network protocols.

Tetcos service offerings comprise of product engineering – concept to market R & D and engineering services and application development in the networking and communications space. From inception it firmly believed in ensuring the highest quality and security for products that Tetcos deliver to clients.

Tetcos academic products are designed with a view of catering to

CHAPTER 2

SYSTEM REQUIREMENT AND SPECIFICATION

The system requirement and specification provided here are used in the development of this system.

2.1 Software Requirements

Front end	:	Java 2 PSE 5.0
Back end	:	MS – Access 2003
Operating System	:	Windows XP

2.2 Hardware Requirements

Processor	:	Pentium IV
RAM	:	256 MB
Hard Disk	:	300 MB

2.3 PROGRAMMING ENVIRONMENT

ABOUT JAVA

The Java Programming Language is a general-purpose, concurrent, strongly typed, class-based object-oriented language. It is normally compiled to the byte code instruction set and binary format defined in the Java Virtual Machine Specification.

JAVA PLATFORM & FEATURES

The basic features that make Java a powerful and popular programming language:

- **Platform Independence**
 - The *Write-Once-Run-Anywhere* is the concept here
- **Object Oriented**
 - Object oriented throughout - no coding outside of class definitions, including main().
 - An extensive class library available in the core language packages.
- **Robust**

- **Compiler/Interpreter Combo**
 - Code is compiled to byte codes that are interpreted by Java virtual machines (JVM).
 - This provides portability to any machine for which a virtual machine has been written.
 - The two steps of compilation and interpretation allow for extensive code checking and improved security.
- **Automatic Memory Management**
 - Automatic garbage collection - memory management handled by JVM.
- **Security**
 - No memory pointers
 - Programs run inside the virtual machine sandbox.
 - Security manager - determines what resources a class can access such as reading and writing to the local disk.
- **Good Performance**
 - Interpretation of byte codes slowed performance in early versions, but advanced virtual machines with adaptive just-in-time compilation improved performance.

ABOUT JAVA SWING

Swing is the part of the Java Foundation Classes (JFC) software that implements a set of GUI components with a pluggable look and feel. Swing is implemented entirely in the Java programming language, and is based on the JDK™ 1.1 Lightweight UI Framework. The pluggable look and feel lets us to design a single set of GUI components that can automatically have the look and feel of any OS platform (Microsoft Windows, Solaris, Macintosh).

FEATURES OF JAVA SWING

- Lightweight - Not built on native window-system windows.
- Much bigger set of built-in controls - Trees, image buttons, tabbed panes, sliders, toolbars, color choosers, tables, text areas to display HTML or RTF, etc.
- Much more customizable – We can change border, text alignment, or add image to almost any control. We can customize how minor features are drawn. We can separate internal representation from visual appearance.
- "Pluggable" look and feel - We can change look and feel at runtime, or design own look and feel.
- Many miscellaneous new features - Double-buffering built in, tool tips, dock able tool bars, keyboard accelerators, custom cursors, etc.

FEATURES OF MS ACCESS 2003

→ Incorporate a wide range of data sources - Access 2003 supports a variety of data formats, including Extensible Markup Language (XML), OLE, Open Database Connectivity (ODBC), and Microsoft Windows SharePoint Services.

→ Update properties automatically - Change a field property in a table and all the forms or reports that have controls bound to it can be updated automatically.

→ Analyze your information in powerful ways - Drag controls onto your Access 2003 form to create a Microsoft PivotTable or Microsoft PivotChart view, or a spreadsheet.

→ Easily back up your information - In Access 2003, save a copy of the database you're working on to another location.

→ Use compatible file formats - Access 2003 uses Access 2000 as the default file format for new databases. Because Access version 2002 and Access 2000 can use and modify the same database, organizations can roll out Access 2003 while maintaining capability with existing Access users and

CHAPTER 3

SYSTEM ANALYSIS

3.1 METHODOLOGY

Methodology followed in this project is **Spiral Model**. This model is an evolutionary software process model that couples the iterative nature of prototyping with the controlled and systematic aspects of Water Fall model. The Spiral model is divided into number of phases, also called as "task regions".

Customer Communication

The tasks required to establish effective communication between developer and customer.

Planning

The tasks required to define resources, timelines, and other project related information.

Risk Analysis

Tasks required to assess both technical and management risks.

Construction and Release

The tasks required to construct, test, install, and provide user support.

Customer Evaluation

The tasks required to obtain customer feedback based on evaluation of the software representations created during the engineering stage and implemented during the installation stage.

3.2 EXISTING SYSTEM

- Real time networking environment is the existing system under consideration.
- Current version of NetSim can transmit only text data while simulating.
- Current version of NetSim can simulate only LAN protocols.
- Very difficult to identify the packet level trace and network performance in real time networking environment.
- Real time system is too costly.
- As Hardware Locks were used Network and Time Congestion occurs.
- Limited properties are only allowed.
- All the metrics values are combined and shown so the user gets confused.

3.3 PROPOSED SYSTEM

"Application Development For Network Simulator" in effect aims at developing an User Interface that let the users to build an environment for simulation through easy to use and east to learn method.

- Proposed system can transmit text file and voice file or any kind of file while simulating.
- Proposed system can simulate both LAN & WAN protocols.
- Used to identify the packet or frame status while transferring the data.
- Also used to measure and differentiate the performance of protocols.
- Security is very high so hacking cannot be done.
- Faster access can be done in software lock.
- Themes is one of the major feature in product.
- It is used to change the style of the application based on the user needs.

3.4 FEASIBILITY ANALYSIS

Feasibility analysis is the measure of how beneficial or practical the development of Information System will be to the Organization. Once the scope of the problem has been identified and initial analysis of the system has been completed, the feasibility of the project and the software to be developed is put under the test. This is done at this point to basically verify whether the software which is to be developed meets the scope and whether the project is feasible to

3.4.1 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 technical issues that have to be dealt with in this phase are regarding the technology the system uses and its modifiability. It be verified that the system would be within the state of the art and defects, if any can be reduced to a level matching the application needs. Other considerations include:

- Existing of the necessary technologies.
- Capacity of the proposed system to hold the required data.
- Ability of the system to respond accurately to all inquiries.
- Scope of expandability of the system
- Technical guarantee of accuracy, reliability, ease of access and data security.

When all of the above mentioned features have been considered and the result is found to be positive, then the system development is said to be technically feasible. The proposed system has been identified that it is technically feasible to do.

3.4.2 Operational Feasibility

The proposed system is said to be operationally feasible only if it meets all the requirements of the client. Here the proposed system has found encouraging feedback from skilled users to non-skilled users. The proposed system follows standard UID guidelines so it will work fine when it is developed and installed.

3.4.3 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 development since the system does not require procurement of additional hardware facilities it is economically feasible. In addition, the capability of the system to incorporate future enhancements will improve the performance to suit the future needs of the client organization.

3.4.4 Users of the System

The users are classified into two types, they are as follows.

- Administrator
- Users

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. 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 and Output Design
- ❖ File Design
- ❖ Database Design
- ❖ Prototyping
- ❖ Usability test of Design

4.1.1 Features of a well defined system

In design an efficient and effective system is of great importance to consider the human factor and equipment that these will require to use. System analyst must evaluate the capabilities and limitations of the personal and corresponding factors of the equipment itself.

The characteristics associated with effective system operation are:

- ❖ Accessibility
- ❖ Decision making ability
- ❖ Flexibility
- ❖ Reliability
- ❖ Simplicity

4.1.2 File Design

Software tools are used to describe, manipulate and manage data. Database files are the key source of information into the system. The concept of Dynamic Routing is achieved through Object Serialization, which stores objects state into files. The files should be properly designed and planned for collection, accumulation, editing and retrieving the required information. The objectives of the file design are to provide effective auxiliary storage and to contribute to the overall efficiency of the proposed system.

4.1.3 Modular Design

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 **Application Development For Network Simulator** are as below:

- ❖ NetSim Security (Software Lock)
- ❖ NetSim Themes
- ❖ Packet Level Simulation Trace
- ❖ GUI for Traffic Generator
- ❖ Analysis of Performance Metrics

MODULE DESCRIPTION

NetSim Security (Software Lock)

In this module we overcome the problem of hardware lock by using Software lock. Software lock provides flexibility and reliability. It provides high security. According to the user request license is generated and given to the user. While installing our product Security server is also installed. Security server monitors the license file. If user tries to make any irrelevant changes to the product the Software lock detects it and will not allow the user to make any changes.

NetSim Themes

Theme is used for giving more attraction to the NetSim. Theme can be changed according to the user wish. User can change background color, link color, font color and style of the window. There are five theme available in this software they are

- ❖ Motif
- ❖ Windows
- ❖ Default (Java)
- ❖ Liquid
- ❖ Hippo

Packet Level Simulation Trace

The trace is optional one for the user. If user wants to know about the packet details the trace will be very useful. Trace attributes options are displayed to the user. The user selects the options based on his requirements. Trace attributes differ from protocol to protocol. User selected trace attributes will be passed into Simulation Business logic. Trace attribute Values are stored into user specified file type like Text.

GUI for Traffic Generator

Traffic generator is defined as the GPF...

generation etc. Users can select these inputs from combo boxes & can give inputs to Text Fields.

Analysis of Performance Metrics:

The performance of each device is calculated and displayed to the user. The output got is from the business logic. The output got can also be saved by the user.

4.1.4 Input Design

Input design is the process of converting user-originated inputs to computer-based format. Input data are collected and organized into groups of similar data. Validations are made for each and every data entered in the screens for data accuracy.

The entire project is implemented using Java. The information such as User Id and Password are given in the input screen, which is verified for correctness and then all the processes are done. All users are registered initially and then logged in. If the input fails, then the user should retry it.

On each click of the controls used the respective screens are opened. Each screen has Textboxes, Label and Buttons, Combo boxes. All the screens

system. Each time the data is entered, verifications are done to ensure no errors are committed and to confirm its accuracy.

The first step in design is to design input within predefined guidelines. Inaccurate input data are the most common cause of errors in data processing. Errors entered by data entry operators can be controlled by input design.

4.1.5 Output Design

Computer output is the most important and direct source of information to the user. Efficient and intelligent output design should improve the system's relationships with the user and help in decision making. A major form of output is a hard copy from the printer.

The types of output used in the system are internal output, interactive output, turn-around output and data item. The output design focuses on to serve the intended purposes, to fit the user, deliver the appropriate quality of output. Based on the need and requirements of the various departments, the outputs were designed with much care and consideration.

4.1.6 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 overall objective in the development of database technology has been to treat data as an organizational resource and as an integrated as whole. Database Management System allows data to be protected and organized separately from other resources.

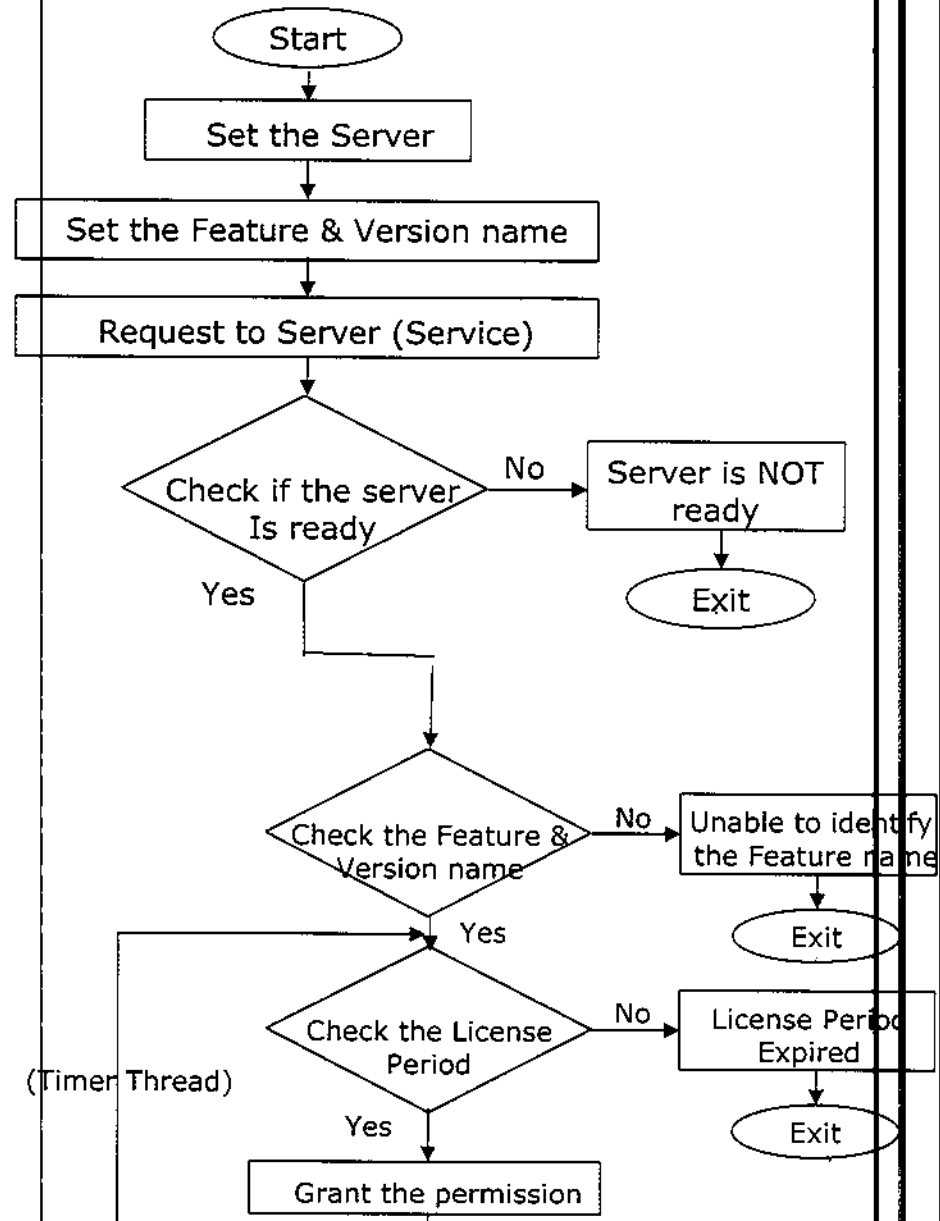
The details about the relevant data for the system are first identified. According to their relationship, tables are designed through the following method.

- 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. Database management system provides a centralized access to the data from the programs. The main objectives of database design are data integration and data independence.

4.1.7 Prototyping

4.2 SYSTEMFLOW DIAGRAM (SFD)



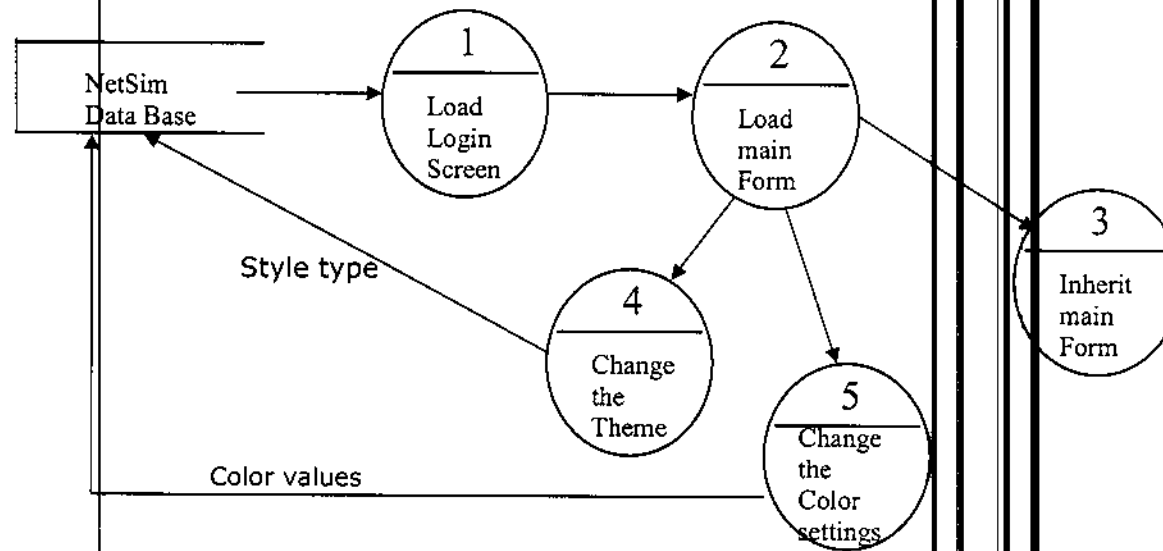


Figure 4.2.2 SFD FOR NETSIM THEME

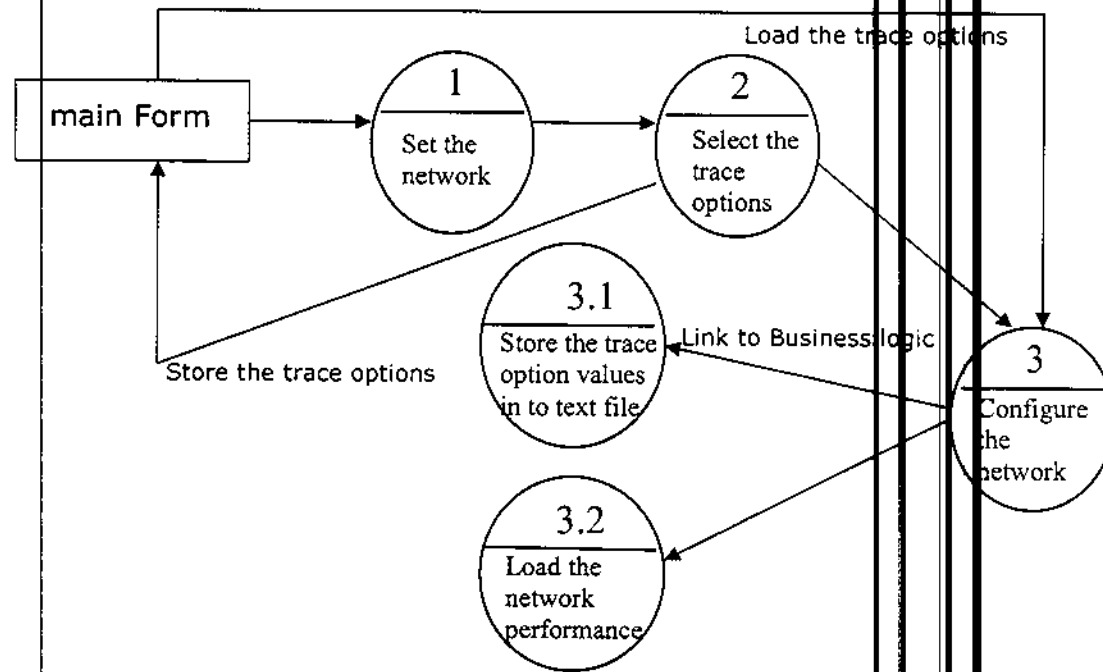


Figure 4.2.3 SFD FOR PACKET LEVEL SIMULATION TRACE

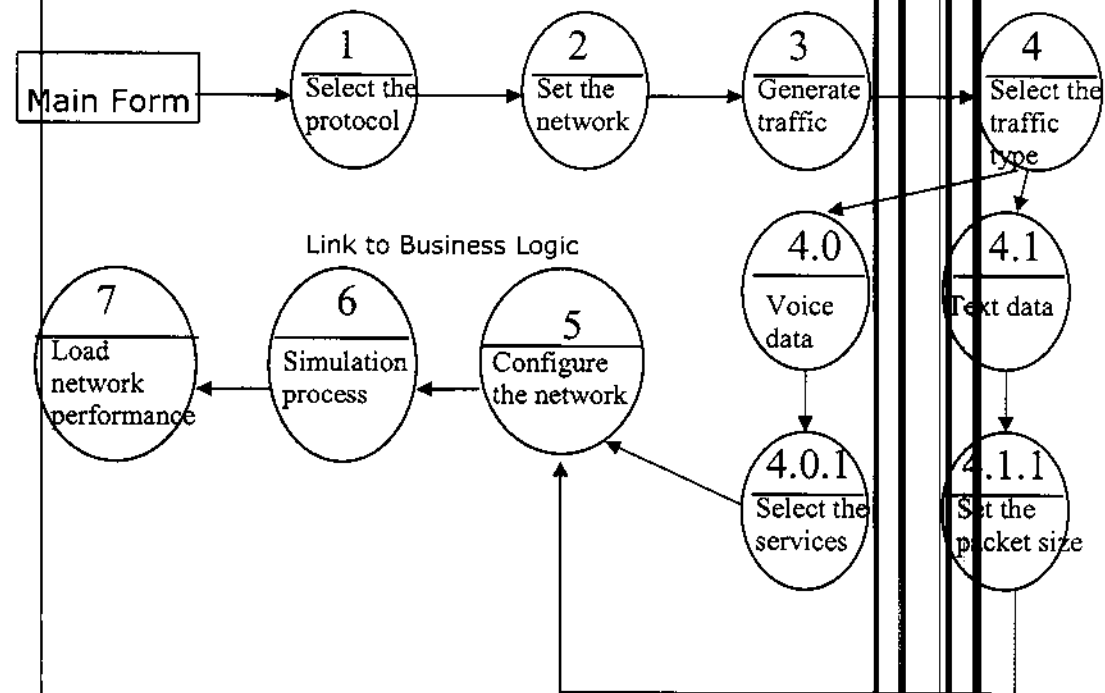


Figure 4.2.4 SFD FOR TRAFFIC GENERATOR

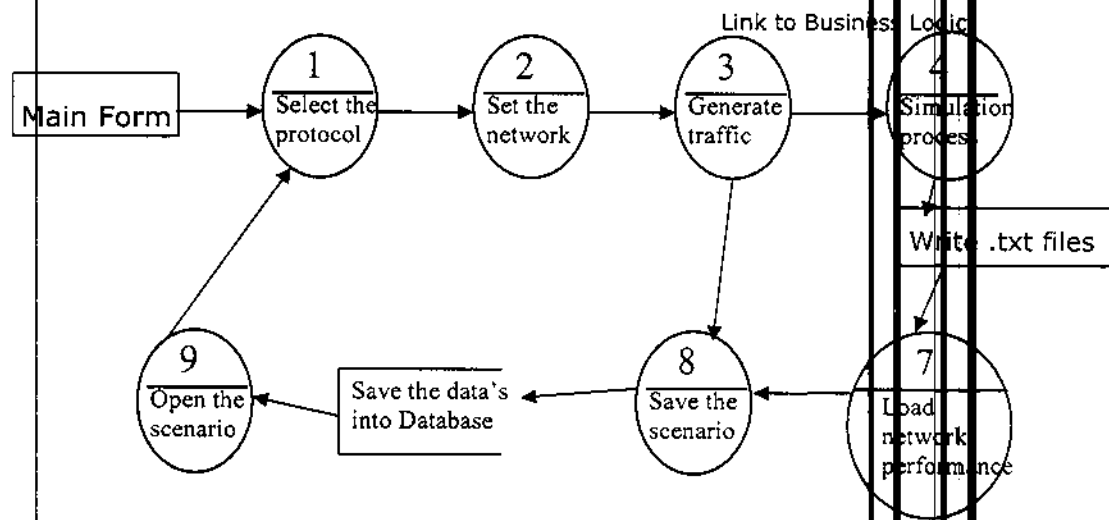


Figure 4.2.5 SFD FOR PERFORMANCE METRICS

CHAPTER 5

SYSTEM TESTING AND IMPLEMENTATION

5.1 SYSTEM 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 the testing proposed 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 are:

- ❖ Unit Test

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.

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. In a page, each control is further tested in unit testing. 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.

Test cases were generated to test the control flow of each unit or module. Almost all cases needed for testing control flows have been generated.

Test Cases for the Login Screen

Sl.No	Test Case	Expected Result	Observed Result	Status
1	User Name : Admin Password : tetcos	Login successful	Login successful	Pass
2	User Name : test88 Password : tet	Login successful	Login Successful	Pass

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.

In this project top-down integration testing is followed. Modules were linked to the main menu in a sequence as required in the real time operating mode of the system. Menu items were created as and when required for the integration. The same procedure is followed in other modules in the same level at first. Then the upper level is taken into action. The flow of data through the whole module in the upper level is taken and executed. A change of data made in one screen should have reflected in all other screens.

This process is continued from the page level to module level, finally to the system level. In the final stage, the whole system is taken together and tested for integration. A change in one place should be reflected through out the system. Data can be lost across the interfaces; one module may have adverse effect on other. Thus integration testing is a systematic testing for constructing tests to uncover errors within the interface.

In this project each and every module are combined and the program

System Testing

System testing is actually a series 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. It should be able to be run on the specified hardware for variety of cases. The project is tested against recovery from errors.

Security Testing

Security testing is important in system testing. The system in no way shall be accessible to unauthorized users. Testing is done to ensure that a user with respective rights can only view the various forms and reports presented by the system. If users try to perform something beyond his assigned rights corresponding messages should be displayed. In such cases it redirects the user back to the previous page.

Load Testing and Performance Testing

Load Testing executes a system in a manner that demands environment to be simulated in abnormal quantity, frequency or volume. The project was load tested in the company to understand the reliability of the system and performance of the proposed system.

Regression Testing

The regression testing is next level of testing. This testing involves adding new features to the existing system and then testing them. Addition of new features would bring many new errors. So once a new feature is added, it is checked for regression test. This testing is conducted at the final level after completing all other tests.

Validation Testing

Validation testing is where requirements established as part of software requirements analysis is validated against the software that has been constructed. The validation should be identified and tested. This test provides the final assurance that the software meets all the functional, behavioral and performance requirements. The errors which, are uncovered during integration testing, are corrected during this phase.

Output Testing

No system could be useful if it does not produce the required output in the specific format. The outputs generated or displayed by the system under consideration are tested along the users about the format required by them.

Usability Testing

5.2 SYSTEM 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 Java programming language, which would develop user interface in 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.

The Swing concept in java allows us to build an effective JID that is easy to use and easy to learn. The proposed system is implemented using the core java concepts and with JFC Swing. The object oriented concepts of java lets to design the components like Nodes, CPEs, Switches, BSS and Routers.

5.2.1 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.

5.1.2 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.

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 the proposed 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 "Simulate" button should connect to the business logic and the values of the configured environment will be transferred. This level of validation can continue to all the controls in the system. This checking is usually done after the system is developed so that all activities that are affected

CHAPTER 6

CONCLUSION AND FUTURE ENHANCEMENTS

6.1 CONCLUSION

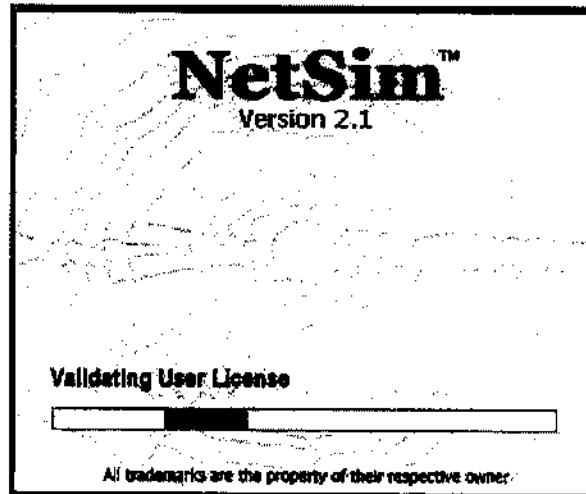
The "**Application Development for Network Simulator**" develops a good User Interface that represent the entire capabilities of the system. The system has met the needs of technically skilled persons and also unskilled normal users. It makes the Network Simulator (NetSim) easy to use and easy to learn and train users. It also gives more security to the product.

The developed system supports traffic generator, packet level simulation trace, theme. The system was tested and implemented in customer workplaces and the performance was found to be good.

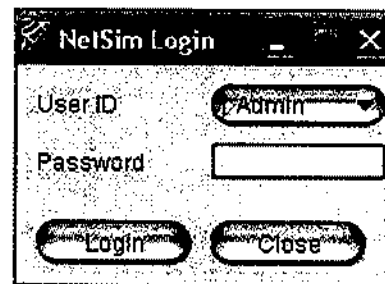
6.2 FUTHER ENCHANCEMENTS

The NetSim is a stand alone application. So, the developed User Interface for NetSim is for stand alone computers. The User Interface Design can be still improved and extended in the future by making NetSim as a centralized application, so that the Business Logic part will reside on the server and User Interface will reside on client and there will be request and response

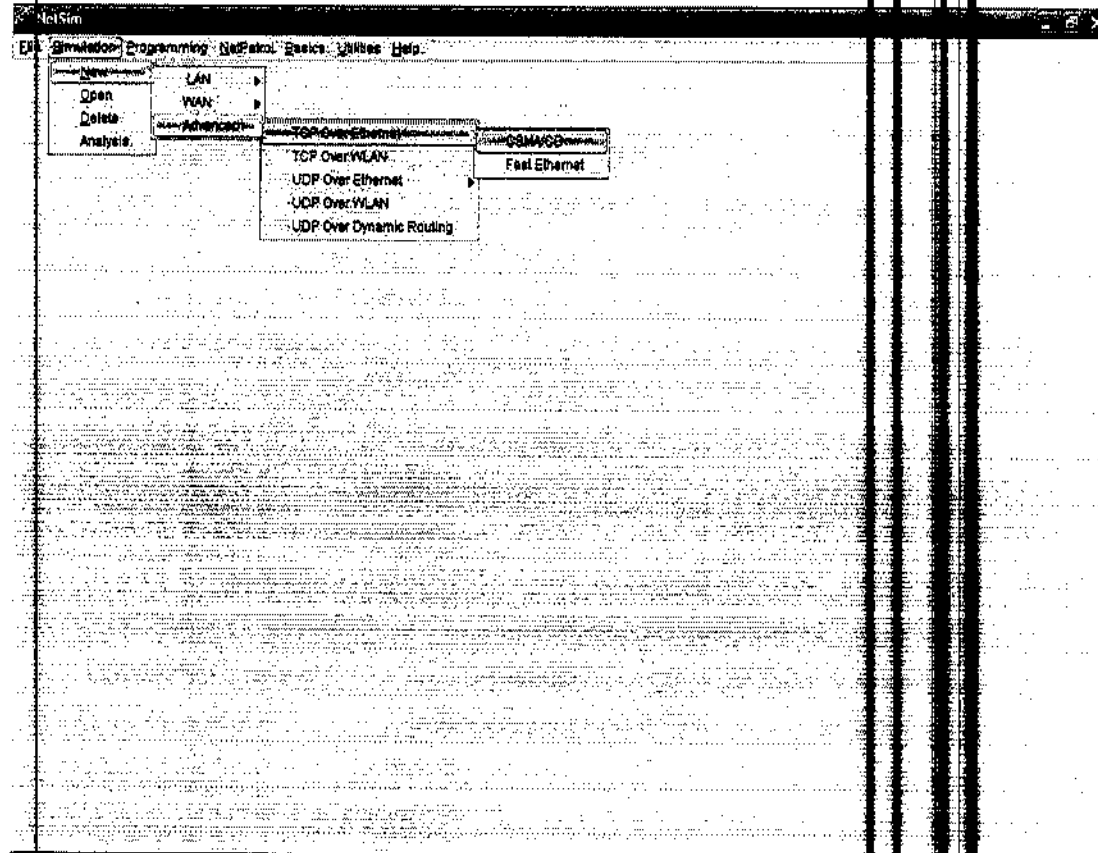
APPENDICES



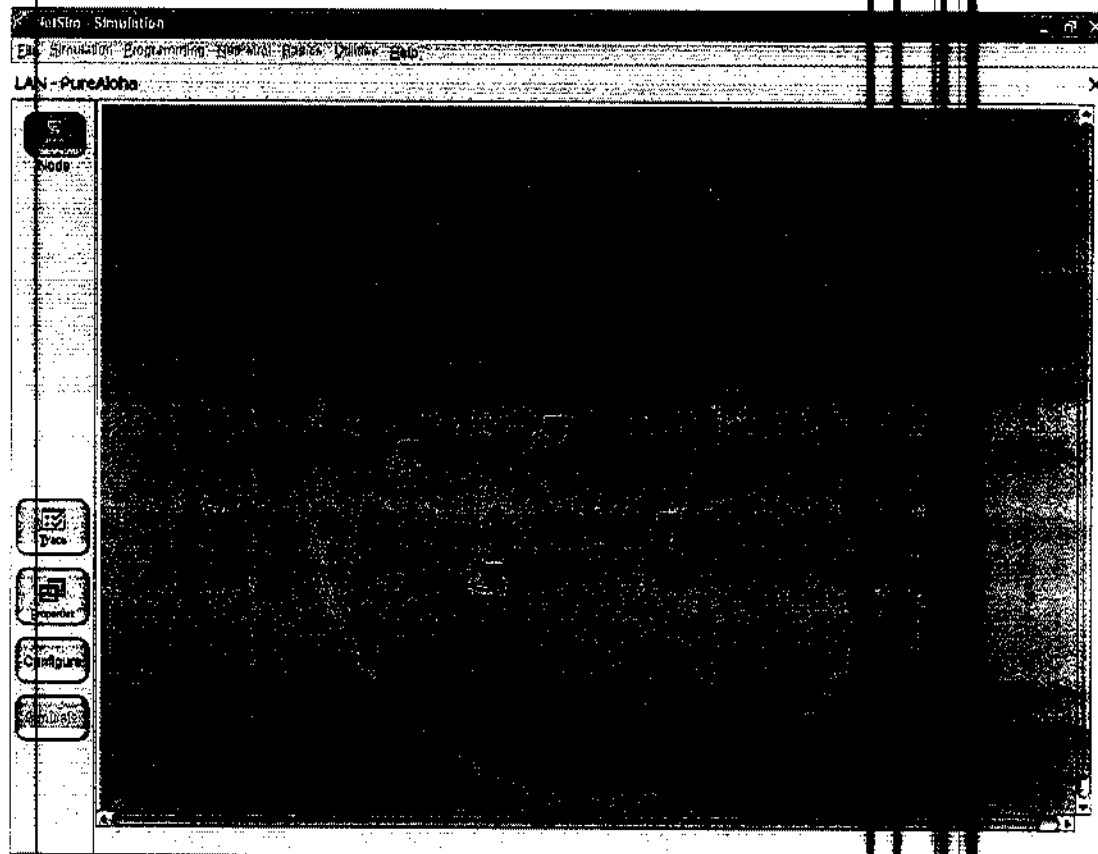
Loading Form



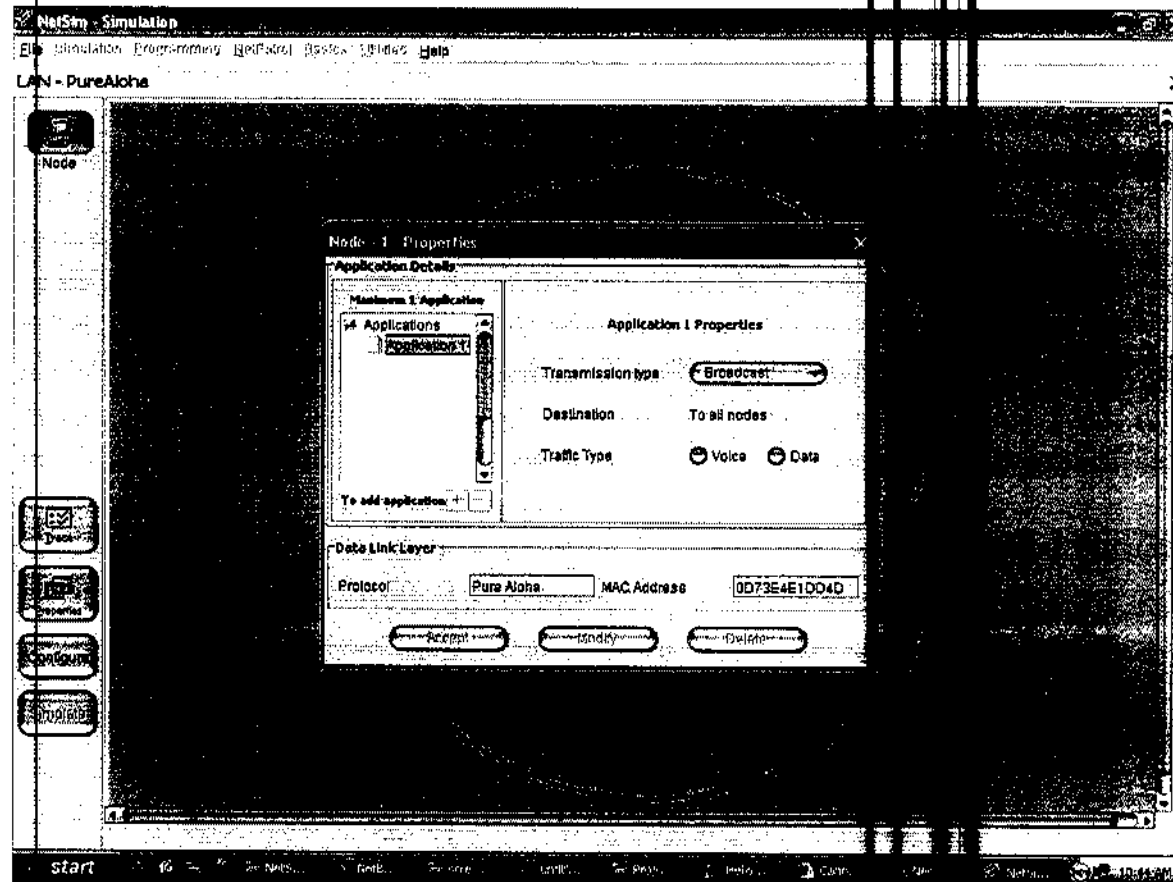
Login Form



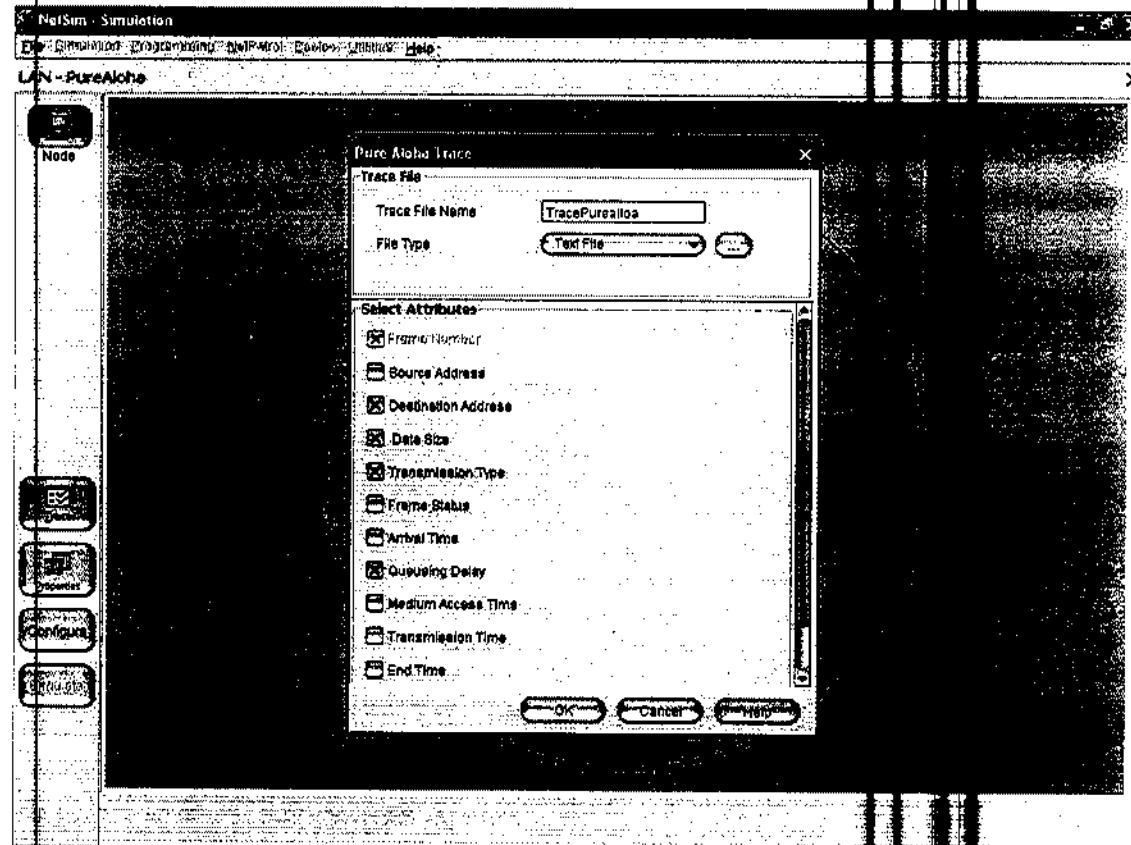
Main Form



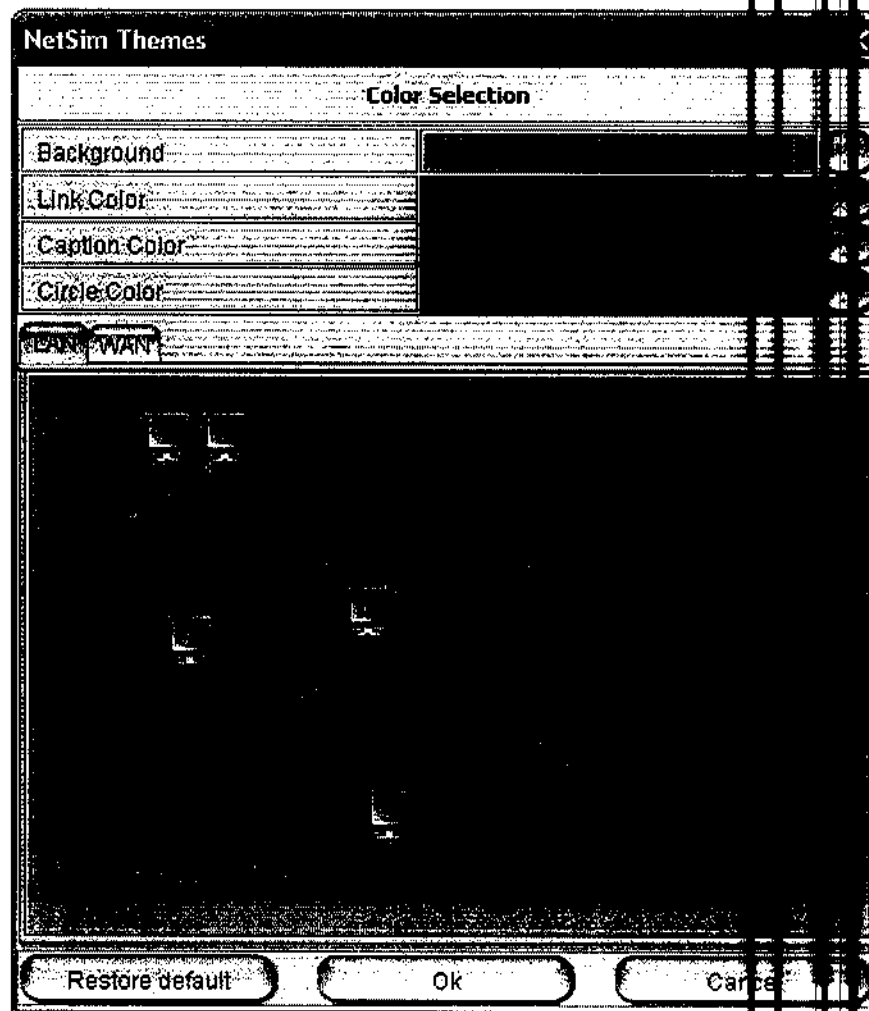
Network Configuration Form

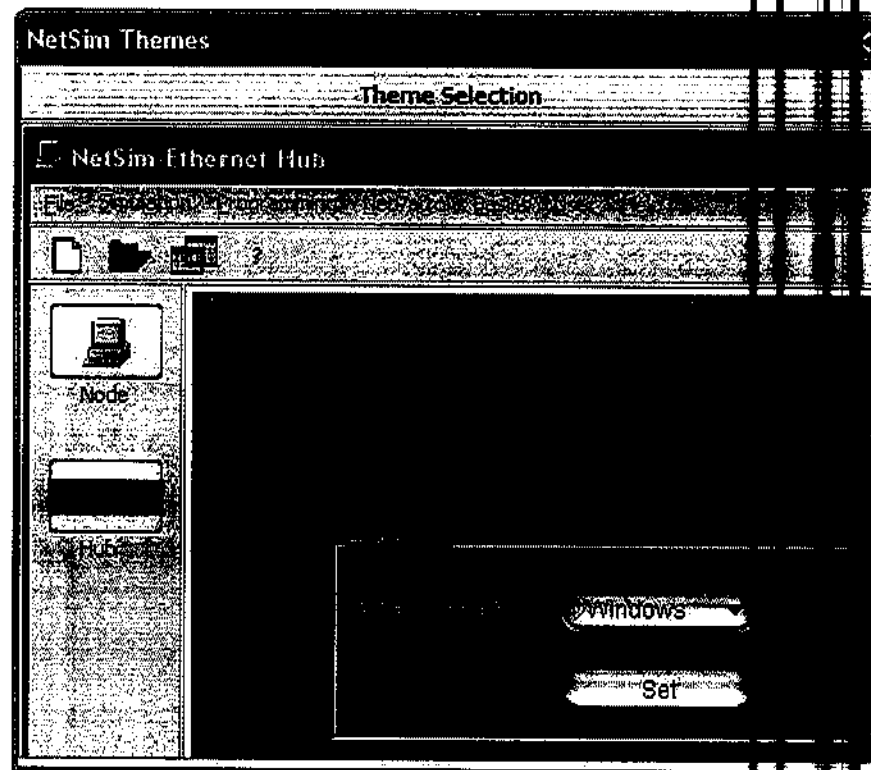


Traffic Generator window



Trace Window





Theme Selection Window

NetSim - Simulation

File Simulation Programming Help Patrol Batches Utilities Help

Advanced - TCP Over WLAN

Network Performance Metrics

Network Performance | BSS Performance | Node Performance | Access Point Performance

TOP Metrics (Cumulative Values)

Node Identity	Node 1	Node 2
BSS Identity	1	1
Distance from the access...	0	0
Frames Generated	50	50
Signal Strength	-58.53	-63.17
DataRate	11.0	5.6
BitError rate	3E-008	3E-005
Response Time	1032.19	990.88
MeanDelay	1032.19	990.88
Throughput	5.78	5.78
Normalized Throughput	5.56	5.56
Probability of success	0.980382	0.980382
Average Attempt	0.000052	0.000052
RTS Collision Count	0	0
Dropped frames	0	0

Description:

Simulation Time (in Sec)

Simulation End Time (in Second)

Metrics Actions

Show Network | Export To Excel | Print | Save

Performance Metrics Window

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