

## 2. OPNET MODELER

We are using the Optimized Network Engineering Tool (OPNET v14.5) for simulation of our networks which is one of the most powerful simulation tools regarding wireless communications. OPNET is a research oriented network simulation tool which provides a development environment for modeling and simulation of deployed wired as well as wireless networks and also provides multiple solutions for managing networks and applications e.g. network operation, planning, research and development (R&D), network engineering and performance management. OPNET 14.5 is designed for modeling communication devices, technologies, protocols and to simulate the performance of these technologies. User can create customized models and simulate various network scenarios [6]. It is possible to simulate various wireless communication technologies such as MANET, 802.11, 3G/4G, Ultra Wide Band, WiMAX, Bluetooth, ZigBee using OPNET tool.

The OPNET modeler is object oriented and employs a hierarchical approach to model communication networks as shown in fig below. The OPNET usability can be divided into four main steps.

1. Modeling : This module is used to build or create a network model.
2. Choose and select statistics: We can choose different statistics to collect from each network.
3. Simulate the network.
4. View and analyze results.

The OPNET Modeler comprises a series of hierarchical user interfaces including Project, node, process, link model, path, and project editors [7] as shown in figures 2, 3, 4.

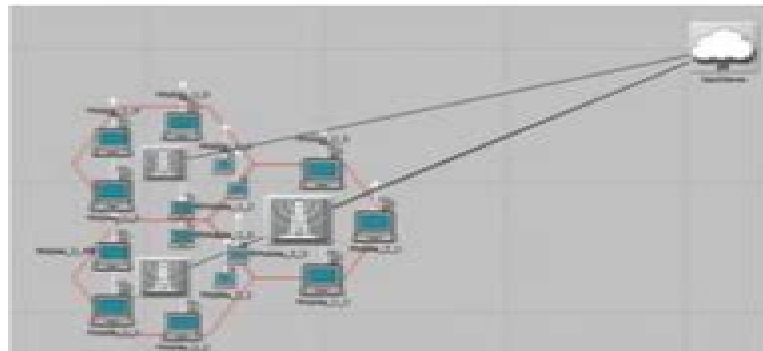


Fig 2 The Network model

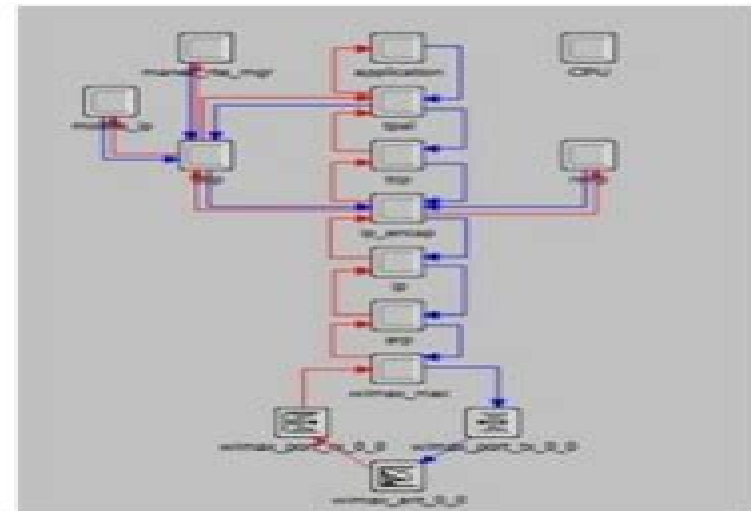


Fig 3 The Node model

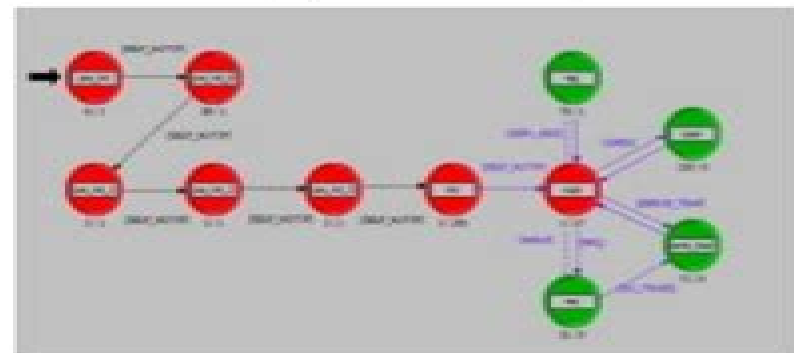


Fig 4 The Process model

## 3. SIMULATION INFRASTRUCTURE AND SCENARIOS FOR WIMAX NETWORK

### 3.1 Simulated Test Bed Infrastructure

The test bed infrastructure consists of simulated WiMAX network, which is interconnected with real devices defined as nodes. The network topology of our test bed network is given in Figure. We have created three network models with different number of nodes and base stations. These models consist of a circular placement of nodes in a hexagon pattern

# Opnet Guru Lab Manual

**Ian Pickup**



## **Opnet Guru Lab Manual:**

Network Simulation Experiments Manual Emad Aboelela, 2007-12-05 Network Simulation Experiments Manual Second Edition enables networking professionals to visualize how networks work by providing free access to easy to install OPNET software. This software provides a virtual environment for modeling, analyzing, and predicting the performance of IT infrastructures including applications, servers, and networking technologies. The book also goes a step further by providing detailed experiments on core networking topologies for use in this simulation environment. Each experiment is also accompanied by review questions, a lab report, and exercises. This book is recommended for graduate students and networking designers and professionals. Useful experimentation for professionals in the workplace who are interested in learning and demonstrating the capability of evaluating different commercial networking products. The experiments in this manual are closely tied to Peterson/Davie Computer Networks fourth edition, a best-selling Morgan Kaufmann title, making it a perfect companion book.

**The Practical OPNET User Guide for Computer Network Simulation** Adarshpal S. Sethi, Vasil Y. Hnatyshin, 2012-08-24 One of the first books to provide a comprehensive description of OPNET IT Guru and Modeler software. The Practical OPNET User Guide for Computer Network Simulation explains how to use this software for simulating and modeling computer networks. The included laboratory projects help readers learn different aspects of the software in a hands-on way.

**Q Learning Management Systems and Instructional Design: Best Practices in Online Education** Kats, Yefim, 2013-04-30 The technical resources, budgets, curriculum, and profile of the student body are all factors that play in implementing course design. Learning management systems administrate these aspects for the development of new methods for course delivery and corresponding instructional design. Learning Management Systems and Instructional Design: Best Practices in Online Education provides an overview on the connection between learning management systems and the variety of instructional design models and methods of course delivery. This book is a useful source for administrators, faculty, instructional designers, course developers, and businesses interested in the technological solutions and methods of online education.

**Official Gazette of the United States Patent and Trademark Office**, 2002

**Network Simulation Experiments Manual** Emad Aboelela, 2003-07-10 The lab exercises contained in the network simulation experiments manual are based on the OPNET simulator v 9, a network simulation tool that was originally developed at MIT. It provides networking professionals with the option of implementing experiments from their homes or workplaces, and the lab manual comes with directions for downloading the free, easy-to-install software. Special version to this book only: see system requirements below. These labs run through simulations closely tied to the material in the text so that you can visualize the discussions covering core network topologies. Various scenarios are presented within each topology, and review questions and a lab report exercise accompany each lab experiment. The experiments also follow the organization of Computer Networks Third Edition by Larry Peterson and Bruce Davie. System requirements for using the OPNET IT Guru

Academic Edition release 9 1 Intel Pentium III 4 or compatible 500 MHz or better 256 MB RAM 400 MB disk space Display 1024 x 768 or higher resolution 256 or more colors The English language version of the following operating systems are supported Microsoft Windows NT Service Pack 3 5 or 6a Windows 2000 Service Pack 1 and 2 are supported but not required Windows XP Service Pack 1 is required Written by an instructor who has used OPNET simulation tools in his classroom for numerous demonstrations and real world scenarios Software download based on an award winning product made by OPNET Technologies Inc whose software is used by thousands of commercial and government organizations worldwide and by over 500 universities Useful experimentation for professionals in the workplace who are interested in learning demonstrating the capability of evaluating different commercial networking products i e Cisco routers Covers the core networking topologies and includes assignments on the ethernet token rings ATM Switched LANs Network Design RIP TCP Queuing Disciplines QoS etc Instructors can download the solutions manual to the exercises in the Network Simulation Experiments Manual by clicking on the Instructors resource link in the upper right corner of the screen and searching for author Aboelela *The Practical OPNET User Guide for Computer Network Simulation* Adarshpal S. Sethi,Vasil Y. Hnatyshin,2012-08-24 One of the first books to provide a comprehensive description of OPNET IT Guru and Modeler software The Practical OPNET User Guide for Computer Network Simulation explains how to use this software for simulating and modeling computer networks The included laboratory projects help readers learn different aspects of the software in a hands on way Quickly Locate Instructions for Performing a Task The book begins with a systematic introduction to the basic features of OPNET which are necessary for performing any network simulation The remainder of the text describes how to work with various protocol layers using a top down approach Every chapter explains the relevant OPNET features and includes step by step instructions on how to use the features during a network simulation Gain a Better Understanding of the Whats and Whys of the Simulations Each laboratory project in the back of the book presents a complete simulation and reflects the same progression of topics found in the main text The projects describe the overall goals of the experiment discuss the general network topology and give a high level description of the system configuration required to complete the simulation Discover the Complex Functionality Available in OPNET By providing an in depth look at the rich features of OPNET software this guide is an invaluable reference for IT professionals and researchers who need to create simulation models The book also helps newcomers understand OPNET by organizing the material in a logical manner that corresponds to the protocol layers in a network **Lab Manual** Azimuth Interactive,2005-04-01 **Lab Manual** Jeffrey S. Beasley,Mark E. Oliver,2004-12

Lab Manual Latest Edition Dr. J. P. Goel,2016-12-17 Lab E Manual Physics For XIIth Practicals A Every student will perform 10 experiments 5 from each section 8 activities 4 from each section during the academic year Two demonstration experiments must be performed by the teacher with participation of students The students will maintain a record of these demonstration experiments B Evaluation Scheme for Practical Examination One experiment from any one section 8 Marks

Two activities one from each section 4 4 8 Marks Practical record experiments activities 6 Marks Record of demonstration experiments Viva based on these experiments 3 Marks Viva on experiments activities 5 Marks Total 30 Marks

**Section A**

**Experiments**

- 1 To determine resistance per cm of a given wire by plotting a graph of potential difference versus current
- 2 To find resistance of a given wire using metre bridge and hence determine the specific resistance of its material
- 3 To verify the laws of combination series parallel of resistances using a metre bridge
- 4 To compare the emf of two given primary cells using potentiometer
- 5 To determine the internal resistance of given primary cells using potentiometer
- 6 To determine resistance of a galvanometer by half deflection method and to find its figure of merit
- 7 To convert the given galvanometer of known resistance and figure of merit into an ammeter and voltmeter of desired range and to verify the same
- 8 To find the frequency of the a c mains with a sonometer

**Activities**

- 1 To measure the resistance and impedance of an inductor with or without iron core
- 2 To measure resistance voltage AC DC current AC and check continuity of a given circuit using multimeter
- 3 To assemble a household circuit comprising three bulbs three on off switches a fuse and a power source
- 4 To assemble the components of a given electrical circuit
- 5 To study the variation in potential drop with length of a wire for a steady current
- 6 To draw the diagram of a given open circuit comprising at least a battery resistor rheostat key ammeter and voltmeter Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram

**Section B**

**Experiments**

- 1 To find the value of  $v$  for different values of  $u$  in case of a concave mirror and to find the focal length
- 2 To find the focal length of a convex lens by plotting graphs between  $u$  and  $v$  or between  $1/u$  and  $1/v$
- 3 To find the focal length of a convex mirror using a convex lens
- 4 To find the focal length of a concave lens using a convex lens
- 5 To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation
- 6 To determine refractive index of a glass slab using a travelling microscope
- 7 To find refractive index of a liquid by using i concave mirror ii convex lens and plane mirror
- 8 To draw the I V characteristic curve of a p n junction in forward bias and reverse bias
- 9 To draw the characteristic curve of a zener diode and to determine its reverse break down voltage
- 10 To study the characteristics of a common emitter npn or pnp transistor and to find out the values of current and voltage gains

**Activities**

- 1 To study effect of intensity of light by varying distance of the source on a L D R
- 2 To identify a diode a LED a transistor and IC a resistor and a capacitor from mixed collection of such items
- 3 Use of multimeter to i identify base of transistor ii distinguish between npn and pnp type transistors iii see the unidirectional flow of current in case of a diode and a LED iv check whether a given electronic component e g diode transistor or IC is in working order
- 4 To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab
- 5 To observe polarization of light using two Polaroids
- 6 To observe diffraction of light due to a thin slit
- 7 To study the nature and size of the image formed by i convex lens ii concave mirror on a screen by using a candle and a screen for different distances of the candle from the lens mirror
- 8 To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses

**Suggested Investigatory Projects**

1 To investigate whether the energy of a simple pendulum is conserved 2 To determine the radius of gyration about the centre of mass of a metre scale as a bar pendulum 3 To investigate changes in the velocity of a body under the action of a constant force and determine its acceleration 4 To compare effectiveness of different materials as insulators of heat 5 To determine the wavelengths of laser beam by diffraction 6 To study various factors on which the internal resistance emf of a cell depends 7 To construct a time switch and study dependence of its time constant on various factors 8 To study infrared radiations emitted by different sources using photo transistor 9 To compare effectiveness of different materials as absorbers of sound 10 To design an automatic traffic signal system using suitable combination of logic gates 11 To study luminosity of various electric lamps of different powers and make 12 To compare the Young's modulus of elasticity of different specimens of rubber and also draw their elastic hysteresis curve 13 To study collision of two balls in two dimensions 14 To study frequency response of i a resistor an inductor and a capacitor ii RL circuit iii RC circuit iv LCR series circuit      Lab Manual

Networking Essentials Course Technology Staff,2000-03      **Lab Manual for Plaster's Soil Science and Management, 5th** Edward Plaster,2013 The Laboratory Manual is a valuable tool designed to enhance your lab experience Lab activities objectives materials lists step by step procedures illustrations and review questions are commonly found in a Lab Manual

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**Lab Manual** Gregory L. Moss,1991      **Lab Manual** Dean Farwood,2009-01-05 The Lab Manual for SECURITY GUIDE TO NETWORK SECURITY FUNDAMENTALS 3rd Edition is a valuable tool designed to enhance your classroom experience Lab activities objectives materials lists step by step procedures illustrations review questions and more are all included Important Notice Media content referenced within the product description or the product text may not be available in the ebook version      *Lab Manual* Bogart,2003-09      **Integrated Science Laboratory Manual** Charles O'Neill,J O'Neill,1991-05-01      **Exam 70-215 Project Lab Manual** Laudon,2003-07

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## **Table of Contents Opnet Guru Lab Manual**

1. Understanding the eBook Opnet Guru Lab Manual
  - The Rise of Digital Reading Opnet Guru Lab Manual
  - Advantages of eBooks Over Traditional Books
2. Identifying Opnet Guru Lab Manual
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Opnet Guru Lab Manual
  - User-Friendly Interface
4. Exploring eBook Recommendations from Opnet Guru Lab Manual
  - Personalized Recommendations
  - Opnet Guru Lab Manual User Reviews and Ratings
  - Opnet Guru Lab Manual and Bestseller Lists
5. Accessing Opnet Guru Lab Manual Free and Paid eBooks
  - Opnet Guru Lab Manual Public Domain eBooks
  - Opnet Guru Lab Manual eBook Subscription Services
  - Opnet Guru Lab Manual Budget-Friendly Options
6. Navigating Opnet Guru Lab Manual eBook Formats

- ePub, PDF, MOBI, and More
- Opnet Guru Lab Manual Compatibility with Devices
- Opnet Guru Lab Manual Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Opnet Guru Lab Manual
  - Highlighting and Note-Taking Opnet Guru Lab Manual
  - Interactive Elements Opnet Guru Lab Manual
- 8. Staying Engaged with Opnet Guru Lab Manual
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Opnet Guru Lab Manual
- 9. Balancing eBooks and Physical Books Opnet Guru Lab Manual
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Opnet Guru Lab Manual
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Opnet Guru Lab Manual
  - Setting Reading Goals Opnet Guru Lab Manual
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Opnet Guru Lab Manual
  - Fact-Checking eBook Content of Opnet Guru Lab Manual
  - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
- 14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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