



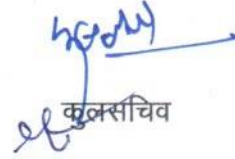
पं० रविशंकर शुक्ल विश्वविद्यालय, रायपुर (छ०ग०)  
॥ दावा आपत्ति सूचना ॥

क्र० 464/विकास/2024

रायपुर, दिनांक 9 / 7 / 2024

NetSim Standard (R & D) Version Software के Proprietary Software होने के संबंध में दावा आपत्ति सूचना।

विश्वविद्यालय के कम्प्यूटर विज्ञान अध्ययनशाला के लिए NetSim Standard (R & D) Version Software कय किया जाना है। उक्त Software के संबंध में फर्म TETCOS LLP, 214, 39<sup>th</sup> A Cross, 7<sup>th</sup> Main, 5<sup>th</sup> Block, Jayanagar, Bangalore 560041 India द्वारा दावा किया गया है कि उक्त Software उनके फर्म द्वारा ही बनाया जाता है तथा Proprietary Product होने का प्रमाण पत्र प्रस्तुत किया गया है। अतः किसी फर्म/संस्था को उक्त के संबंध में किसी प्रकार का दावा आपत्ति हो तो दिनांक 08/08/2024 तक अपना दावा आपत्ति कुलसचिव, पं. रविशंकर शुक्ल विश्वविद्यालय, रायपुर (छ.ग.) के नाम से विकास विभाग में रजिस्टर्ड डाक/स्पीड पोस्ट/कोरियर के माध्यम से प्रस्तुत करें। निर्धारित तिथि के पश्चात प्राप्त दावों पर विचार नहीं किया जावेगा। विस्तृत सूचना विश्वविद्यालय की वेबसाइट [www.prsu.ac.in](http://www.prsu.ac.in) में उपलब्ध है।

  
कुलसचिव



TETCOS LLP  
# 214,39<sup>th</sup> A Cross, 7<sup>th</sup> Main, 5<sup>th</sup> Block,  
Jayanagar. Bangalore 560 041 India

**MANUFACTURER'S PROPRIETARY PRODUCT CERTIFICATE**

**No:** TET / 24-25 / NetSim / 01

**Date:** 03<sup>rd</sup> Apr 2024

This is to certify that item NetSim  
is an article of proprietary nature and TETCOS LLP is the original equipment manufacturers  
(OEM) of the said item.

a) These item(s) are solely manufactured / developed by us in India and not by anyone  
else in the entire world.

b) The proprietary item NetSim is exclusively developed by us and  
trademarked vide Government of India, Trade Mark No: 1331357. Journal No: 1337.  
Class: 41. Trade Mark No: 13311356. Journal No: 1341 Class:9 and Trade Mark No:  
1331358 Journal No. 1655 Class 42.

For TETCOS LLP

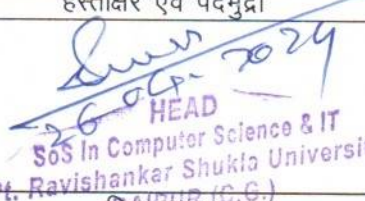



Pranav Viswanathan  
(Partner)

**परिशिष्ट - 4**  
**नियम 4.3.1**  
**(प्रशासकीय विभाग के पत्र में)**

यह प्रमाणित किया जाता है कि,

- (1) सांपत्तिक वस्तु (Proprietary Article) NetSim Standard (R&D) Version (v14.0 or higher)  
 का निर्माण निर्माता/इकाई मेसर्स TETCOS LLP, #214, 39<sup>th</sup> ACross, 7<sup>th</sup> Main, 5<sup>th</sup> Block  
 द्वारा किया जाता है। Jaynagar, Bangalore 560041, India
- (2) सांपत्तिक वस्तु (Proprietary Article) किसी भी अन्य मेक एवं मॉडल स्वीकृत नहीं किये जाने के संबंध में कारण (लिपिबद्ध हो)  
संबंधित उल्लेखित मेक एवं मॉडल Computer Network के शोध कार्य के अधिकतम आवश्यकताओं के Simulation का पूर्ति में सक्षम है।

हस्ताक्षर एवं पदमुद्रा	हस्ताक्षर एवं पदमुद्रा
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# NetSim<sup>®</sup>

Accelerate Network R&D

EDU Suite



## Network Simulation and Emulation Software

Trusted by 500+ Universities Across the World for Network R&D and Lab Experimentation



Satellite Communication



Vehicular Adhoc Networks



5G NR



Internet of Things



Software Defined Networks

New!



Underwater Acoustic Networks



Network Emulator



# WHAT IS NETSIM® AND HOW IS IT USED?

NetSim is the industry's leading network simulation software for protocol modelling and simulation, network R & D and defence applications.

It is an end-to-end, full stack, packet level network simulator and emulator, providing researchers with a technology development environment for protocol modelling and network R&D. The behaviour and performance of new protocols and devices can be investigated in a virtual network within NetSim at significantly lower cost and in less time than with hardware prototypes.



## Design the network

- Create network scenarios using NetSim's GUI or using XML config files
- Click and drop devices, links, application etc. into the environment using NetSim's GUI
- Set properties with just a click. Layer-wise parameters can be edited



## Run the simulation

- Run the Discrete Event Simulation (DES) through the GUI or CLI
- Log packet trace and event trace files
- Capture packets using Wireshark



## Visualize the simulation - Packet animator

- Animate packet flow over wired and wireless links
- Colour variation for control packets, data packets and error packets
- Animate mobility of devices
- Control animation with play, pause and simulation time-line



## Analyse the results

- Examine output performance metrics at multiple levels - network, sub network, link, queue, application etc.
- Study a variety of metrics such as throughput, delay, loss, packet error, link utilization etc.
- Interpret metrics using in-built plots and graphs
- Create pivot tables and charts for visualization



## Interface with external software

- MATLAB®
- SIMULINK®
- SUMO
- WIRESHARK
- Python



## Develop your own protocol / algorithm

- Extend existing algorithms by modifying NetSim's source C code
- Create custom protocols using NetSim's simulation API's
- Debug your code (step-in, step-out, step-over, continue) and watch your variables in sync with simulation

# WHAT DOES NETSIM'S USER INTERFACE LOOK LIKE ?

**Design Window**

Devices & Links  
 Application  
 Traces and Logs  
 Environment

The Design Window displays a network topology with various components including User Equipment (UE), Routers, and Access Points. The interface includes a menu bar (File, Options, Help), a toolbar with icons for adding devices and links, and a main workspace where the network is visualized. A sidebar on the left lists available components like 'UE', 'Router', 'Access Point', and 'eNB'. The workspace shows a complex network of connections between these devices, with some links labeled with 'Uplink Speed' and 'Downlink Speed'.

**Results Window**

Tabular Output  
 Dynamic Metrics Plot  
 Source Data  
 Print  
 Reset Plot  
 Color Picker

Packet & Event Trace  
 Log files  
 Plot Window

The Results Window provides a comprehensive view of simulation data. It features several data tables:
 

- Network Performance:** A table with columns for Application Name, Packet generated, Packet received, Throughput (Mbps), and Delay (microseconds).
- TCP Metrics:** A table with columns for Source, Destination, Segment Sent, Segment Received, Ack Sent, and Ack Received.
- Link Metrics Table:** A table with columns for Link ID, Link Throughput, Data, Control, and Delay.

 Additionally, there is a 'Dynamic Metrics Plot' showing a graph of network performance over time. The interface also includes options for 'Print', 'Reset Plot', and 'Color Picker'. A 'Packet & Event Trace' section is visible at the bottom left, and a 'Plot Window' is shown on the right side.

**Animator Window**

Speed Controls  
 Play / Pause / Stop  
 Animation Options  
 Table Filters

Packet Flow  
 Node Mobility  
 25+ Fields of Packet Information

The Animator Window allows for a dynamic view of the network simulation. It includes a 'Speed Controls' section with 'Play', 'Pause', and 'Stop' buttons, along with a 'Simulation Time' slider and an 'Animation Speed' control. A 'Table Filters' section is also present. The main workspace shows the network topology with nodes and links, and a 'Packet Flow' visualization. A 'Node Mobility' section is also visible. At the bottom, a table displays '25+ Fields of Packet Information':
 

PACKET_ID	SEGMENT_ID	PACKET_TYPE	CONTROL_PACKET_TYP...	SOURCE_ID	DESTINATION_ID	TRANSMITTER_ID	RECEIVER_ID	APP_LAYER_ARRIVAL_E...
0	N/A	Control Packet	TCP SYN	NODE-1	NODE-1	Router-10	Router-10	N/A
0	0	Control Packet	DISP_HELLO	MMSE-11	Broadcast-0	MMSE-11	ROUTER-10	0.000
0	0	Control Packet	DISP_HELLO	ROUTER-10	Broadcast-0	ROUTER-10	MMSE-11	0.000
0	0/A	Control Packet	LTE Measurement Report	UE-41	RELAY-15	UE-41	RELAY-15	N/A



# EXPLORE THE WIDE RANGE OF PRODUCT CAPABILITIES

Libraries (Toolboxes)	Networks / Protocols
<p><b>Component 1</b> (Base. This is required for all other components to run)</p>	<p><b>Inter-Networks:</b>            Ethernet - Fast &amp; Gigabit, ARP; WLAN - 802.11 a, b, g, n, ac and e            Propagation - Pathloss, Shadowing, Fading; IPv4, Firewalls            Routing - RIP, OSPF; Queuing - Round Robin, FIFO, Priority; TCP - Old Tahoe, Tahoe, Reno, New Reno, BIC, CUBIC, SACK, Window Scaling; UDP</p> <p><b>Common Modules:</b>            Applications (Traffic Generator): Voice, Video, FTP, Database, HTTP, Email, Peer-to-peer and Custom; Encryption - XOR, TEA, AES, DES; Virtual Network Stack, Simulation Kernel; Command Line Interface, Metrics Engine with Packet Trace and Event Trace; Packet Animator, Results window with dynamic plots ; Command Line Interpreter</p> <p><b>External Interfaces:</b> Wireshark and MATLAB interfaces</p>
<p><b>Component 2</b></p>	<p><b>Legacy &amp; Cellular Networks:</b> Pure Aloha &amp; Slotted Aloha, GSM and CDMA</p>
<p><b>Component 3</b></p>	<p><b>Advanced Routing and Switching:</b> IGMP, PIM, VLAN, ACL, NAT, Layer 3 Switch</p>
<p><b>Component 4</b></p>	<p><b>Mobile Adhoc Networks:</b> MANET - DSR, AODV, OLSR, ZRP; Multiple MANETs, Interfacing with Bridge Node.</p>
<p><b>Component 5</b></p>	<p><b>Software Defined Networks:</b> Open flow v1.3 Compatible</p>
<p><b>Component 6</b> (Requires C4)</p>	<p><b>Internet of things:</b> IoT with RPL protocol            Wireless Sensor Networks (WSN)            LR-WPAN 802.15.4, Energy model</p>
<p><b>Component 7</b></p>	<p><b>Cognitive Radio Networks:</b> WRAN IEEE 802.22</p>
<p><b>Component 8</b></p>	<p><b>Long-Term Evolution Networks:</b> LTE (4G), LTE Advanced (4.5G)</p>
<p><b>Component 9</b> (Requires C4)</p>	<p><b>Vehicular Adhoc Networks:</b> IEEE 1609 WAVE, Basic Safety Message (BSM) protocol per J2735 DSRC, Interface with SUMO for road traffic simulation</p>
<p><b>Component 10</b> (Requires C3 &amp; C8)</p>	<p><b>5G Networks:</b> Based on 3GPP 38.xxx            Deployment: SA/NSA; Layers: SDAP, RRC, PDCP, RLC, MAC, PHY; MIMO, Beamforming, mmWave, Propagation and Channel Models</p>
<p><b>Component 11</b> (Requires C3)</p>	<p><b>Satellite Communication Networks:</b> Geo Stationary Satellite. Forward link TDMA in Ku Band and Return link MF-TDMA in Ka band per DVB S2. Markov Loo Fading model</p>
<p><b>Component 12</b> <sup>New!</sup> (Requires C2 &amp; C3)</p>	<p><b>Underwater Acoustic Networks:</b> Features underwater communication using the acoustic PHY and Thorp propagation models. Interfaces with legacy networks for running slotted aloha in MAC layer</p>
<p><b>Network Emulator</b> Add On</p>	<p><b>Network Emulator:</b> Connect real hardware running live applications to NetSim Simulator. Interface with Raspberry Pi</p>
<p><b>Advanced 5G</b> <sup>New!</sup> Add On (Requires C10)</p>	<p><b>Advanced 5G:</b> Block Error Rate (BLER), UL and DL Interference, Outer Loop Link Adaptation (OLLA).</p>



# MACHINE LEARNING (ML) WITH NETSIM

NetSim 5G library can be used in combination with ML techniques for a wide range of applications, including:

- Traffic estimation, Load balancing, Throughput prediction
- Resource allocation, Link adaptation
- Power control, Beamforming, Interference estimation, Signal strength prediction

## ML Algorithms

- Reinforcement learning: Q-learning, Multi-armed bandit, MDP, etc.
- Supervised learning: DQN, DNN, GANs etc.

## NetSim – Python Interfacing

- Call NetSim from Python or call Python from NetSim
- NetSim outputs CSV data files that can be imported using python keras or tensor flow

## Generate synthetic data for ML

NetSim can generate vast amounts of perfectly labeled data that is representative of a wide variety of scenarios and edge cases. Data and output files include:

- Network Performance Metrics
- Instantaneous and average throughputs for each link and each application
- Buffer occupancy vs. time, TCP congestion window vs. time
- Packet trace: 30+ parameters for every packet as it flows through the network. These include arrival times, queuing times, departure times, payload, overhead, errors, collisions, etc
- Radio measurements: SINR, Pathloss, Shadowing, Fast fading, LOS/NLOS states, O2I Loss, MCS, CQI, UE-gNB distances, UE-gNB association.
- Radio resource allocation: Buffer fill (queue size), scheduling metric, PRB allocation

## WHAT ARE SOME RESEARCH AREAS WHERE NETSIM IS USED ?

List of R&D projects with code and documentation is available at [www.tetcos.com/file-exchange](http://www.tetcos.com/file-exchange)

### 5G Networks

- » End to End simulation of 5G
- » Radio numerology and impact on latency
- » Channel models for FR1 and FR2

### Internet Of Things (IoT)

- » IoT security
- » Energy management and sustainable operation
- » 6LoWPAN based IoT design

### Wireless Sensor Networks (WSN)

- » Energy efficiency
- » Routing, Clustering and LEACH
- » Localization

### Software Defined Networks (SDN)

- » SDN based Wired/Wireless/MANETs/VANETs
- » Performance evaluation
- » SDN based traffic engineering and QoS

### Vehicular Adhoc Networks(VANETs)

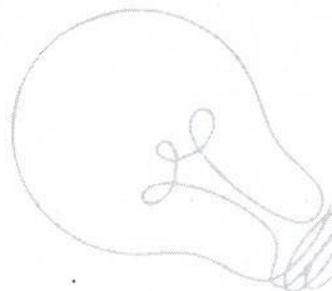
- » v2v and v2i communication
- » Mobility models and connectivity
- » Clustering and routing

### Cognitive Radio Networks (WRAN)

- » Spectrum sensing and incumbent detection
- » Spectrum allocation
- » Interference analysis, spectrum usage

### Mobile Ad hoc Networks (MANET)

- » Location based, Power aware routing
- » Sinkhole attack
- » Intrusion detection systems



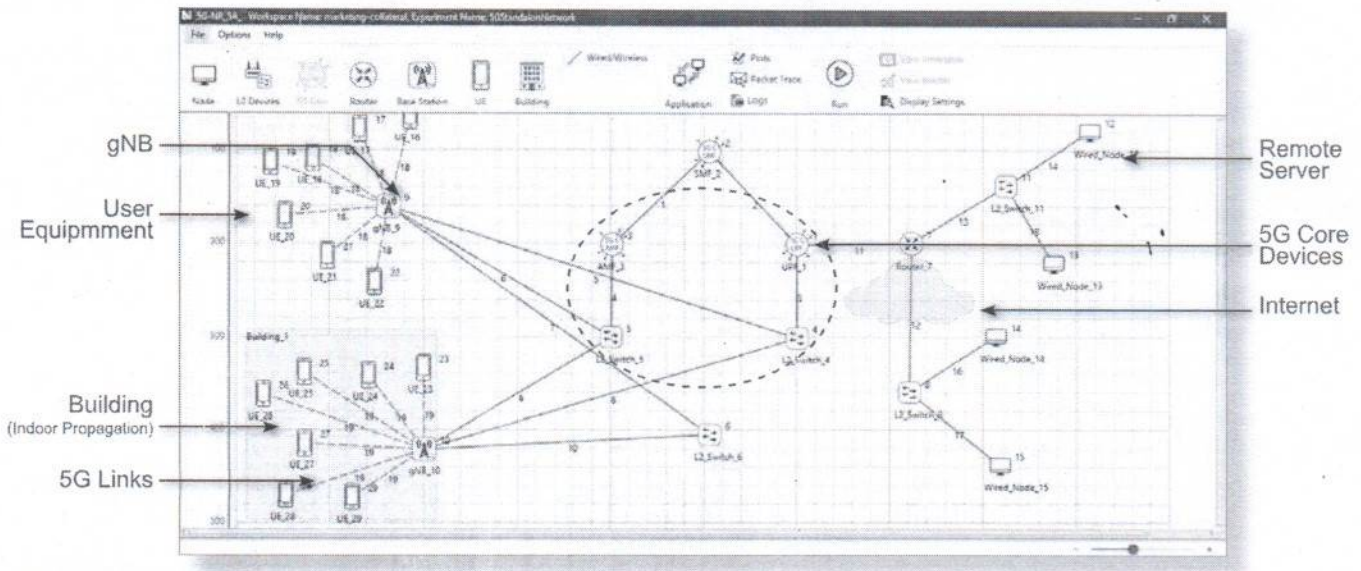
RESEARCH



# NETSIM 5G LIBRARY

## Overview

- End-to-End simulation of 5G networks
- Devices: UE, gNB, 5G Core, Router, Switch, Server
- Interfaces with NetSim's proprietary TCP/IP stack providing simulation capability across all layers of the stack
- Application Models - FTP, HTTP, Voice, Video, Email, DB, Custom and more
- 5G Core covering AMF, SMF and UPF.
- SA and NSA and NSA (LTE-5G dual connectivity) deployment architectures



## Specifications

- MAC Layer based on specification 38.321
  - MAC Scheduler featuring Round Robin, Proportional Fair, Max Throughput and Strictly fair algorithms
  - Link Adaptation to change MCS based on CQI
  - HARQ with retransmissions and soft combining
  - Radio resource allocation log
- PHY Layer
  - Flexible sub-carrier spacing in the NR frame structure using multiple numerologies  $\mu = 0, 1, 2, 3$
  - FR1 and FR2, TDD and FDD, Carrier aggregation
  - Radio measurements log: SNR, RSSI, Pathloss, ShadowFading Loss, BeamformingGain, CQI, MCS
  - PHY layer modulations supported - BPSK, QPSK, 16QAM, 64QAM, 256QAM
- MIMO
  - » gNB antenna count supported 1, 2, 4, 8, 16, 32, 64, 128
  - » UE antenna count supported 1, 2, 4, 8, 16
- Digital and Analog Beamforming
- Interference Models
- RF propagation (Based on 3GPP TR38.900 Channel Model)
  - Rural Macro, Urban Macro, Urban Micro, Indoor, Mixed and Open Office. LOS/NLOS. Outdoor to Indoor
- Mobility and Handover

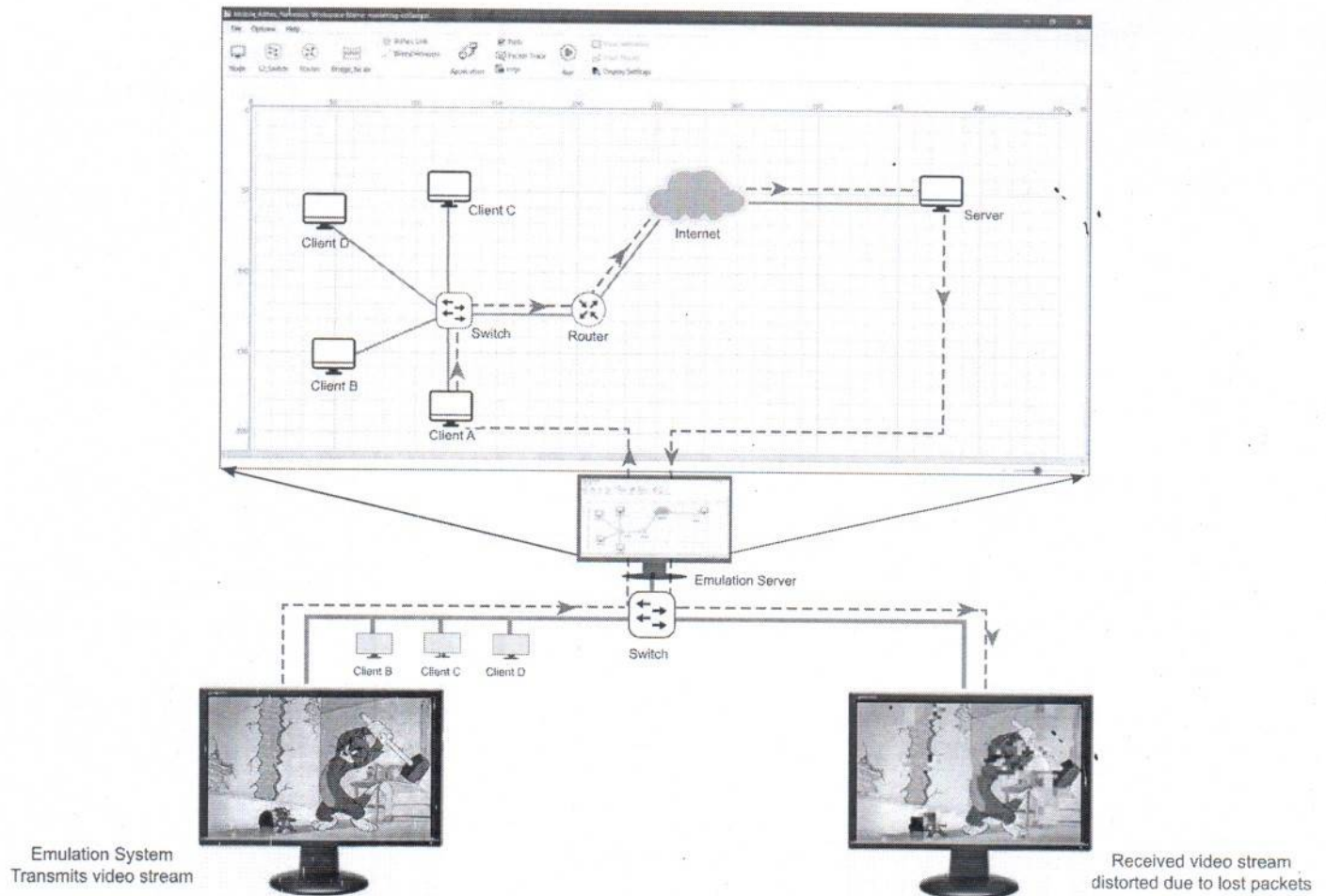
## Featured Examples

- Effect of distance on pathloss for different channel models - Rural-Macro, Urban-Macro, Urban-Micro
- Effect of UE distance on throughput in FR1 and FR2
- Impact of MAC Scheduling algorithms on throughput, in a Multi UE scenario
- 5G Peak Throughput: 3.5 GHz n78 band, 26 GHz n258 band
- Impact of numerology on a RAN with phones, sensors, and cameras
- 4G vs. 5G: Capacity analysis for video downloads

# HOW DO I CONNECT REAL DEVICES TO NETSIM FOR EMULATION ?

NetSim emulator provides critical insights into application performance by enabling user to run their live application over an equivalent virtual network and see how the application is performing in real time.

NetSim is an IP based, data plane, flow-through network emulator; NetSim emulates the network for the data flowing between the client(s) and server(s)



## What is Emulation?

- » NetSim Emulator enables users to connect NetSim simulator to real hardware and interact with live applications
- » Users can test the performance of real applications over a virtual network.
- » If you are designing a new network or expanding an existing network then NetSim emulator will enable you to run your live application over an equivalent virtual network and see how the application is performing in real time

## How does it work?

- » Create the desired network in the Emulation server using NetSim GUI
- » Route traffic from the PC's/VM's where your application runs, to NetSim emulation server
- » Each live PC/VM corresponds to a node in the simulated network. In the simulated network map the device IP addresses per the real PC/VM
- » Run your application & Measure various parameters such as throughput, delay, loss etc. for your live application using Wireshark

## Where can it be used?

- » Military radio networks
- » Satellite link analysis
- » Metro rail networks
- » R&D in new protocol design

## What are the benefits?

- » Can be used to emulate a wide range of technologies
- » Switching, Routing, MANETs, 4G-LTE networks etc.,
- » NetSim Emulator is a cost effective alternative to hardware emulators that have high costs, complicated configuration requirements and limited scale



# TEACH WITH NETSIM

NetSim features in-built sample experiments to teach networking fundamentals through simulation.

## List of Experiments

1. Introduction to NetSim
2. Understand the working of basic networking commands - Ping, Route Add/Delete/Print, ACL
3. Understand the events involved in NetSim DES (Discrete Event Simulator) in simulating flow of one packet from a Wired node to a Wireless node
4. Plot the characteristic curve of throughput versus offered traffic for a Pure and Slotted ALOHA system
5. Understand Measures of Network Performance: Throughput and Delay
6. Simulating Link Failure, Delay and Little's Law, Throughput and Bottleneck Server Analysis
7. Study the working and routing table formation of Interior routing protocols, i.e., Routing Information Protocol (RIP) and Open Shortest Path First (OSPF)
8. Understand working of ARP and IP Forwarding within a LAN and across a router
9. Simulate and study the spanning tree protocol
10. Understanding VLAN operation in L2 and L3 Switches
11. Understanding Access and Trunk Links in VLANs
12. Understanding Public IP Address & NAT (Network Address Translation)
13. M/D/1 and M/G/1 Queues
14. Understand the working of OSPF
15. Introduction to TCP connection management
16. Reliable data transfer with TCP
17. Mathematical Modelling of TCP Throughput Performance
18. TCP Congestion Control Algorithms
19. Understand the working of TCP BIC Congestion control algorithm, simulate, and plot the TCP congestion window
20. Wi-Fi: IEEE 802.11g -Throughput variation with distance
21. Wi-Fi: UDP Download Throughput
22. How many downloads can a Wi-Fi access point simultaneously handle?
23. Multi-AP Wi-Fi Networks: Channel Allocation
24. Wi-Fi Multimedia Extension (IEEE 802.11 EDCA)
25. Cyber physical systems (CPS) and IoT – An Introduction
26. One Hop IoT Network over IEEE 802.15.4
27. IoT – Multi-Hop Sensor-Sink Path
28. Performance Evaluation of a Star Topology IoT Network
29. Study the 802.15.4 Superframe Structure and analyze the effect of Superframe order on throughput (Level
30. To analyze how the allocation of frequency spectrum to the Incumbent (Primary), CR CPE (Secondary User) affects throughput
31. Study how call blocking probability varies as the load on a GSM network is continuously increased
32. Simulate and study 5G Handover procedure

View complete Experiments manual online at

[https://tetcos.com/downloads/v13.2/NetSim\\_Experiment\\_Manual.pdf](https://tetcos.com/downloads/v13.2/NetSim_Experiment_Manual.pdf)

## HOW DO I WRITE MY OWN CODE/ALGORITHM ?



### Protocol Libraries

provided in source C code form with necessary API's and documentation



### User Generated Libraries

can be created by modifying protocol source C code



### Development Environment

in NetSim enables you to call into NetSim user generated libraries to run network scenarios



### Detailed Simulation Report

of user generated libraries covering millions of packets and events are available for detailed analysis



# HOW DOES NETSIM COMPARE WITH COMMERCIAL SIMULATORS ?

## Modeling and Simulation

- 5G
- Internet of Things (IoT)
- Software Defined Networks
- Vehicular Adhoc Networks
- Cognitive Radio Networks
- Special utilities: Config file generator, Batch simulation manager, Multi-parameter sweeper
- Special modules for LEACH, Node Failure, Intrusion detection and Sink hole attacks
- Results dashboard with plots of simulation parameters over time

## Core Architecture

- Protocol Source Code
- Writing and building custom code
- De-bugging custom code
- Packet Animation
- Workspaces: for multiple code bases (and associated experiments)

## Licensing

- License validity
- Cloud Licenses

## Documents and Projects

- Sample Projects based on referenced IEEE papers
- Project Source Code
- Lab Experiment manual

## External Interfaces

- MATLAB® Interface
- SUMO Interfacing for VANETs
- Wireshark interface

## Support and Training

- E-mail & Phone Support
- On-site Support & Training

	Commercial Simulators	NetSim™ Standard
5G	×	✓
Internet of Things (IoT)	×	✓
Software Defined Networks	×	✓
Vehicular Adhoc Networks	×	✓
Cognitive Radio Networks	×	✓
Special utilities: Config file generator, Batch simulation manager, Multi-parameter sweeper	×	✓
Special modules for LEACH, Node Failure, Intrusion detection and Sink hole attacks	×	✓
Results dashboard with plots of simulation parameters over time	×	✓
<b>Core Architecture</b>		
Protocol Source Code	C++	C
Writing and building custom code	Re-build entire tool every time	Build only your primitives code
De-bugging custom code	Off line debug. No visibility of protocol variables	Simulation-in-the-loop debug, visibility of protocol variables
Packet Animation	Available, but no packet information provided	Available with packet information
Workspaces: for multiple code bases (and associated experiments)	×	✓
<b>Licensing</b>		
License validity	Annual	Annual/Perpetual
Cloud Licenses	×	✓
<b>Documents and Projects</b>		
Sample Projects based on referenced IEEE papers	×	✓
Project Source Code	×	✓
Lab Experiment manual	×	Per international university syllabi
<b>External Interfaces</b>		
MATLAB® Interface	×	✓
SUMO Interfacing for VANETs	×	✓
Wireshark interface	×	✓
<b>Support and Training</b>		
E-mail & Phone Support	Internet Forum only. E-mail / Telephone extra	✓
On-site Support & Training	On site support from OEM not available	✓



# HOW DOES NETSIM COMPARE WITH OPEN SOURCE SIMULATORS ?

	Open Source Simulators	NetSim™ Standard
<b>Install</b>	Complicated installation process. Requires knowledge of various compilers and support packages for Python, QT, Doxygen, Mercurial, TCP Dump, and more	Two minute click-through installation
<b>OS/Compiler Support</b>	Linux gcc / g++	Windows Visual Studio (community Edition)
<b>Ease of Use</b>	Write hundreds of lines of script code to create network scenarios. Need to know various scripting and programming languages	Easy to use GUI allows users to simply drag and drop devices, links and applications
<b>Simulation Output</b>	Analyse and write code to extract performance results from multi megabyte files	Results dashboard provides appealing simulation performance reports with tables & graphs
<b>Data Visualization</b>	Fragmented tools with each requiring users to write programs for visualization	Inbuilt graphing with extensive formatting (axes, colours, zoom, titles etc)
<b>Technologies</b>	Limited technologies Stand alone	Wide range of technologies including the latest in 5G, IoT, WSN, MANET, VANET, SDN, LTE-Adv Cognitive Radio, 802.11 n / ac.. and more. Libraries work together
<b>Lab Experimentation</b>	Unsure of the quality of the build / patch you have used and if the results are even valid at the end	Comes with a pre-built set of 30-experiments covering important networking concepts
<b>External Interface</b>	Spend many days researching how to link to external software	Inbuilt interfaces to external software like MATLAB®, SUMO and Wireshark
<b>Easy Debug</b>	Code tens of printf statements to debug your code	Online debug capability and ability to 'watch' all variables. Run animation in parallel for immediate visual feedback
<b>Support</b>	No personalized ontime support Users dependent on online resources which require advanced programming knowledge	Professional support via email, helpdesk, remote desktop and phone



# HOW DO THE DIFFERENT VERSIONS OF NETSIM COMPARE ?

NetSim Standard and NetSim Academic are targeted at educational institutions. NetSim Pro is supplied to Defence and Industry. Please visit [www.tetcos.com](http://www.tetcos.com) for more information on NetSim Pro.

## Technology Coverage

- Internetworks
- Legacy Networks
- SDN
- MANETs
- Cellular Networks
- Wireless Sensor Networks
- Internet Of Things
- Cognitive Radio Networks
- LTE/LTE-A Networks
- VANETs
- 5G NR
- 5G Advanced
- Satellite Communication Networks
- Underwater Acoustic Networks

## Performance Reporting

Performance metrics available for Network and Sub-network

## Packet Animator

Used to animate packet flow in network

## Packet Trace

Available in csv format for easy post processing

## Protocol Library Source Codes with Documentation

Protocol C source codes with extensive documentation

## External Interfacing

Interfacing with SUMO, MATLAB and Wireshark

## Integrated Debugging

Write and link code to NetSim and debug using Visual Studio

## Event Trace

Logs every event processed by NetSim's discrete event engine

## Dynamic Metrics

Allows users to graph the values of parameter over simulation time

## Simulation Scale

## Target Users and Segment

## Emulator(Add on)

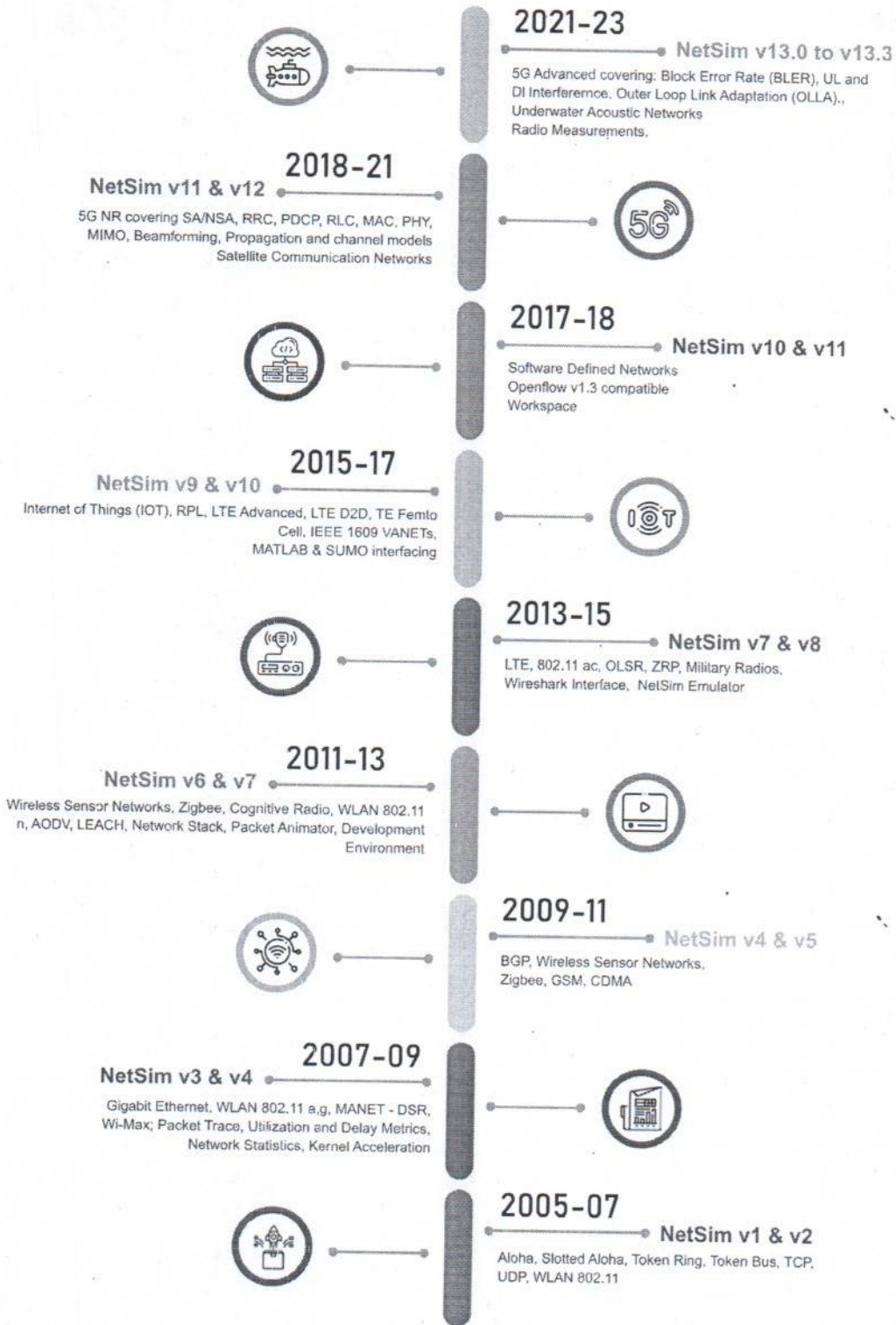
Connect to real hardware running live applications

	NetSim® Academic	NetSim® Standard
Internetworks	✓	✓
Legacy Networks	✓	✓
SDN	✓	✓
MANETs	✓	✓
Cellular Networks	✓	✓
Wireless Sensor Networks	✓	✓
Internet Of Things	✓	✓
Cognitive Radio Networks	✓	✓
LTE/LTE-A Networks	✓	✓
VANETs	✗	✓
5G NR	✗	✓
5G Advanced	✗	✓
Satellite Communication Networks	✗	✓
Underwater Acoustic Networks	✗	✓
<b>Performance Reporting</b> Performance metrics available for Network and Sub-network	✓	✓
<b>Packet Animator</b> Used to animate packet flow in network	✓	✓
<b>Packet Trace</b> Available in csv format for easy post processing	✓	✓
<b>Protocol Library Source Codes with Documentation</b> Protocol C source codes with extensive documentation	✗	✓
<b>External Interfacing</b> Interfacing with SUMO, MATLAB and Wireshark	✗	✓
<b>Integrated Debugging</b> Write and link code to NetSim and debug using Visual Studio	✗	✓
<b>Event Trace</b> Logs every event processed by NetSim's discrete event engine	✗	✓
<b>Dynamic Metrics</b> Allows users to graph the values of parameter over simulation time	✗	✓
<b>Simulation Scale</b>	100 Nodes	500 Nodes
<b>Target Users and Segment</b>	Educational (Lab use)	Educational (Research)
<b>Emulator(Add on)</b> Connect to real hardware running live applications	✗	✓



# OUR JOURNEY

Our customers benefit from our 17+ years of experience in the field of network simulation.



## SUPPORT ECOSYSTEM



Support Portal



Webinars



Videos



File Exchange



Knowledgebase/FAQ



GitHub Repo

# SELECT LIST OF EDUCATION CUSTOMERS



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AC College of Technology, Karaikudi  
Agra Engg. College, Agra  
Aliah University, Kolkata  
Aligarh Muslim University, Aligarh  
Anna University College of Engg., Chennai  
Army Institute of Technology, Pune  
Assam University, Silchar  
A.U College of Engg. Vizag  
B.C.Roy Engg. College, West Bengal  
Basaveshvar College of Engg., Karnataka  
Bhilai Institute of Technology, Chattisgarh  
BIT, Mesra, Patna Campus  
BITS, Pilani, Goa Campus  
BITS, Pilani, Hyderabad Campus  
BITS, Pilani, Pilani Campus  
BVCOEP, Pune  
Central Institute of Technology, Kokrajhar  
CIT, Coimbatore  
College of Engg. and Tech, Bhubaneswar  
College of Engg., Pune  
DAIICT, Ahmedabad  
DCRUST, Murthal  
Delhi Technical University, Delhi  
Dibrugarh University, Assam  
Dr. D.Y Patil Inst of Engg. and Tech, Pune  
FGIET, Bariely  
GNDEC, Ludhiana  
Govt College of Technology, Coimbatore  
Govt Engineering College, Farmagudi, Goa  
Govt Engineering College, Idukki, Kerala Govt  
Engineering College, Kannur, Kerala  
Govt Engineering College, Raipur  
Guru Nanak Dev University, Amritsar  
Gwalior Engg. College, Gwalior  
Haldia Institute of Technology, Kolkata  
IFTM University, Moradabad  
IGIT, Dhenkanal, Orissa  
IIEEST, Shibpur  
IIIT, Allahabad  
IIIT, Bangalore  
IIIT, Guwahati  
IIIT, Gwalior  
IIIT, Raipur  
IIST, Trivandrum  
IIT, Bhubaneswar  
IIT, Delhi  
IIT, Dhanbad  
IIT, Goa  
IIT, Kanpur  
IIT, Kharagpur  
IIT, Patna  
IIT, Roorkee  
Institute of Tech & Management, Gwalior  
Jabalpur Engineering College, Jabalpur  
Jadavpur University, Kolkata  
JNTU College of Engg., Ananthapur  
JNTU College of Engg., Hyderabad  
JNTU College of Engg., Kakinada  
K.K Wagh College of Engineering, Nashik  
Kongu Engg. College, Erode  
Kumaon Engineering College, Uttarakhand  
M.M.M College of Engineering, Gorakhpur  
Malnad College of Engg., Hassan  
MIT, Chennai  
MIT, Pune  
Mizoram University, Aizawl  
Motihari College of Engineering, Bihar  
MS University, Tirunelveli  
Mukesh Patel College of Engg., Mumbai  
NEC, Kovilpatti  
NERIST, Itanagar  
NIT, Agartala  
NIT, Bhopal  
NIT, Calicut  
NIT, Delhi  
NIT, Durgapur  
NIT, Hamirpur  
NIT, Jaipur  
NIT, Jalandhar  
NIT, Kurukshetra  
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NIT, Meghalaya  
NIT, Nagaland  
NIT, Nagpur  
NIT, Rourkela  
NIT, Sikkim  
NIT, Silchar  
NIT, Surat  
NIT, Suratkal  
NIT, Trichy  
NIT, Yupia  
NITTR, Chandigarh  
PEC, Chandigarh  
Pondicherry Engg. College, Puducherry  
Pondicherry University, Puducherry  
PSG College of Technology, Coimbatore  
Punjab College of Engineering, Chandigarh  
RGPV, Bhopal  
Sant Longowal Inst of Technology, Punjab  
Sastra University, Thanjavur, TN  
Sree Chitra Tirunal Engg. College, Trivandrum  
Shivaji University, Kolhapur  
Sinhgad College of Engineering, Pune  
SMVDU, Katra  
SPIT, Mumbai  
Thanthai Periyar Govt Inst of Tech, TN  
Thapar University, Patiala  
TIT, Tripura  
UIET, Chandigarh  
University of Calcutta, Kolkata  
VES Institute of Technology Mumbai  
VIT, Andhra Pradesh  
VIT Chennai  
VIT, Vellore  
VJTI, Mumbai  
VNR VJMET, Hyderabad  
Walchand College of Engineering, Sangli

## Education - International

Al Nahrain University, Iraq  
Alberta University, Canada  
Allepo University, Syria  
Anglia Ruskin University, UK  
Asia Pacific University, Malaysia  
Bayamon Central University, Puerto Rico  
BITS Pilani, Dubai  
Canterbury Christ Church University, UK  
Concordia University, Canada  
Cranfield University-DARTEC, UK  
Education University of HK, Hong Kong  
Fleming College, Canada  
Florida Gulf Coast University, USA  
FREA - AIST, Japan  
Gannon University, USA  
GIST, Korea  
Greenwich University, UK  
Holy Spirit University, Lebanon  
Ingolstadt University, Germany  
INTI, Malaysia  
Kent University, UK  
KFUPM, Saudi Arabia  
Klaipeda University, Lithuania  
KUET, Bangladesh  
LAAS-CNRS, France  
Leeds Beckett Univ, UK  
Liverpool John Moores University, UK  
Michigan University, USA  
Military Technical College, Egypt  
National Institute of Telecommunications, Poland  
National Taiwan University, Taiwan  
National University of Singapore, Singapore  
North Carolina A&T State University, USA  
North West University, South Africa  
Northwestern Polytechnical University, China  
Oslo and Akerhus University, Norway  
Pearson Education, USA  
Poznan University of Technology, Poland  
Queen's University, Canada  
Sabanci University, Turkey  
Salford University, UK  
Sheffield University, UK  
Singapore Institute of Technology, Singapore  
Spelman College, USA  
Staffordshire University, UK  
Sungshin Women's University, South Korea  
Taif University, Saudi Arabia  
Transport & Telecom. Inst, Latvia  
United Arab Emirates University, UAE  
University of Calgary, Canada  
University of Castilla-La Mancha, Spain  
University of Evry, France  
University of Jaffna, Sri Lanka  
University of KwaZulu Natal, South Africa  
University of Malaysia Pahang, Malaysia  
University of Memphis, USA  
University of Nottingham Ningbo China, China  
University of Ottawa, Canada  
University of Patras Greece  
University of South Australia, Australia  
University of Sydney, Australia  
University of Texas at El Paso, USA  
University of Udine, Italy  
University of Wales, UK  
University of Wisconsin Eau Claire, USA  
University Technology Petronas, Malaysia  
University Teknology Malaysia, Malaysia  
UTHM, Malaysia  
York University, Canada



500+ CUSTOMERS ACROSS 25+ COUNTRIES



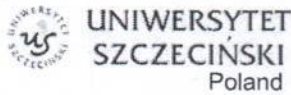
University of Udine Italy



Indian Institute of Space Science and Technology



Philips Netherlands



Sultan Qaboos University Oman



University of Wisconsin Eau Claire USA



STAFFORDSHIRE UNIVERSITY



IIT, Kharagpur



International Institute of Information Technology Bangalore



DRDO-CAIR



DAIICT Ahmedabad India



VIT Vellore Institute of Technology (Dormed from University under section 3 of UGC Act, 1956)



IIT Bhubaneswar Indian Institute of Technology Bhubaneswar

