

# A Survey on Importance of Network Tools and their Applications

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**Abstract**— This paper emphasizes about the importance of Network tools and their field of application. Understanding the importance of network tools and its applications is very important as far a researcher in network field is concerned. In this research paper an elaborate study of the different network tools that can be used for various purposes in computer networks like network management, monitoring, analyzing, simulating and emulating is done.

**Keywords**— Network tools, Simulating, Cisco Packet Tracer, Wireshark, Monitoring, Analyzing, Computer Networks.

## I. INTRODUCTION

In the world that we are living in today it is impossible to think of a system without computer networks as they play a significant role in our day to day life from education to each and every day to day activities. Due to immense use of computer networks there is a significant rise in network traffic. Computer networks is the base of communication. The nodes or devices connected together in the computer network share resources using some protocols for the network. The nodes or devices are interconnected using some network topologies.

Some of the challenges faced in computer networks are monitoring, maintenance, identification of host, conflicts during configuration, concerns related to capacity, security, more time taken for connectivity and degradation in performance. Network simulation is a tool used in computer network research to simulate the behaviour of a network by computing the interactions between its many components, such as its routers, switches, nodes, access points, and connections as given in Figure 1.



Fig 1. Different types of network devices

## II. LITERATURE REVIEW

A review of computer network tools used for various purposes like monitoring, management, simulation, emulation, analysis is done in this section.

A virtual laboratory of computer networks was evaluated in progress by P. Gil et al. [1] using free

simulation tools like GNS3 and associated libraries. The students were able to design and simulate topologies and implement as in real time. They were also able to evaluate the performance and study the behaviour of their network devices all for free. Based on the assessment the students were able to understand the subject's fundamental concepts easily. It posed certain limitations to emulate various protocols like Token Ring or WiFi. But, the findings of this study showed that virtualized computer network labs using GNS3 are effective in helping students learn, especially those who are unfamiliar with TCP/IP architecture and computer networks in general.

R. Emiliano et al. [2] demonstrated the reliability of networking lab environments using GNS3, providing a learning environment for both beginning and more experienced students and practitioners to more effectively learn networking topics in the classroom and through independent study. Figure 2 shows the diagrammatic representation of GNS3 simulation platform.

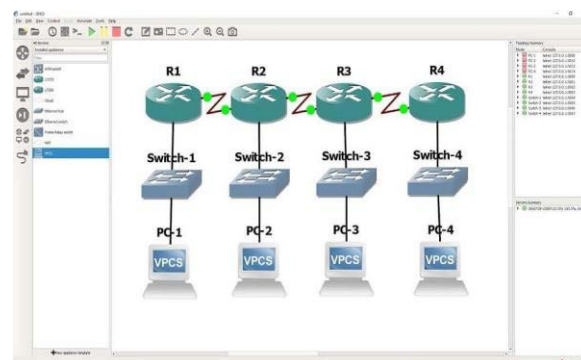


Fig. 2. GNS3 Simulation Platform

A network management simulation was run as a proof-of-concept to demonstrate how Peru could be reconnected to the region's sophisticated networks via CLARA. In order to obtain a sort of baseline for operating the suggested network, a test comparing SNMP and Syslog was carried out as part of the request. Jose -I et al. [3] developed a GNS3 cloud environment by running emulation in two physical computers connected in a peer to peer fashion to alleviate the problem caused by financial constraints, when employing limited computers.

A really well secure communication protocol is SSH. However, the SSH protocol does not provide mobility management. I.-H. Huang [4] suggested a mobile SSH

protocol that uses an application-layer handover mechanism to make SSH work in wireless networks. The suggested protocol has been added to Open SSH and Putty as shown in Figure 3. Their experimental findings indicate that the recovery latency is extremely short.

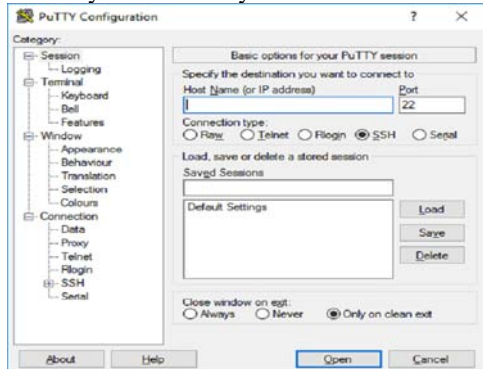


Fig. 3. Putty simulation Platform

The study suggested by Sinha D et al.[5] used several agents to find secure routes with the least amount of network strain. Having used several agents, the source node distributes the secure key to all likely paths. By lowering control packet overheads, these agents ease network congestion. The finalized path is chosen based on the route with the highest weighted trust value. The three phased strategy improved network performance totally and reduced network congestion using an agent based approach. The simulation platform of Secure CRT is as shown in Figure 4.

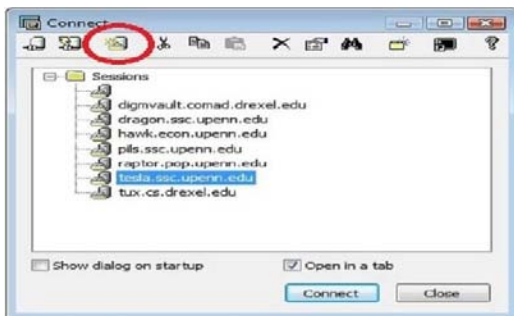


Fig. 4. Secure CRT simulation Platform

The theoretical line loss model was developed by Qiuxia et al.[6] where VBA tool was used and Microsoft Visio 2003 whose simulation platform is given in Figure 5 was the primary development platform. Visio 2003 based line loss computation software for high voltage networks was created which demonstrated that the Visio secondary development process provided a fresh and efficient way to create software for high voltage networks and other power applications that graphically calculates line losses.

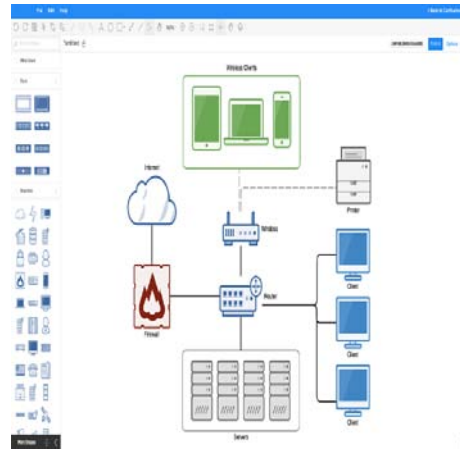


Fig. 5. Microsoft Visio simulation platform

The indemnity of service level agreement (SLA) violations affects the service provider in a cloud domain. W. Hussain et al. [7] proposed SLA violation risk reduction methodology for complex QoS prediction. A minimax disparity strategy is used to weigh the OWA operator in order to manage the risk of SLA breach. By taking into account every potential attitude of the service provider, this approach forecasted deviation in custom prioritised QoS parameter intelligently and recommended necessity of mitigating action. This study made use of linguistic terms, fuzzy numbers, and interval figures to cope with ambiguous information. The analysed findings using PRTG network monitor whose simulation platform set up is as given in Figure 6 showed how the suggested strategy effectively addressed complicated risk reduction actions.



Fig. 6. PRTG Network Monitor simulation platform

As far as internet is concerned routing is very important. In [8] Ida Nurhaida et al. designed OSPF routing for IP internet networks using EVE and their performance was assessed. The experiment's findings suggested that VPLS over MPLS with VLAN Management can improve the performance of video conferences. According to the TIPHON standard, the measurement of QoS metrics such as packet loss, throughput, latency, and jitter was rated as "Good." A considerable impact was produced by the inclusion of VPN administration and the VPLS over MPLS scenario. Packet loss, delay, and jitter was decreased in video conference services by implementing VPN and VPLS over MPLS. VPLS over MPLS: 0.44% packet loss, 4.637 ms delay, and 4.636 ms jitter, respectively. A thorough evaluation of the VLAN management on OSPF, with throughput values up to 59.6%, packet losses up to 0.32%, jitter, and delays of 4.44 ms, was also provided by the study. The simulation platform for EVE is as given in Figure 7.

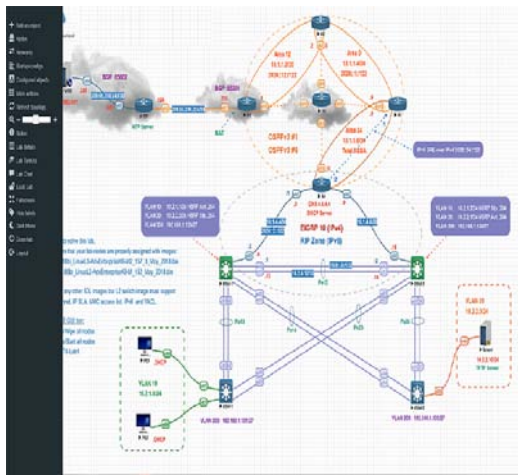


Fig. 7. EVE simulation platform

The 5G mobile communication was designed to meet the increasing user needs, which is summarized as having access to high quality services whenever and wherever they need them. Due to the distinct qualities of satellites, such as increased coverage, reliability, and availability, these demands can be met through the integration of satellites in 5G systems. It has become mandatory that before deploying the new technologies should be tested and improved so as to cut down on time, cost needed and limit blind exploitation of new systems. A great way to assess fresh concepts and put experimental systems to the test is by building a System Level Simulator (SLS). N. Badini et al. [9] described a Network Simulator 3 (NS3)-based open-source SLS (NS3). The simulation platform of NS3 is as given in Figure 8. This tool outperforms cutting-edge technologies and enables simulation of 5G Satellite-Terrestrial Integrated Networks (STIN).

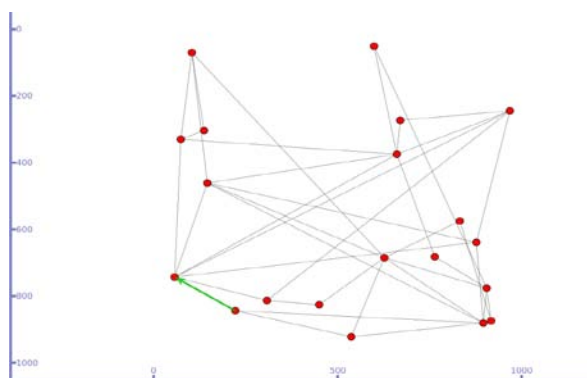


Fig. 8. NS3 simulation platform

According to the study made by Gandotra, R et al.[10], a framework that was created to enable non-intrusive real-time power consumption data gathering from the next generation of networking devices was presented in this paper. The experiment's findings using SNMP Agent simulator as given in Figure 9 suggested that, even in the absence of support for the necessary information models, power consumption data can be collected using non-standard tailored information models, standardised IETF information models, or by abstracting and exposing the data

in a uniform format. The suggested methodology is functionally validated, and the findings from this study could be used to inform energy-efficient network management choices.



Fig. 9. SNMP Agent Simulator platform

The foundation of a smart city is made up of smart buildings. The IoT-based smart building for a scientific department was proposed in the work by O. K. T. AL sultan et al. [11] offered a variety of services like lighting, fire alarms and smart parks, all of which was remotely controlled via the Internet using either the IoT server webpage or the server static IP address through smartphones from outside or inside of the building, PC's or laptops. Java programming was used for setting up the sensors, gateway, and servers. By using IoT industry standard technologies and networking protocols, standardisations are taken intoaccount in the task. The paper discussed the idea to use the Ninevah University building as a prototype for our IoT smart building simulation utilising Cisco packet tracer v7.3, which offers many components and devices that imitate the real network. The Cisco Packet Tracer Simulation platform is as given in Figure 10.

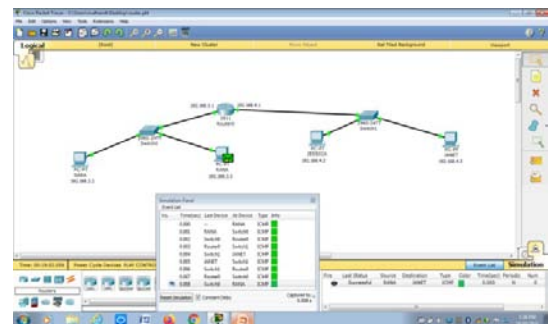


Fig. 10. Cisco Packet Tracer Simulation Platform

IoT technologies employ sensors and controllers to network and organise devices as a single ecosystem, collect data, and control them. To create a system for a smart environment, IoT developers should experiment with a variety of devices and setups. A potent network simulation tool to test network behaviour is Cisco Packet Tracer. In addition, Packet Tracer can be a simulation environment for IoT development that offers an API for interacting with actual devices. In order to monitor and manage the actual IoT devices, the paper by Y. -C. Chen et al. [12] provided the Packet Tracer user interface.

In [13] A. Utsav et al. proposed a smart irrigation system for the climatic conditions of India utilising Cisco packet tracer software. To control and secure the farms, they

deployed a variety of sensors, webcams, and other technological devices. In order to maintain efficient use of water and resources, various analyses for various crops (Kharif and Rabi) were described. The software performed accurate simulation for each situation. Security-based simulations were conducted and described in the subsequent section. They also claimed that our farmers can manage and keep an eye on the farms that are not connected to the Internet with its assistance.

In peer to peer networks a large number of risks is involved and it can be determined. The system itself is vulnerable to insider attacks, remotely and probably there can be heavy leakage of delicate and sensitive information when the data is sent over different data centres. In [14] A. Musa, et al. analysed the security of peer to peer networks using Wireshark. The simulation platform for Wireshark is as given in Figure 11. This paper had given a technique to improve the security of peer-to-peer networks using simulation based experimental study which was followed by a summary of prevailing techniques to mitigate possible threats on peer to peer networks.

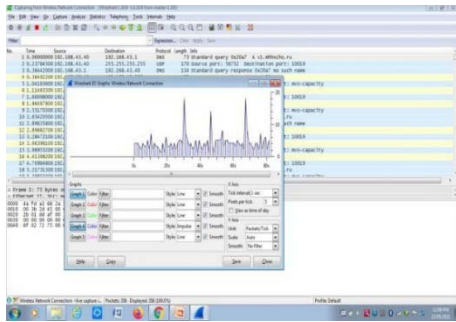


Fig. 11. Wireshark simulation platform

Every day, more people are turning to the internet for various purposes. The expanding and changing needs make it more challenging using the traditional network architecture. Traditional networks also have a complicated architecture and administration issues. To solve the aforementioned network issues, the idea of Software Defined Networks (SDN) has emerged. SDN is a revolutionary network technique that isolates the control and data plane from one another, as well as enabling network programming and responding swiftly to changing events by giving a global perspective of the network, in an effort to get around the limits of today's network infrastructure. The control plane is on top of the load balancer SDN application. Based on a number of factors, load balancers divide the workload between many servers. Using a variety of methodologies, load balancers divide the workload between various servers. unpredictable and some load balancing strategies include round robin. In [15], Ş. Aymaz et al. implemented these two POX controller-based techniques and wireshark analyzed them.

TCP/IP is the most important element of a study of networking aspects. Shaoqiang Wang et al. in [16] had given an understanding about how Wireshark may be used to teach students about TCP/IP protocols. They showed that Wireshark might result in successful educational outcomes by highlighting how valuable it is for practical usage and widespread adoption.

### III. CONCLUSION

For a beginner in computer network research this paper will be very useful. It gives a clear idea about the different network tools that can be used specifically for network management, monitoring, analysing, simulating, and emulating. It also shows the simulation platform setup for the different network tools. It is very difficult to test any system physically. With the help of these network tools the tedious work of a network researcher is reduced to a greater extent. A Survey is conducted successfully in this paper which shows how the network tools can be a promising one in future for the next generation when it comes to simulation even from education field to deploying irrigation for our farmers.

### IV. APPLICATIONS AND FUTURE ENHANCEMENT

The network tools discussed in this paper can be used for taking good decisions related to capacity management which will in turn lead to a wide growth of the network. As future enhancement, deep learning predictive analysis techniques can be used to help telecom industry to predict the growth of the network. Quality of Experience and High Value Customers can help the network administrator get an insight about how to increase network capacity satisfying the customer needs.

### REFERENCES

- [1] P. Gil, G. J. Garcia, A. Delgado, R. M. Medina, A. Calderón and P. Marti, "Computer networks virtualization with GNS3: Evaluating a solution to optimize resources and achieve a distance learning," 2014 IEEE Frontiers in Education Conference (FIE) Proceedings, Madrid, Spain, pp. 1-4, 2014, doi: 10.1109/FIE.2014.7044343.
- [2] R. Emiliano and M. Antunes, "Automatic network configuration in virtualized environment using GNS3," 2015 10th International Conference on Computer Science & Education (ICCSE), Cambridge, UK, pp. 25-30, 2015, doi: 10.1109/ICCSE.2015.7250212.
- [3] J. I. Castillo-Velazquez, E.-Y. Ramirez-Diaz and W. R. M. Niño, "Use of GNS3 Cloud Environment for Network Management Emulation when Comparing SNMP vs Syslog Applied Over an Advanced Network," 2019 IEEE 39th Central America and Panama Convention (CONCAPAN XXXIX), Guatemala City, Guatemala, pp. 1-6, 2019, doi: 10.1109/CONCAPANXXXIX47272.2019.8976995.
- [4] I. -H. Huang, W. -J. Tzeng, S. -W. Wang and C. -Z. Yang, "Design and Implementation of a Mobile SSH Protocol," TENCON 2006 - 2006 IEEE Region 10 Conference, Hong Kong, China, 2006, pp. 1-4, doi: 10.1109/TENCON.2006.343956.
- [5] D. Sinha, and R.Chaki, "AESCRT: Agent enabled secure CRT based routing topology for MANET," Proceedings - International Conference on 2014 Applications and Innovations in Mobile Computing, AIMoC, pp. 172-178, 2014, doi: 10.1109/AIMOC.2014.6785537.
- [6] Q. Yuan, J. Zhang, S. Niu, F. Zhang and B. Zhang, "Study of theoretical line loss calculation for high voltage network and the development of relevant graphic software based on Visio," 2012 International Conference on Systems and Informatics (ICSAI2012), Yantai, China, pp. 1227-1230, 2012, doi: 10.1109/ICSAI.2012.6223256.
- [7] W. Hussain, M. R. Raza, M. A. Jan, J. M. Merigó and H. Gao, "Cloud Risk Management With OWA-LSTM and Fuzzy Linguistic Decision Making," in IEEE Transactions on Fuzzy Systems, vol. 30, no. 11, pp. 4657-4666, Nov. 2022, doi: 10.1109/TFUZZ.2022.3157951.
- [8] Ida Nurhaida, DesiRamayanti, ImayNur, "Performance Comparison based on Open Shortest Path First (OSPF) Routing Algorithm for IP Internet Networks", Communications on Applied Electronics 7(31):12-25. Sept. 2019, DOI:10.5120/cae2019652838.
- [9] N. Badini, M. Marchese and F. Patrone, "NS-3-based 5G Satellite-Terrestrial Integrated Network Simulator," 2022 IEEE 21st Mediterranean Electrotechnical Conference (MELECON), Palermo, Italy, pp. 154-159, 2022, doi: 10.1109/MELECON53508.2022.9843098.
- [10] R. Gandotra, and L. Perigo, "We've Got the Power: A Framework for Real-Time Network Power Monitoring", Journal of Computer and Communications, vol. 8, pp. 75-88, 2020, doi: 10.4236/jcc.2020.85004.

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- [11] O. K. T. AL sultan and A. R. Suleiman, "Simulation of IoT Web-based Standard Smart Building Using Packet Tracer," 2021 7th International Engineering Conference "Research & Innovation amid Global Pandemic" (IEC), Erbil, Iraq, pp. 48-53, 2021,doi: 10.1109/IEC52205.2021.9476125.
- [12] Y. C. Chen, S. S. Chen and S. P. Tseng, "The Implement of Packet Tracer as UI to Monitor and Control Real IoT Devices," 2020 8th International Conference on Orange Technology (ICOT), Daegu, Korea (South), pp. 1-4, 2020,doi: 10.1109/ICOT51877.2020.9468802.
- [13] Pazhani, A. A. J., Gunasekaran, P., Shanmuganathan, V., Lim, S., Madasamy, K., Manoharan, R., &Verma, A. (2022). Peer-Peer Communication Using Novel Slice Handover Algorithm for 5G Wireless Networks. *Journal of Sensor and Actuator Networks*, 11(4), 82.
- [14] A. Musa, A. Abubakar, U. A. Gimba and R. A. Rasheed, "An Investigation into Peer-to-Peer Network Security Using Wireshark," 2019 15th International Conference on Electronics, Computer and Computation (ICECCO), Abuja, Nigeria, pp. 1-6, 2019,doi: 10.1109/ICECCO48375.2019.9043236.
- [15] Dhanabalan, S. S., Sitharthan, R., Madurakavi, K., Thirumurugan, A., Rajesh, M., Avanimathan, S. R., & Carrasco, M. F. (2022). Flexible compact system for wearable health monitoring applications. *Computers and Electrical Engineering*, 102, 108130.
- [16] Shaoqiang Wang, DongShengXu and ShiLiang Yan, "Analysis and application of Wireshark in TCP/IP protocol teaching," 2010 International Conference on E-Health Networking Digital Ecosystems and Technologies (EDT), Shenzhen, pp. 269-272, 2010,doi: 10.1109/EDT.2010.5496372.