

Design and Implementation of a Secure Campus Network

Thota Shiva Sai Krishna, N. Shiva Priya, Dr.C. Rajabhushanam

Received: 29 March 2018 • Revised: 19 April 2018 • Accepted: 01 June 2018

Abstract: Security has been an essential issue within the style in readying of an enterprise network. A campus network is a very important part of campus life and network security is crucial for a campus network. Secured network protects an establishment from security attacks related to network. A university network includes a range of uses like teaching, learning, research, management, e-library, result publication. Network security can stop the university network from differing kinds of threats and attacks. The theoretical contribution of this study may be a reference model design of the university campus network that may be pre-designed or custom-made to make strong, however versatile network that the successive generation needs.

Keywords: Campus Network, Security, Wan, Security Threats, Network Attacks, VPN, VLAN, Firewall.

INTRODUCTION

As the computers and networked systems thrive in today's world, the necessity for increased robust pc and network security becomes more and more necessary. The rise within the network system has exposed several varied styles of web threats. The safety could embrace identification, authentication, authorization and camera to safeguard integrity, convenience, authenticity of element or network instrumentation. There's no laid-down procedure for coming up with a secure network. Network security must be designed to suit the requirements of a organisation.

Campus network is crucial and it plays a very important role for any organization. Architecture and its security are as necessary as air, water, food, and shelter. Network security threat and architecture are invariably serious problems. A campus network is an autonomous network beneath the management of a university that is at within a neighbourhood geographical place and typically it should be a metropolitan area network.

Generally, IT manager in a very network faces many challenges within the course of maintaining, availability, performance, good infrastructure, and security. Securing an enormous network has been always a difficulty to an IT manager. There are plenty of similarities between securing an outsized network and university network; however each has its own problems and challenges. Current institution organisations pay a lot of attention to IT to boost their students' learning experience. Architects of campus can do this if IT managers hold on to the basic principles self-addressed during this reference architecture namely LAN or WAN connectivity design considerations, security, and centralized management. The network infrastructure style has become a vital part for a few IT organizations in recent years. A very important network design consideration for today's networks is making the potential to support future growth in a very reliable, scalable and secure manner. This needs the designer to outline the client's unique situation needed for what significantly the current technology, application, and information design.

Here, completely different analysis papers are consulted for security in campus network. Numerous network info for security issues and their solutions. They represented the current security info standing

Thota Shiva Sai Krishna, UG Scholar, Department of Computer Science and Engineering, BIST, BIHER, Bharath Institute of Higher Education & Research, Selaiyur, Chennai. E-mail: shivasai7392@gmail.com

N. Shiva Priya, Assistant Professor, Department of Computer Science and Engineering, BIST, BIHER, Bharath Institute of Higher Education & Research, Selaiyur, Chennai. E-mail: shivapriyamari@gmail.com

Dr.C. Rajabhushanam, Professor, Department of Computer Science and Engineering, BIST, BIHER, Bharath Institute of Higher Education & Research, Selaiyur, Chennai. E-mail: Rajabhushanam.cse@bharathuniv.ac.in

of the campus network, analysed security threat to campus network and represented the ways to maintenance of network security.

RELATED WORK

1. IS Strategy (by Glasgow University)

- Impact on Network Development and Architecture
- Universal Access
- Security

2. IT Strategy (by ijetae)

- Implement Network Architecture recommendations

BACKGROUND

There are various categories of network like Personal Area Network (PAN), Local Area Network (LAN), and Metropolitan Area Network (MAN), campus Area Network (CAN), Storage Area Network (SAN) and Wide Area Network (WAN).

A Personal Area Network (PAN) may be a network organized around a private person. Personal Area Networks usually involve a mobile, a cellphone and/or a hand-held computing device such as PDA. A Local Area Network (LAN) may be a cluster of computers and associated devices that share a standard communications line or wireless link. Typically, connected devices share the resources of one processor or server within a little geographical area. A Metropolitan Area Network (MAN) may be a network that interconnects users with system resources in an exceedingly geographical area or region larger than that filled by even a large Local Area Network (LAN) however smaller than the space filled by a Wide Area Network (WAN). A campus Area Network (CAN) may be a proprietary Local Area Network (LAN) or set of interconnected LANs serving a organisation, federal agency, university, or similar organization. A Storage Area Network (SAN) may be a high-speed network of storage devices that additionally connects those storage devices with servers. It provides block-level storage that may be accessed by the applications running on any networked servers. A Wide Area Network (WAN) may be a geographically distributed telecommunications network. The term distinguishes a broader telecommunication structure from an Local Area Network (LAN). Intensive analysis or project has been done in the position of network architecture and security problems in CAN.

NETWORK ARCHITECTURE IN CAMPUS AREA NETWORK

The campus network of our study is meant in a hierarchical manner that may be a common practice of campus and enterprise networks. It provides a standard topology of building blocks that enable the network to evolve simply. A hierarchical design avoids the necessity for a fully-meshed network which all network nodes are interconnected.

Designing a campus network might not seem as fascinating or exciting as designing an associate IP telephone network, an associate IP video network, or maybe planning a wireless network. However, emerging applications like these are engineered upon the campus foundation. Very similar to the development of a house, if the engineering work is skipped at the foundation level, the house can crack and eventually collapse.

If the foundation services associated reference design in an enterprise network don't seem to be rock-solid, applications that depend upon the services offered by the network like IP telephone, IP video and wireless communications can eventually suffer performance and responsibility challenges. To continue the analogy, if a reliable foundation is built and engineered, the house can indicate years, growing with the owner through alterations and expansions to provide safe and reliable service throughout its life cycle.

The same is true for associate enterprise campus network. The design principles and implementation best practices represented during this document are tried-and-true lessons learned over time according to my referred research papers.

SECURITY ISSUES IN CAMPUS NETWORK

There are a large vary of network attacks and security threats, network attack methodologies, and categorizations of network attacks. The question is: how will we minimize these network attacks? The sort of attack, as specified by the categorization of reconnaissance, access, or DoS attack, determines the suggests that of mitigating a network threat.

Table 1:Identify the threat

Threat	Internal \ External	Threat consequences
e-mail with virus	External origination internal use	Could infect system reading email and subsequently spread throughout entire organization.
Network Virus	External	Could enter through unprotected ports, compromise whole network.
Web based virus	Internal browsing to external site	Could cause compromise on system doing browsing and subsequently affect other internal systems.
Web server attack	External to web servers	If web server is compromised hacker could gain access to other systems internal to network
Denial of service attack	Internal	External services such as web Email and ftp could become unusable. If router is attack , whole network could go down.
Network User Attack (Internal employee)	Internal to anywhere	Traditional border firewalls do nothing for this attack. Internal segmentation firewall can help contain damage.

TYPES OF NETWORK ATTACKS

Classes of attack would possibly add passive observance of communications, active network attacks, close-in attacks, exploitation by insiders, and attacks through the service supplier. Data systems and networks offer attractive targets and will be resistant to attack from the complete vary of threat agents, from hackers to nation-states. A system should be ready to limit injury and recover rapidly after once attacks occur. Here are some attacks types:

1. Passive Attack
2. Active Attack
3. Distributed Attack
4. Insider Attack
5. Close-in Attack
6. Phishing Attack
7. Hijack attack
8. Spoof attack
9. Buffer overflow
10. Exploit attack
11. Password attack

REAL TIME DATA: SOME NETWORK ATTACKS

A.DENIAL OF SERVICE (DOS):

Denial of service (DoS) is a interruption of service either as a result of the system is destroyed, or as a result of its quickly out of stock. Examples add destroying a computer's hard disc, cutting the physical infrastructure, and consumption of all offered memory on a resource. Fig1 shows a true note value of DoS attack knowledge in a very campus network using Cyber am security device. After configure Firewall and VLAN for DoS attack

Attacker tried DoS Attack however the protection device dropped the traffic that we've shown within the diagram.

Attack Type	Source		Destination	
	Applied	Traffic Dropped	Applied	Traffic Dropped
<u>SYN Flood</u>	Yes	44844	No	0
<u>UDP Flood</u>	Yes	48240	No	0
TCP Flood	No	0	No	0
<u>ICMP Flood</u>	Yes	27	Yes	429

UDP Flooders	
IP Address	Last Seen
103.21.42.205	Sat 20 June 14:04:48
103.21.42.206	Sat 20 June 14:56:31
172.16.20.141	Sat 20 June 15:19:15
172.16.20.222	Sat 20 June 16:22:57
172.16.21.140	Sat 20 June 16:04:01
172.16.22.22	Thu 18 June 16:59:49
172.16.22.82	Sat 20 June 13:11:56
173.194.49.104	Sat 20 June 14:03:06
173.194.49.112	Sat 20 June 13:48:55
182.48.85.204	Sat 20 June 16:13:37
182.48.85.206	Sat 20 June 15:56:10
185.23.127.61	Fri 19 June 17:06:11
216.58.220.37	Sat 20 June 23:27:40
52.74.248.98	Fri 19 June 17:02:37
74.125.214.208	Sat 20 June 13:58:12

Figure 1: Attacker IP List
B. ARP SPOOFING ATTACK

ARP spoofing could be a style of attack during which a malicious actor sends falsified ARP (Address Resolution Protocol) messages over Local Area Network (LAN). This ends up in the linking of associate attacker's mackintosh (MAC) address with IP address of a sever on the network. We are showing some real time information that attacker using Net cut Software package exploit the weakness within the stateless ARP protocol due to lack of authentication in a campus network. Examples add destroying a computer's hard disc, cutting the physical infrastructure and using all the memory.

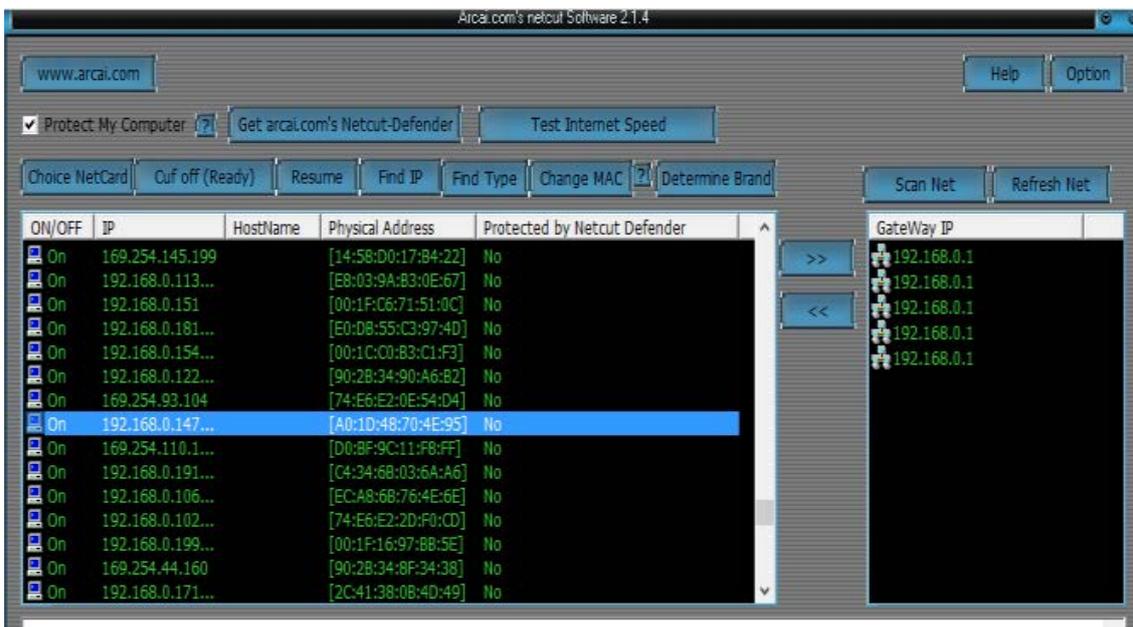


Figure 2 : ARP Spoofing Attack in Campus network

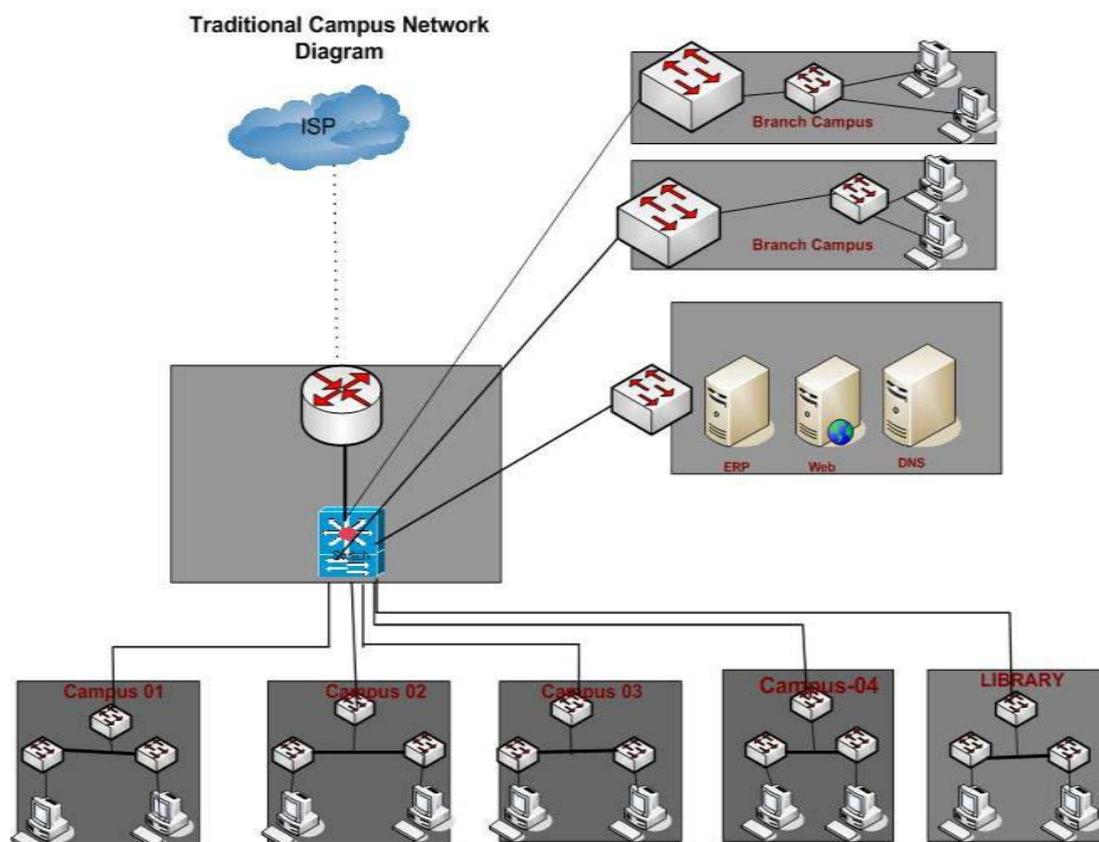


Figure 3: Traditional campus network design

CONCLUSION

Network architecture and its security are necessary for any organization. If we tend to follow the hierarchic network design, network will be scalable, performance and security are increased, and therefore the network are simple to take care of. During this work, we tend to project a compact price effective secure campus network design based on the work atmosphere and required quantify ability, security and different aspects.

This proposed network infrastructure is realizable with adaptable infrastructure. It conjointly provides a summary of the most effective practices in mitigating the known attacks and recommendation on a way to stop reoccurrence attacks.

REFERENCES

- [1] Das, J., Das, M.P., & Velusamy, P. (2013). Sesbania grandiflora leaf extract mediated green synthesis of antibacterial silver nanoparticles against selected human pathogens. *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 104, 265-270.
- [2] Umanath, K.P.S.S.K., Palanikumar, K., & Selvamani, S.T. (2013). Analysis of dry sliding wear behaviour of Al6061/SiC/Al₂O₃ hybrid metal matrix composites. *Composites Part B: Engineering*, 53, 159-168.
- [3] Udayakumar, R., Khanaa, V., Saravanan, T., & Saritha, G. (1786). Cross layer optimization for wireless network (WIMAX). *Middle-East Journal of Scientific Research*, 16(12), 1786-1789.
- [4] Kumaravel, A., & Rangarajan, K. (2013). Algorithm for automaton specification for exploring dynamic labyrinths. *Indian Journal of Science and Technology*, 6(5S), 4554-4559.
- [5] Pieger, S., Salman, A., & Bidra, A.S. (2014). Clinical outcomes of lithium disilicate single crowns and partial fixed dental prostheses: a systematic review. *The Journal of prosthetic dentistry*, 112(1), 22-30.
- [6] Vijayaraghavan, K., Nalini, S.K., Prakash, N.U., & Madhankumar, D. (2012). One step green synthesis of silver nano/microparticles using extracts of *Trachyspermum ammi* and *Papaver somniferum*. *Colloids and Surfaces B: Biointerfaces*, 94, 114-117.

- [7] Khanaa, V., Mohanta, K., & Satheesh, B. (2013). Comparative study of uwb communications over fiber using direct and external modulations. *Indian Journal of Science and Technology*, 6(6),4845-4847.
- [8] Khanaa, V., Thooyamani, K.P., & Udayakumar, R. (1798). Cognitive radio based network for ISM band real time embedded system. *Middle-East Journal of Scientific Research*, 16(12), 1798-1800.
- [9] Vijayaraghavan, K., Nalini, S.K., Prakash, N.U., & Madhankumar, D. (2012). Biomimetic synthesis of silver nanoparticles by aqueous extract of *Syzygium aromaticum*. *Materials Letters*, 75, 33-35
- [10] Caroline, M.L., Sankar, R., Indirani, R.M., & Vasudevan, S. (2009). Growth, optical, thermal and dielectric studies of an amino acid organic nonlinear optical material: L-Alanine. *Materials Chemistry and Physics*, 114(1), 490-494.
- [11] Kumaravel, A., & Pradeepa, R. (2013). Efficient molecule reduction for drug design by intelligent search methods. *International Journal of Pharma and Bio Sciences*, 4(2), B1023-B1029.
- [12] Kaviyarasu, K., Manikandan, E., Kennedy, J., Jayachandran, M., Ladchumananandasivam, R., De Gomes, U.U., & Maaza, M. (2016). Synthesis and characterization studies of NiO nanorods for enhancing solar cell efficiency using photon upconversion materials. *Ceramics International*, 42(7), 8385-8394.
- [13] Sengottuvel, P., Satishkumar, S., & Dinakaran, D. (2013). Optimization of multiple characteristics of EDM parameters based on desirability approach and fuzzy modeling. *Procedia Engineering*, 64, 1069-1078.
- [14] Anbuselvi S., Chellaram, C., Jonesh S., Jayanthi L., & Edward J.K.P. (2009). Bioactive potential of coral associated gastropod, *Trochus tentorium* of Gulf of Mannar, Southeastern India. *J. Med. Sci*, 9(5), 240-244.
- [15] Kaviyarasu, K., Ayeshamariam, A., Manikandan, E., Kennedy, J., Ladchumananandasivam, R., Gomes, U.U., & Maaza, M. (2016). Solution processing of CuSe quantum dots: Photocatalytic activity under RhB for UV and visible-light solar irradiation. *Materials Science and Engineering: B*, 210, 1-9.
- [16] Kumaravel, A., & Udayakumar, R. (2013). Web portal visits patterns predicted by intuitionistic fuzzy approach. *Indian Journal of Science and Technology*, 6(5S), 4549-4553.
- [17] Srinivasan, V., & Saravanan, T. (2013). Reformation and market design of power sector. *Middle-East Journal of Scientific Research*, 16(12), 1763-1767.
- [18] Vidhya, P. (2016). Active Contour based Segmentation of Tumor Edema and Normal Tissues of Brain through MRI Imaging Technology. *International Journal of Advances in Engineering and Emerging Technology*, 8(2), 74-82.
- [19] Kaviyarasu, K., Manikandan, E., Kennedy, J., & Maaza, M. (2015). A comparative study on the morphological features of highly ordered MgO: AgO nanocube arrays prepared via a hydrothermal method. *RSC Advances*, 5(100), 82421-82428.
- [20] Kumaravel, A., & Udhayakumarapandian, D. (2013). Construction of meta classifiers for apple scab infections. *International Journal of Pharma and Bio Sciences*, 4(4), B1207-B1213.
- [21] Sankari, S.L., Masthan, K.M.K., Babu, N.A., Bhattacharjee, T., & Elumalai, M. (2012). Apoptosis in cancer-an update. *Asian Pacific journal of cancer prevention*, 13(10), 4873-4878
- [22] Harish, B.N., & Menezes, G.A. (2011). Antimicrobial resistance in typhoidal salmonellae. *Indian journal of medical microbiology*, 29(3), 223-229.
- [23] Manikandan, A., Manikandan, E., Meenatchi, B., Vadivel, S., Jaganathan, S.K., Ladchumananandasivam, R., & Aanand, J.S. (2017). Rare earth element (REE) lanthanum doped zinc oxide (La: ZnO) nanomaterials: synthesis structural optical and antibacterial studies. *Journal of Alloys and Compounds*, 723, 1155-1161.
- [24] Caroline, M.L., & Vasudevan, S. (2008). Growth and characterization of an organic nonlinear optical material: L-alanine alaninium nitrate. *Materials Letters*, 62(15), 2245-2248.
- [25] Saravanan T., Srinivasan V., Udayakumar R. (2013). A approach for visualization of atherosclerosis in coronary artery. *Middle - East Journal of Scientific Research*, 18(12), 1713-1717.
- [26] Poongothai, S., Ilavarasan, R., & Karrunakaran, C.M. (2010). Simultaneous and accurate determination of vitamins B1, B6, B12 and alpha-lipoic acid in multivitamin capsule by reverse-phase high performance liquid chromatographic method. *International Journal of Pharmacy and Pharmaceutical Sciences*, 2(4), 133-139.

- [27] Udayakumar, R., Khanaa, V., & Saravanan, T. (2013). Synthesis and structural characterization of thin films of SnO₂ prepared by spray pyrolysis technique. *Indian Journal of Science and Technology*, 6(6), 4754-4757
- [28] Anbazhagan, R., Satheesh, B., & Gopalakrishnan, K. (2013). Mathematical modeling and simulation of modern cars in the role of stability analysis. *Indian Journal of Science and Technology*, 6(5S), 4633-4641.
- [29] Caroline, M.L., & Vasudevan, S. (2009). Growth and characterization of bis thiourea cadmium iodide: A semiorganic single crystal. *Materials Chemistry and Physics*, 113(2-3), 670-674.
- [30] Sharmila, S., Jeyanthi Rebecca, L., & Das, M.P. (2012). Production of Biodiesel from *Chaetomorpha antennina* and *Gracilaria corticata*. *Journal of Chemical and Pharmaceutical Research*, 4(11), 4870-4874.
- [31] Thooyamani, K.P., Khanaa, V., & Udayakumar, R. (2013). An integrated agent system for e-mail coordination using jade. *Indian Journal of Science and Technology*, 6(6), 4758-4761.
- [32] Caroline, M.L., Kandasamy, A., Mohan, R., & Vasudevan, S. (2009). Growth and characterization of dichlorobis L-proline Zn (II): A semiorganic nonlinear optical single crystal. *Journal of Crystal Growth*, 311(4), 1161-1165.
- [33] Caroline, M.L., & Vasudevan, S. (2009). Growth and characterization of L-phenylalanine nitric acid, a new organic nonlinear optical material. *Materials Letters*, 63(1), 41-44.
- [34] Kaviyarasu, K., Fuku, X., Mola, G.T., Manikandan, E., Kennedy, J., & Maaza, M. (2016). Photoluminescence of well-aligned ZnO doped CeO₂ nanoplatelets by a solvothermal route. *Materials Letters*, 183, 351-354.
- [35] Saravanan, T., & Saritha, G. (2013). Buck converter with a variable number of predictive current distributing method. *Indian Journal of Science and Technology*, 6(5S), 4583-4588.
- [36] Parthasarathy, R., Ilavarasan, R., & Karrunakaran, C.M. (2009). Antidiabetic activity of *Thespesia Populnea* bark and leaf extract against streptozotocin induced diabetic rats. *International Journal of PharmTech Research*, 1(4), 1069-1072.
- [37] Hanirex, D.K., & Kaliyamurthie, K.P. (2013). Multi-classification approach for detecting thyroid attacks. *International Journal of Pharma and Bio Sciences*, 4(3), B1246-B1251.
- [38] Kandasamy, A., Mohan, R., Lydia Caroline, M., & Vasudevan, S. (2008). Nucleation kinetics, growth, solubility and dielectric studies of L-proline cadmium chloride monohydrate semi organic nonlinear optical single crystal. *Crystal Research and Technology: Journal of Experimental and Industrial Crystallography*, 43(2), 186-192.
- [39] Devaarul, S., & Iyapparaja, M. (2019). Hybridization Approach to Classify Big Data Using Social Internet of Things. *Bonfring International Journal of Software Engineering and Soft Computing*, 9(2), 31-35.
- [40] Sankari, G., Pushpalatha, G., Senbagam, V., Karthika, M., & Anbuselvan, N. (2019). Search Engine Optimization in Advanced Computer Vision. *The SIJ Transactions on Computer Networks & Communication Engineering (CNCE)*, 7(1), 6-9.
- [41] Srinivasan, V., Saravanan, T., Udayakumar, R., & Saritha, G. (2013). Specific absorption rate in the cell phone user's head. *Middle-East Journal of Scientific Research*, 16(12), 1748-50.
- [42] Udayakumar R., Khanaa V., & Saravanan T. (2013). Chromatic dispersion compensation in optical fiber communication system and its simulation. *Indian Journal of Science and Technology*, 6(6), 4762-4766.
- [43] Vijayaragavan, S.P., Karthik, B., Kiran, T.V.U., & Sundar Raj, M. (1990). Robotic surveillance for patient care in hospitals. *Middle-East Journal of Scientific Research*, 16(12), 1820-1824.
- [44] Wen, K.L., Chang, K.H., & Shen, Y.C. (2019). The Evaluation of Automobile in Germany via Globalization Grey Relational Grade. *The SIJ Transactions on Computer Networks & Communication Engineering (CNCE)*, 7(1), 1-6.
- [45] Rajesh, R., Vinibha, G.J.S., Kalaimathi, K., Kamalakkanni, P., & Kamatchi, V. (2019). NFC Identification System for Fuel Management. *The SIJ Transactions on Computer Networks & Communication Engineering (CNCE)*, 7(4), 1-6.
- [46] Aravindan, K., Kanniyappan, M., & Karthi, R. (2019). Advance Smart Surveillance System. *The SIJ Transactions on Computer Networks & Communication Engineering (CNCE)*, 7(4), 7-9.
- [47] Chandan, A. (2019). Experimental Analysis of Kinematics and Injury of Pillion Passenger in Motorcycle Crash. *Journal of Computational Information Systems*, 15(1), 23-34.

- [48] Tharinie, V., & Pandiyaraj, (2016). Ant Colony Optimization based Latency Conscious Routing Protocol (ACO-LCRP) for Wireless Sensor Network. *International Journal of Advances in Engineering and Emerging Technology*, 8(3), 191-199.
- [49] Chandran, C., & Arulgeetha, G. (2016). Efficient User Revocation for Anonymity Control Cloud Data Access Privilege. *International Journal of Advances in Engineering and Emerging Technology*, 8(3), 209-222.
- [50] Hariharan, N., Karthikeyan, K., Nelson, M., & Sangeetha, K.S. (2016). Attribute based Encryption with Distributed System. *International Journal of Advances in Engineering and Emerging Technology*, 8(3), 223-227.