ISSN: 2581-3404 (Online)
International Journal of Innovative Research in Technology and Management (IJIRTM), Volume-3, Issue-5, 2019

Software Defined Networking for Improved Communication in Wireless Sensor Network

Kundan Kumar[1], Prof. Mukesh Saini[2], Prof. Jitendra Mishra[3]

[1]M. Tech Scholar, Department of EC, PIES, Bhopal (India)

[2]Associate Professor, Department of EC, PIES, Bhopal (India)

[3]Head & Professor, Department of EC, PIES, Bhopal (India)

ABSTRACT

Wireless sensor networks (WSN) is a technology commonly used for remote monitoring, tracking and detection applications. Since energy efficiency is a major concern in wireless sensor network, to know the remaining energy on each node could optimize the energy consumption. Numerous solutions have tried to optimize the performance of these networks by introducing new design principles as well as establishing new protocols and algorithms. In recent years, a new paradigm, which is called Software Defined Networking (SDN), is introduced that allows the network administrators to dynamically manage their networks. In this paper our main focus is to improve the performance of software defined wireless sensor networks by using mesh architecture in wireless sensor network, our result shows that the better performance from the existing techniques.

Keywords: Wireless Sensor Networks, Software-Defined Networking, Energy Efficiency, Topology Discovery, Internet of Things.

INTRODUCTION

A WSN is made up of a large number of small, low-cost, low powered sensor nodes. These nodes monitor environmental conditions, such as temperature, sound, pressure, humidity, etc., and then send that information wirelessly over the network to a host system where it is processed, analysed and presented in a readable format. These networks have a wide range of applications. They can be used to monitor weather conditions on farm fields or to detect enemy's movements in warzones. They can also be used to monitor the traffic to keep it away from jams and accidents or to predict natural disasters such as volcanoes and earthquakes [4].

The history of WSNs dates back to several decades. According to a report published by the Silicon Labs on the evolution of WSNs, the Sound Surveillance System (SOSUS) was the first wireless system that shows any resemblance to the modern day WSN. It was invented by the US military to keep track on Soviet submarines. The system consisted of a large number of submerged acoustic sensors called hydrophones that were dispersed all over the Atlantic and Pacific Ocean [7]. This detecting technology is still being used in some areas to monitor natural disasters and make the system more secure, the system engineer and designers have to make trade-offs among the choice of underlying hardware, power resources, and networking protocols.

ISSN: 2581-3404 (Online)
International Journal of Innovative Research in Technology and Management (IJIRTM), Volume-3, Issue-5, 2019

Wireless Sensor Networks (WSN) is composed of resource constrained devices with the purpose of gathering information from the environment. These devices can sense, process, and communicate, increasing the information and perception about the world. In fact, WSN constitutes an important tool for real-world applications, improving the information gathering process in many scenarios such as precision agriculture, biodiversity monitoring/research, elderly/disabled monitoring, and health support as well [2].

Wireless sensor networks (WSNs) consist of individual nodes that interact with the environment by sensing and controlling physical parameters such as temperature, pressure and volume. The nodes also have to interact with each other through wireless communication to achieve the sensing task, and are autonomous although some user-driven data collection is also possible. These nodes contain computation, sensing, actuation and wireless communication functions. Therefore, WSNs are continuously becoming important especially with the advent of Internet of Things (IoT) essential for monitoring several objects in applications such as smart cities, smart health care, smart water networks, smart power grids, smart farming and intelligent transport systems. Furthermore, wireless sensor nodes are usually not tethered to a power source as they require a minimum amount of energy which is usually supplied by integrated batteries.

WSNs are very flexible in their applications but also pose a research challenge due to their resource constrained and application specific architecture. With increased demand in the application of WSNs, the extent to which the technology can be applied is limited by their resource constrained nature [9]. The main weakness of wireless sensor networks is related to the resource limitations of the sensor hardware namely processing, memory, energy and communication capabilities , although they are widely used due to the increased number of embedded devices available making deployment easier. However, other issues associated with management of large-scale WSNs arise with the increased node deployment such as meeting the necessary Quality of Service (QoS) for satisfactory operation even as nodes scale up to very large numbers [6].

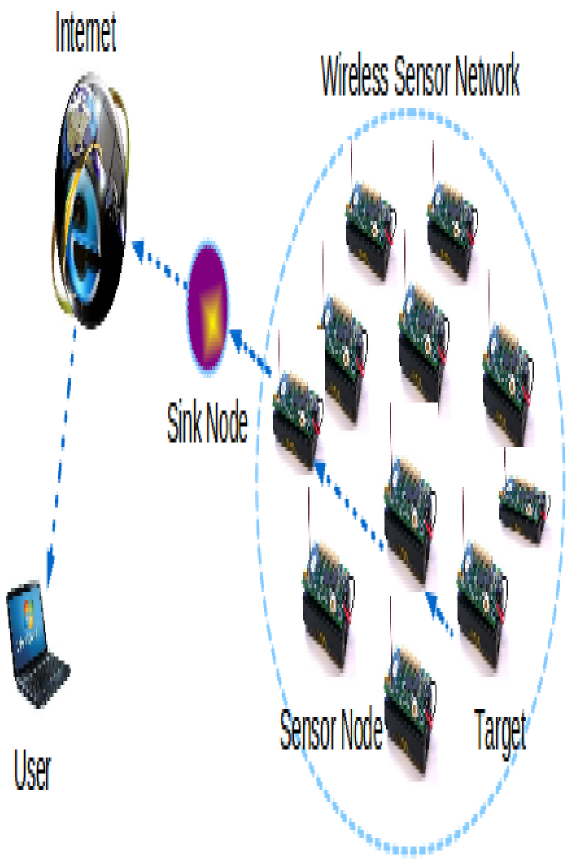

Figure 1.1: Wireless Sensor Network.

The rest of this paper is organized as follows in the first section we describe an introduction of about the routing scheme in wireless sensor networks. In section II we discuss about the network virtualization in wireless sensor networks, in section III we discuss about the proposed work. In section IV we present the experimental result and finally in section V we conclude and discuss the future scope.

II NETWORK VIRTUALIZATION IN SDN

Network slicing allows the coexistence of a set of virtual networks within a single underlying physical network. The virtual networks are composed of a set of virtual nodes and links. Thus, the infrastructure provider can manage the underlying physical network for the service providers who own a virtual network or a slice to provide end to-end network service. These virtual networks or slices managed by individual service provider are isolated from each other while effectively sharing and managing the underlying resources; thus, slicing represents a flexible and effective mechanism that can support a number of resource allocation policies. An example of network slicing is depicted in below figure [11].

SDN can directly express and support slicing. For example, in network slicing, each slice is controlled by a dedicated controller. It is implemented as a layer between the controller and the data plane elements to allow multiple controllers coexist on a single shared data plane, while each controlling a slice of the network. The network configuration requirements provided by the administrator are used as the input to Co Visor. This input is used to determine the network policies, create the virtual network for each controller, and define the traffic access policy for the controllers. Based on this principle the standard OpenFlow input from individual controllers is translated into appropriate rule updates for the switches.

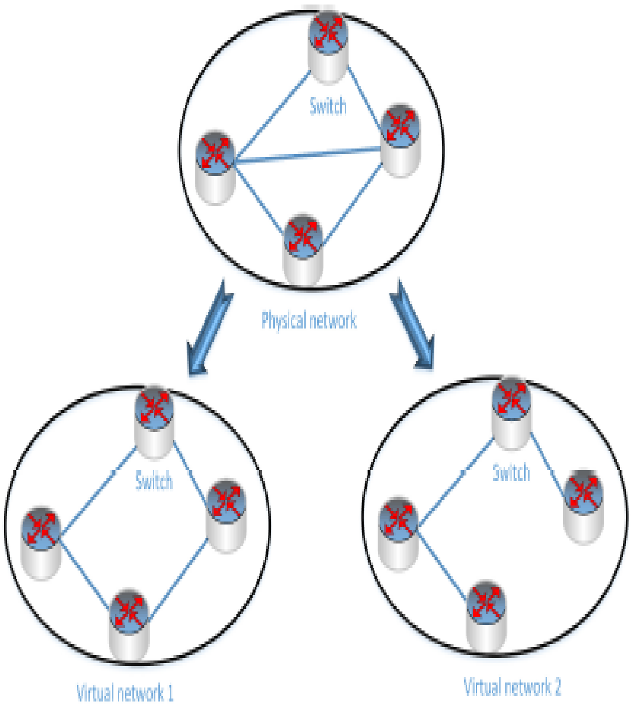

Fig 1: An example of network virtualization.

III PROPOSED WORK

SDN has been investigated in the context of provider and enterprise networks, as well as data centers; they are getting increasingly deployed in these spaces. In contrast, significantly less work has considered using SDN in wireless network settings. In Wireless Cellular Networks (WCNs), phones as well as smart devices connect to the Internet through base stations mounted on cellular towers. The towers host base stations of two types: Serving Gateway (S-GW) and Packet data network Gateway (P-GW). The gateways act both as control and data plane entities. The data plane functions include access control and traffic monitoring while the control plane tasks include connection establishment, mobility management, routing, radio resource assignment, Quality of Service (QoS) and billing.

Mesh Flow a representative of this class, has two goals: first one is flexible routing to improve the performance and load balancing within a mesh network; and second is flexible and efficient client mobility. Mesh Flow implements an OpenFlow based mesh network architecture that consists of OpenFlow enabled mesh routers. These routers have multiple physical interfaces to connect to an access network, other routers, or the Internet. Each physical interface is decomposed into two virtual interfaces to support isolated control and data traffic.

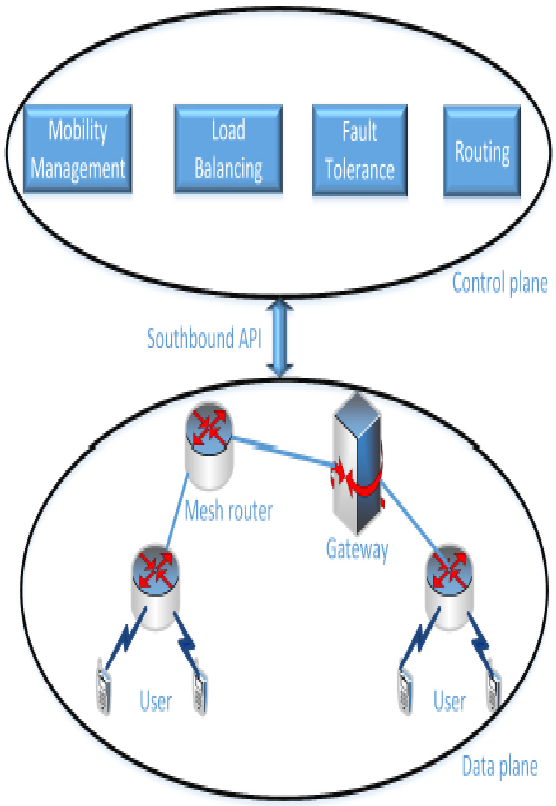

Fig 2: A software defined wireless mesh network architecture.

IV EXPERIMENTAL RESULT

In this section we discuss about the experimental results and the comparative study between the previous and proposed techniques, all the results are simulated with the matlab software. The goal of this paper is to extend the quality of services of SDN-based WSN network applications and routing protocols. There are performances such as the routing management, resource allocation, throughput and packet generation probability.

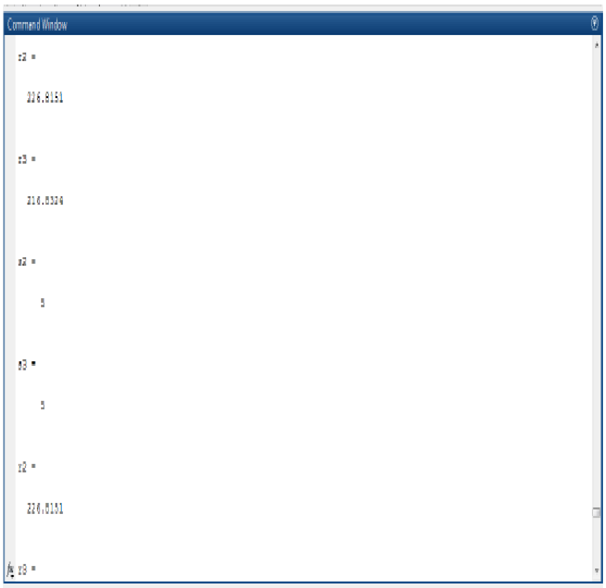

Fig 3: Shows that the implementation window for the communication in wireless sensor network.

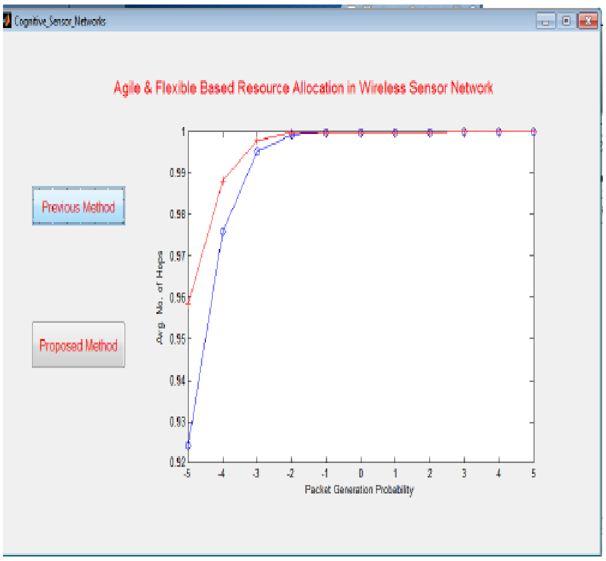

Fig 4: Shows that the comparative solutions for the average number of hopes window for the communication in wireless sensor network.

V CONCLUSION AND FUTURE SCOPE

The growing trend in pervasive systems forces traditional wireless sensor networks to deal with new challenges, such as dynamic application requirements and heterogeneous networks. One of the latest paradigms in this area is software defined wireless sensor network. Despite the current advances in Micro-Electro-Mechanical Systems (MEMS), energy efficiency is still a key problem in WSN. One of the main reasons is because sensor nodes depend on batteries to operated. Furthermore, some applications deployed the WSN in hostile environments where the maintenance becomes a challenging task. In this paper we present the performance enhancement in SDN in wireless sensor network. The simulated result show better results that the existing approach in wireless sensor network.

REFERENCES:-

[1] Israat Haque ,Mohammad Nurujjaman, Janelle Harms, and Nael Abu-Ghazaleh, "SDSense: An Agile an. d Flexible SDN-Based Framework for Wireless Sensor Networks", IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, VOL. 68, NO. 2, FEBRUARY 2019, pp 1866-1876.

[2] Renan C. A. Alves, Doriedson A. G. Oliveira,Geovandro C. C. F. Pereira, Bruno C. Albertini , and Cíntia B. Margi, "*WS*3*N*: Wireless Secure SDN-Based Communication for Sensor Networks", Hindawi Security and Communication Networks Volume 2018, pp 1-15.

[3] Babedi Betty Letswamotse, Reza Malekian, Chi-Yuan Chen, Kgotlaetsile Mathews Modieginyane," Software Defined Wireless Sensor Networks (SDWSN): A Review on Efficient Resources, Applications and Technologies" 2018, pp 1-6.

[4] Hamid Farhady, HyunYong Lee , Akihiro Nakao, "Software-Defined Networking: A survey", Elsevier Feb 2015, pp 1-17.

[5] Choong Seon Hong, S.M. Ahsan Kazmi, Seungil Moon and Nguyen Van Mui, "SDN Based Wireless Heterogeneous Network Management", Springer International Publishing Switzerland 2016,pp 1-10.

[6] Musa Ndiaye , Gerhard P. Hancke and Adnan M. Abu-Mahfouz, "Software Defined Networking for Improved Wireless Sensor Network Management: A Survey", MDPI 2017, pp 1-32.

[7] Danda B. Rawat and Swetha R. Reddy, "Software Defined Networking Architecture, Security and Energy Efficiency: A Survey" , IEEE COMMUNICATIONS SURVEYS & TUTORIALS, VOL. 19, NO. 1, FIRST QUARTER 2017, pp 325-346.

[8] Hassan, Muhammad Ali, Vien, Quoc-Tuan and Aiash, Mahdi, "Software Defined Networking for Wireless Sensor Networks: A Survey", Advances in Wireless Communications and Networks. Vol. 3, No. 2, 2017, pp. 10-22.

[9] Derya Cansever, Sastry Kompella, and Leandros Tassiulas, "Special Issue on Wireless SDN", JOURNAL OF COMMUNICATIONS AND NETWORKS, VOL. 19, NO. 6, DECEMBER 2017, pp 3543-545.

[10] Catherine Nayer Tadros , Bassem Mokhtar , Mohamed R. M. Rizk, "Software Defined Network Based Management Framework For Wireless Sensor Networks", IEEE 2018, pp 1200-1205.

[11] Kun Wang, Yihui Wang, Deze Zeng, and Song Guo, "An SDN-Based Architecture for Next-Generation Wireless Networks", IEEE Wireless Communications February 2017, pp 25-31.

[12] Zheng Yan, Peng Zhang and Athanasios V. Vasilakos, "A security and trust framework for virtualized networks and software-defined networking", SECURITY AND COMMUNICATION NETWORKS 2015, pp 1-11.

[13] Syed Taha Ali, Vijay Sivaraman, Adam Radford, and Sanjay Jha, "A Survey of Securing Networks Using Software Defined Networking", IEEE TRANSACTIONS ON RELIABILITY 2015, pp 1-12.

[14] Israat Tanzeena Haque and Nael Abu-Ghazaleh," Wireless Software Defined Networking: a Survey and Taxonomy", IEEE 2016, pp 1-32.

[15] Jianguo Zhou, Hao Jiang, Jing Wu, Lihua Wu, Chunsheng Zhu, Wenxiang Li, "SDN-based Application Framework for Wireless Sensor and Actor Networks", IEEE ACCESS 2016, pp 1-11.

[16] Hlabishi I. Kobo, Adnan M. Abu-Mahfouz and Gerhard P. Hancke, "A Survey on Software-Defined Wireless Sensor Networks: Challenges and Design Requirements", IEEE 2016, pp 1-28.

[17] Habib Mostafaei, Michael Menth, "Software-Defined Wireless Sensor Networks: A Survey", Journal of Network and Computer Applications June 2018, pp1-20.

Kundan Kumar received his Bachelor`s degree in Electronics Comunication Engineering from TIT College, Bhopal, M.P., in 2014. Currently he is pursuing Master of Technology Degree in Electronics & Comunication (Digital communication) from PIES, (RGPV), Bhopal, Madhya Pradesh India. His research area include Ad-hoc Network, Wireless Sensor Network.

Mukesh Saini received the BE degree in Electronics and Communication and Master of Technology degree in Digital Communication. Currently he is an associate professor department of electronics and communication engineering from PIES, Bhopal India. His research interests are Digital Signal Processing, Antenna Designing, Wireless Communication and Digital Image Processing.

Jitendra Kumar Mishra he is Associate Professor and Head of the Department of Electronics and communication in PIES, Bhopal (RGPV). His received Master of Technology and Bachelor's of engineering respectively in Digital communication from BUIT, Bhopal and from RGPV, Bhopal. He has more than 11 years of teaching experience and publish 45+ papers in International journals, conferences etc. His area of Interests is Antenna & Wave Propagation, Digital Signal Processing, Ad-hoc network, Wireless Communication, Vehicular Ad-hoc network, Image Processing etc.