iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** IV **Month of publication:** April 2020

DOI:

www.ijraset.com

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue IV Apr 2020- Available at www.ijraset.com

Simulation of SDN Enabled Smart Building

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Abstract: ***Smart building will pose a significant impact on communication networks. Smart building helps to automate and control all the operations across the building such as controlling temperature, light and so on. Our project aims in developing a SDN based smart building. Information from the smart devices are processed and stored in the sink node. Data are transferred to the SDN switch from other switches. The most commonly used objective for SDN-enabled SB is handling heterogeneous network, monitoring and controlling traffic in the network and energy consumption. Different types of network can be handled by SDN and the traffic between each node in the network can be monitored and controlled based on the needs. The energy consumption of a building primarily depends on smart devices operation. The network devices within a building may be switched on to consume less power if these devices are not being used. Network elasticity is possible in SDN. Similarly, the period of low network utilization facilitates the possibilities for unused smart devices to turn on and handle the network trace by the smaller number of devices with SDN.***

Keywords: SDN, smart building, heterogeneous, smart devices, switch.

I. INTRODUCTION AND RELATED WORK

In recent years, the world is moving towards smart environments. One such application is smart building. Smart building requires many smart devices like sensor of different types such as light, temperature etc. A smart building is made by connecting various smart devices across the building. Using smart devices, helps to automate the operations within the building. Based on results from smart devices, smart building can perform operations automatically.

Smart building can automate operations in the building such as light control, ventilation etc.. Thus it reduces man power required to do those operations. It can also perform all the operations efficiently. Thus energy can be efficiently utilized.

II. SYSTEM REQUIREMENTS

A. VMware

VMware Workstation Pro allows many operating system to run simultaneously in the same PC . Can create Linux and Windows virtual machines. It also allows to configure virtual networking and can also perform application testing, product demonstration and more. They can work in several environments such as desktop, server and tablets.

B. Contiki OS

Contiki is an open source operating system. It is used to implement for projects in the Internet of Things. Contiki allows several low-cost, low-power microcontrollers to be connected to the Internet. Contiki is an operating system designed for hardware that are constrained in power, memory, bandwidth and so on.

It contains COOJA simulator which can simulate sensors and SDN.

C. SDN-WISE

SDN-WISE is expanded as Software Defined Networking for WIreless SEnsor Networks. SDN-WISE is used to implement SDN networks which can manage networks, develops novel application and can easily experiment new networking solutions.

D. Raspberry Pi

The Raspberry Pi is a mini computer that runs on Linux operating system. It provides a set of GPIO pins that allows to control electronic components such as sensors and other external devices. Thus it allows to explore and implement Internet of Things.

E. DHT11 Sensor

DHT11 is a Humidity and Temperature Sensor. It senses temperature and humidity of the area in which it is present and gives a digital output. A capacitive humidity sensor and a thermistor is used. Thus it measures the surrounding conditions and gives a digital output via the pins.

F. Light Sensor

Light sensors are often referred as types of photo detectors or photo sensors. Most common light density sensors are: Photodiodes (LDR Light Dependent Resistors) and photo resistors. Photo diode is used to convert light into current or voltage for usage. The resistance of photo resistor decreases with increasing light intensity.

G. Proximity Sensor

A proximity sensor is used to detect nearby objects without any physical contact. It detects objects presence by sending a electromagnetic beam and analyzes the return signal.

H. Smoke Sensor

A smoke detector is a device used to sense smoke. Thus it is used to indicate fire. It makes use of two mechanisms to detect smoke: optically (photoelectric) or by physical process (ionization).

I. Mininet

Mininet is a network emulator which is used to create a networks containing hosts, switches, controllers and so on. Mininet hosts uses Linux networking software. The switches in mininet supports OpenFlow protocol which is highly flexible and can allow custom routing. It is used to do experimental network on computers to support research, development, learning, testing and so on.

J. Opendaylight

OpenDaylight Project (ODL) is an open source software to implement SDN project. It is used to enhance SDN usage in both industries and communities. For that OpenDayLight controller is used. As it is open source it can be used by any end users and customers. It provides a shared platform to handle and support various SDN networks. OpenDayLight platform supports multiprotocol and modular approach. So any user needs can fit into it and IT admins have the ability to pick a single or multiple protocols to solve complex problems.

III. SYSTEM DESIGN

In our proposed system for SDN enable smart building we overcome the problems faced by making use of traditional networking. In traditional networking, the hardware has to be changed when changing the protocol or application to be used. But in Software defined networking, there is no need to change the hardware for changes in application. It also provides flexibility in adding nodes to the network. It can support heterogeneous networks and can monitor and control traffic in the network. Thus this project not only provides ease of use but can also effectively manage the network.

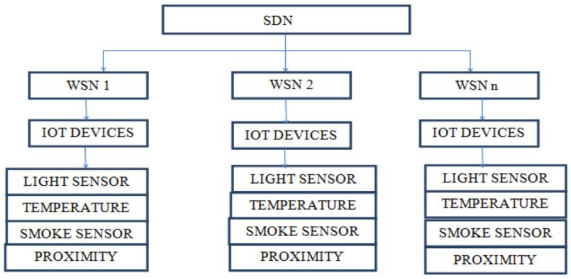

Fig 1. Block diagram

IV. IMPLEMENTATION

The steps to implement are listed below:

A. Create a LAN.
B. Connect sensors with Raspberry Pi and create a WSN.
C. Start OpenVswitch in Raspberry Pi and give IP address of the device in which OpenDayLight is started.
D. Start simulation in Cooja.
E. Start Mininet and define topology to be used by the WSN simulated by Cooja.
F. Start OpenDayLight. Now the heterogeneous network is displayed and with that traffic between the nodes can be monitored and controlled.

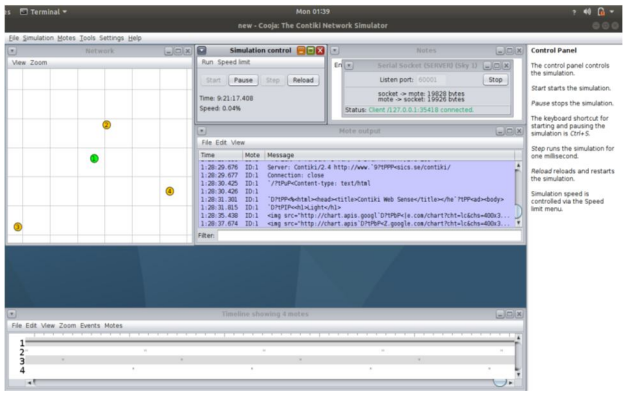

Fig. 2 Simulation in Cooja

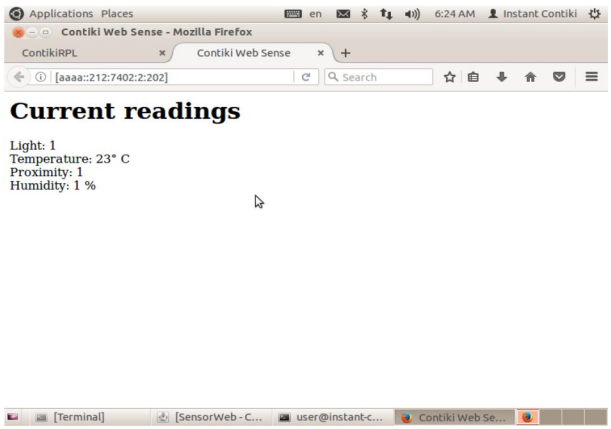

Fig. 3 Simulation in Cooja

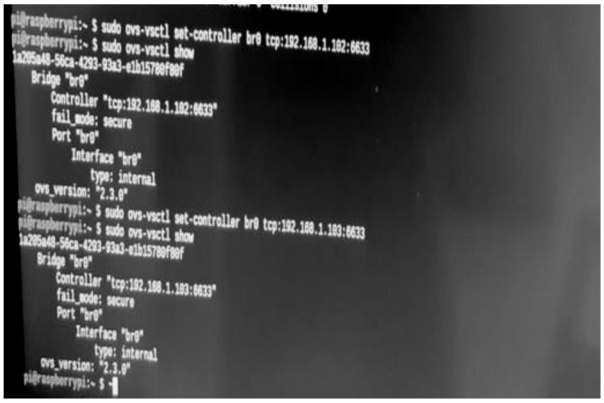

Fig. 4 OPEN V SWITCH

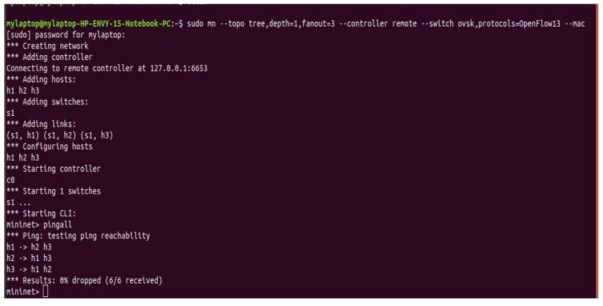

Fig. 5 MININET

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Volume 8 Issue IV Apr 2020- Available at www.ijraset.com

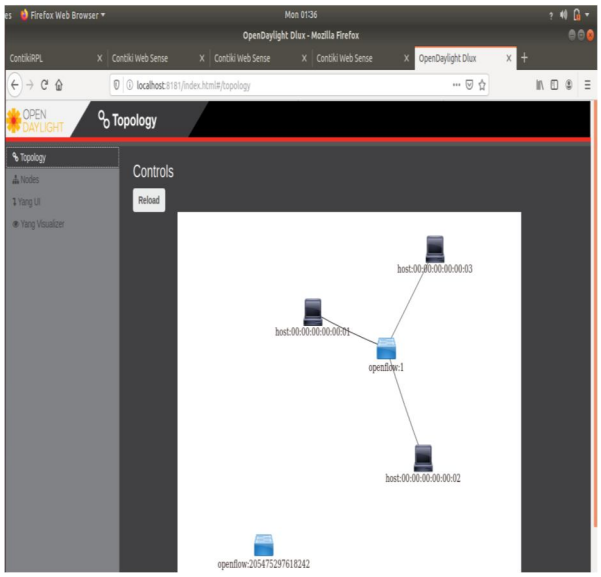


Fig. 6 OpenDayLight

Thus OpenDayLight controls heterogeneous networks i.e. networks form Raspberry Pi as OpenVSwitch and Cooja via Mininet.

V. DISCUSSION

The evaluation of SDN has revolutionized the way of communication. SDN is applied by many global researchers like Cisco, VMware, Juniper, Pluribus and Big Switch. They are working in projects like Smart grid communication, SDN for 5G networks, Vehicular Ad-Hoc networks and so on. SDN has gained attention among many researchers and industries. The ideas explained can be implemented in the application plane so that the data plane that which contains the hardware is not disturbed. As the ideas are implemented in application plane no need to change hardware and thus provides flexibility. Thus SDN provides flexibility, can monitor and control traffic and reconfiguration is also easy to implement.

VI. APPLICATION TO THE SOCIETY

A smart building is a building that uses several smart devices to automatically control the operations in the building such as heating, ventilation, air conditioning and other systems.

It uses sensors, actuators and microchips, in order to collect data and manage it according to a business functions and services which help owners, operators and facility managers. SDN operates in the application plane so it is separated from hardware. It uses software applications to program your network intelligently through centralized control by programming and not changing the underlying hardware.

The smart buildings can automate the building operations and it can be controlled by SDN which is easily programmable. Hence the controlling means can be changed easily by programming and not affecting the underlying hardware.

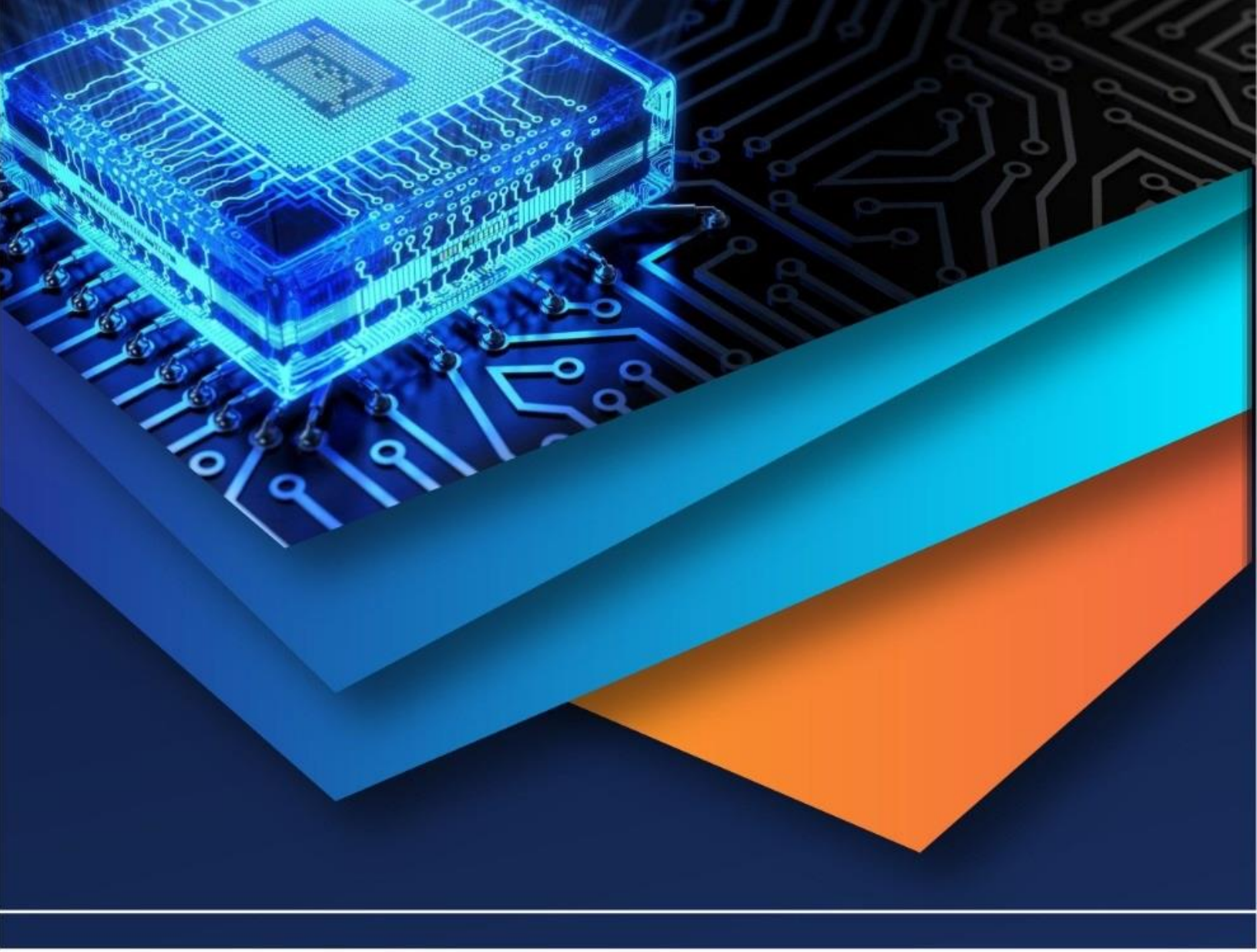
Thus this product when applied to the society reduces cost of hardware when changing the application and provides flexibility. This can support heterogeneous network, monitor and control traffic and provides energy efficiency. It helps people by automating things, industries by efficiently utilizing energy and researchers to easily incorporate changes to its operation with using cost efficiently. Thus this reduces man power and can effectively maintain buildings.

VII. CONCLUSION

The increasing need of efficiency and flexibility leads to Software Defined Networking. An overview of SDN based Smart building is provided in the context. SDN architecture improves some factors such as energy efficiency, monitoring traffic, controlling traffic etc. in SB. Moreover, some challenges are also discussed which are faced after the implementation of SDN in smart building. Finally, deploying SDN in the future may be an efficient one but requires dynamic approach. In future, we intend to improve the energy consumption of smart devices, traffic density, and network management issues through SDN networking.

REFERENCES

[1] Abdelaziz, A., Fong, A. T., Gani, A., Garba, U., Khan, S., Akhunzada, A., Talebian, H., Choo, K.-K. R., "Distributed controller clustering in software defined networks", PloS one 12 (4), e0174715, 2017.
[2] Abdelaziz, A., Tan Fong, A., Gani, A., Khan, S., Alotaibi, F., Khurram Khan, M., "On software-defined wireless network (sdwn) network virtualization: Challenges and open issues", The Computer Journal 60 (10), 1510– 1519, 2017b.
[3] Ahmed, E., Yaqoob, I., Gani, A., Imran, M., Guizani, M., "Internet-of things-based smart environments: state of the art, taxonomy, and open research challenges", IEEE Wireless Communications 23 (5), 10–16, 2016.
[4] Ejaz, W., Naeem, M., Basharat, M., Anpalagan, A., Kandeepan, S., "Efficient wireless power transfer in software-defined wireless sensor networks", IEEE Sensors Journal 16 (20), 7409–7420, 2016.
[5] Braun, W., Menth, M., " Software-defined networking using OpenFlow: Protocols, applications and architectural design choices", Future Internet 6 (2), 302–336, 2014.
[6] Chahal, M., Harit, S., Mishra, K. K., Sangaiah, A. K., Zheng, Z., "A survey on software-defined networking in vehicular ad hoc networks: Challenges, applications and use cases", Sustainable Cities and Society, 2017.
[7] Dawson-Haggerty, S., Krioukov, A., Taneja, J., Karandikar, S., Fierro, G., Kitaev, N., Culler, D. E., "BOSS: Building Operating System Services" En: NSDI. Vol. 13. pp. 443–458, 2013.
[8] Dawson-Haggerty, S., Ortiz, J., Trager, J., Culler, D., Katz, R. H., "Energy savings and the software-defined building", IEEE Design & Test of Computers 29 (4), 56–57, 2012.
[9] Ishimori, A., Farias, F., Cerqueira, E., Abelém, A., "Control of multiple packet schedulers for improving QoS on OpenFlow/SDN networking. En: Software Defined Networks (EWSDN)", 2013 Second European Workshop on. IEEE, pp. 81–86, 2013.
[10] Jacobsson, M., Orfanidis, C., "Using software-defined networking principles for wireless sensor networks", En: 11th Swedish National Computer Networking Workshop(SNCNW2015)Karlstad,May28-29,2015.pp.1–5, 2015.



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