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Design and Implementation of 5G IoT Based Smart Campus Network

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Abstract: *The objective of this research paper is to present the design and an implementation of 5G IoT smart campus network using simulation tool packet tracer. A smart campus is a grouping of Virtual Local Area Networks which offers whole campus coverage. It offers various facilities such as availability, connections and various functions It offers office staffs, faculty and students for different applications and to complete various tasks, thus it needs to be planned and designed earlier. To provide these intricate facilities, combination of standard network devices and IoT in the campus, this research work has been proposed. The smart objects should be registered beforehand in the IOE server and managed by an administrator. The smart campus network design model is proposed that enabling 5G IoT to smart campus is a cost-effective approach. The VLAN simulation aims to simulate smart devices that can individually response and be controlled by end-users distantly to effort efficiency and* effectiveness.

Key Word: *Smart Campus, Virtual Local Area Network, Internet of things*

I.INTRODUCTION

The networks of Campus are planned as a collection of VLAN which virtually distribute the enactment of devices and increase the security of network. In this paper the smart things are considered to be the devices that are registered in the IOE server and act as home gateway controlled through the web by an administrator. The Smart Campus Network Design is proposed to plan campus network by grouping of Internet of Things devices with networking devices, to make numerous campus network operations. This proposed model uses Hierarchal Network Design is used to set devices into several networks. Smart campus can be defined as campus that uses technology and processes to develop more capable operationally, improve employee efficiency and decrease its impact on the environment. Papers that stated in the literature are primarily focused only on implementations of smart campus. So, the motivation of this paper is to provide an intensive 5G implementation of IoT to smart campus using Cisco Packet Tracer tool. The paper is organized as follows: Section II presents related study; while III shows the proposed model. Section IV describes the implementation and results. Section V concludes.

II.RELATED STUDY

The research paper [1]examines the implementation of IoT for smart campus. Many applications used IoT efficiently that support in education process, such as: flipped classroom, entrance system, and feedback of students. Reliability is a vital element with any space-based system when it comes to offers services of wireless communication.

The research paper [2] examines with forming an advanced network with Cisco packet Tracer. The proposed system does not have numerous switches which leads to rise in the usage of routers at various levels of the group which is not cost effective and in turn rise the risk if there are potential misconfigurations on these devises.

In this research paper [3] designing a secure campus network using Cisco packet tracer. The whole network is divided into small chunks known as VLANs which are referred to as virtual LANs. These VLAN's are a set of sub-networks which can be configured just like a router. They have implemented VLAN's but unsuccessful to configure them in a secure manner and lost some significant authorization methods which can be complete.

In this paper [4] employed VLANs to detached the networks from one another, but they unsuccessful to address the MAC Flooding attack, and they also unsuitably configured the switches, leaving open the used ports that an invader could access right if they were left open.

This research paper [5] proposed an CAN architecture used IoT technology to make the Campus Area Network smarter, but he did not suggest using a fire alarm system to make the architecture system more efficient. These fire alarm systems are quite beneficial in the event of a fire.

This research paper [6]proposed a network architecture which is beneficial for organization in several possible ways but ignored some of the vital components that are essential to protection of a network. They failed to add and configure various vital components like IDS, firewalls and IPS. Without these components and required configurations, the network is not harmless and secure and is susceptible to several possible attacks and data breaches.

III. PROPOSED MODEL

To design smart campus network, IoT devices that can be monitored and controlled based necessity in various levels through the registration servers and registration server can be access by always one in the network, to give access for precise persons and to improve the security using implementation of Access Control List (ACL). The network is simulated before

applying the ACL and after applying the ACL. Beforehand applying ACL, everyone can access any device in the network with exam branch servers as well as IoT devices in network and also can perform the modification. Primary setup of a campus network is designed using end devices, switches, router, servers and IoT devices. ACL is configured on the routers to deny/permit the packets.

IV. IMPLEMENTATION AND RESULTS

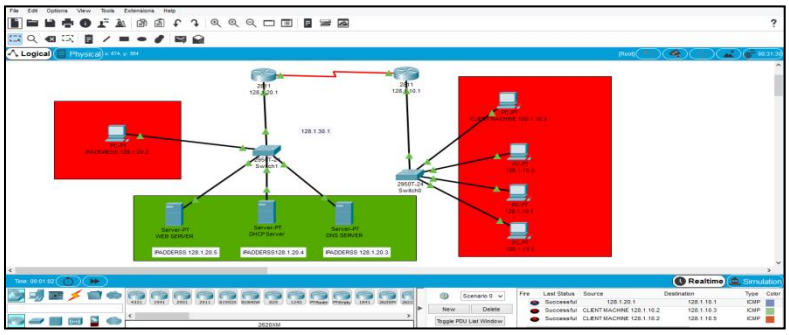

Figure 1: Network Design

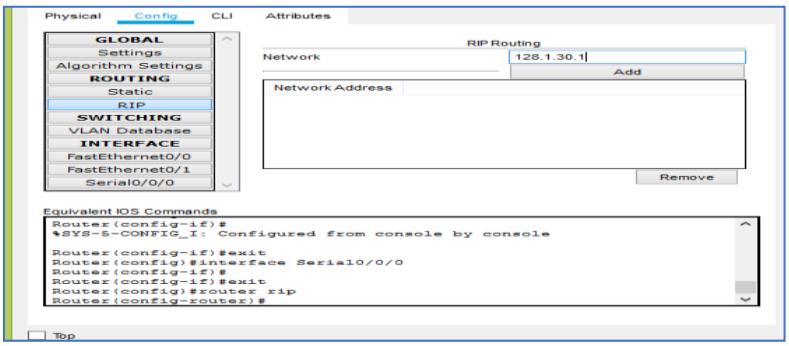

Figure 2: Configure any classless dynamic routing protocol on the routers

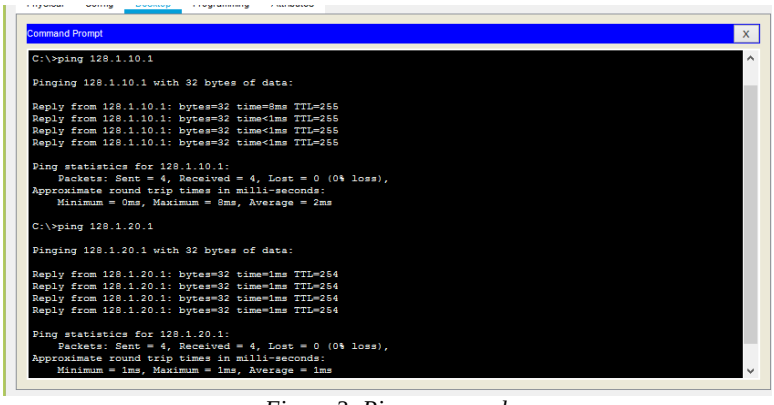

Figure 3: Ping command

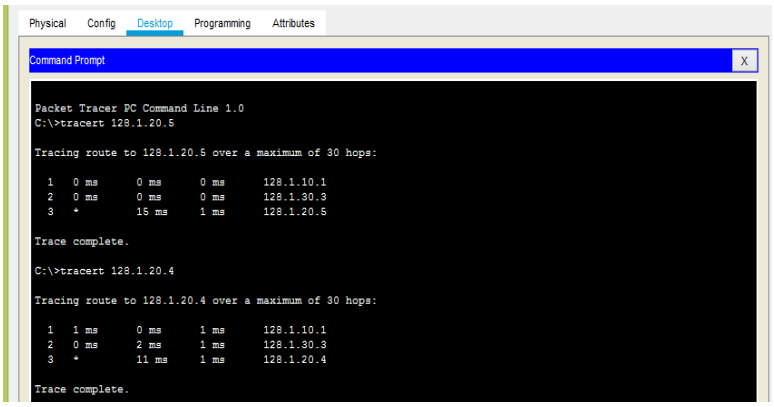

Figure 4: Traceroute command from the client to the server

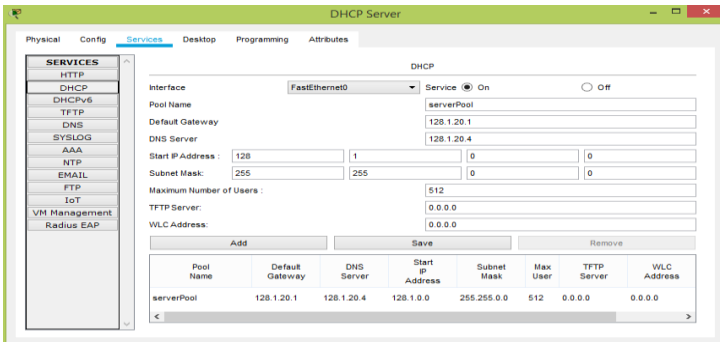

Figure 5: Configure DHCP servers

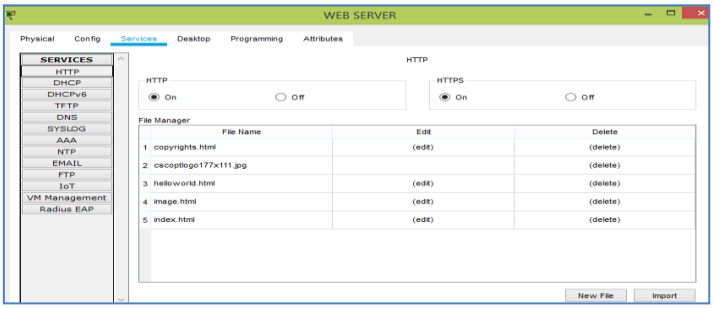

Figure 6: Configure WEB server

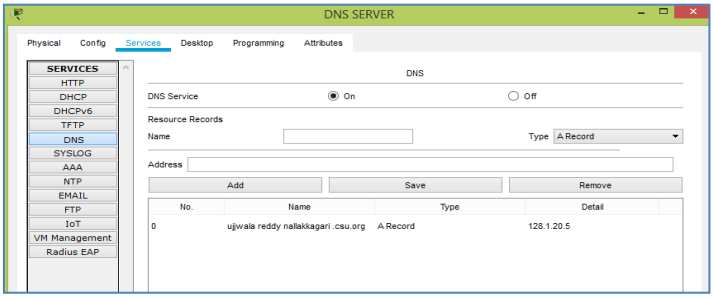

Figure 6: Configure DNS server

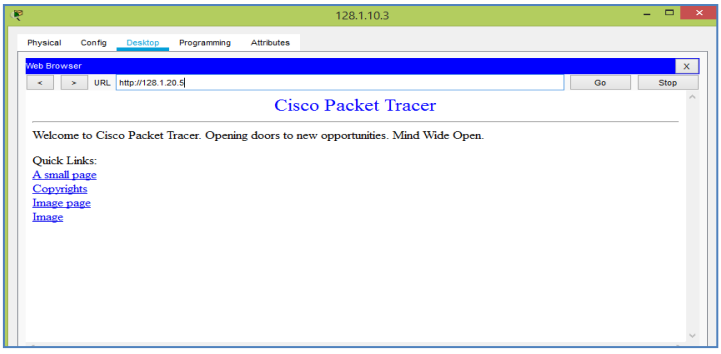

Figure 7: Web Browser

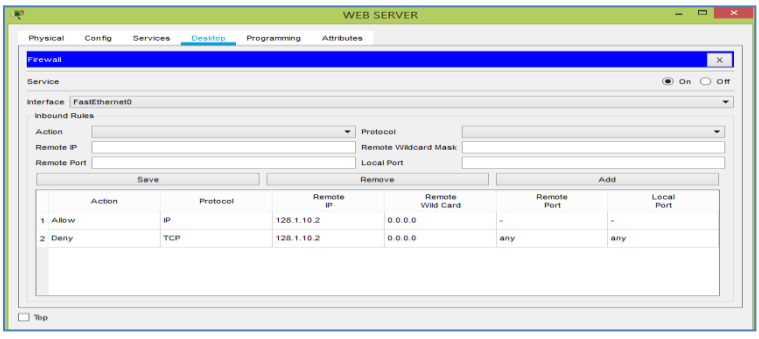

Figure 8: Firewall Configure traffic filtering on the web servers

V.CONCLUSION

A smart campus is a grouping of Virtual Local Area Networks which offers whole campus coverage. It offers various facilities such as availability, connections and various functions It offers office staffs, faculty and students for different applications and to complete various tasks, thus it needs to be planned and designed earlier. To provide these intricate facilities, combination of standard network devices and IoT in the campus, this research work has been proposed. The smart objects should be registered beforehand in the IOE server and managed by an administrator. The smart campus network design model is proposed that enabling 5G IoT to smart campus is a cost-effective approach. The VLAN simulation aims to simulate smart devices that can individually response and be controlled by end-users distantly to effort efficiency and effectiveness.

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