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Recent Techniques in Software Defined Network (SDN)

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***Abstract*— Accelerated development is the most discriminating characteristic of information technology. It is no overstatement to declare that networks like other IT sciences have seen a great deal of innovation in hardware, applications, services, tools, etc. But the network's infrastructure is different from other information technology, which has remainedunchanged in its old structure, and now is the time of the SDN technology revolution. This paper presents the recent techniques and protocols for Software-defined network and their differences with traditional networks and also discusses their structure in a simplified way.**

***Index Terms*— Software-defined networks, SDNN,OpenFlow, controller.**

I. INTRODUCTION

Becauseof the increasing size & requirements of the networks, it is difficult to move between the hardware keys and manual control of individual software keys. Automatic reorganization techniques and their response are not available in existing IP networks. This decreased flexibility and does not allow for the modern and development of network infrastructure. Here comes the role of SDN to facilitate the task. SDN is an innovative way in the current network world, which helps overcome current network infrastructure limitations , removes cephalic integration by decouple control plane from the data plane , this separation makes the network keys and routers simpler and the logic is applied to the controller, also defined as the Network Operating System (NOS), which simplifies the application of the policy and restructures the network and its evolution [1].

II. TRADITIONAL NETWORK VS SDN

Traditional networks use a distributed version of the control plane. Communication between traditional network devices is done without a central device. But SDN uses a central mode of control level. The SDN controller is located at the control plane and the keys are at the data plane. The SDN controller is accountable for maintaining the data level with facts in relation to its own control level. The control plane (where and how the packet is routed), and the data plane (actual packet forwarding on the wire).Figure 1 shows that "Traditional network is the type of network most likely to fail because multiple brains (controller) do not work with each other". In this way, they can be easily written and configurable compared to the network, such as open and plug-in SDN by influx to the controllers of the program layer.

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Control and data plane if placed in a single device, at that time they must share the resources, which increases the load on traffic motion also on the CPU and memory.By decoupling these operations and getting a dedicated server, monitoring and watching the level of control and network portability to make important routing decisions is also easy and enabling the network to configure properly with less traffic load [2].

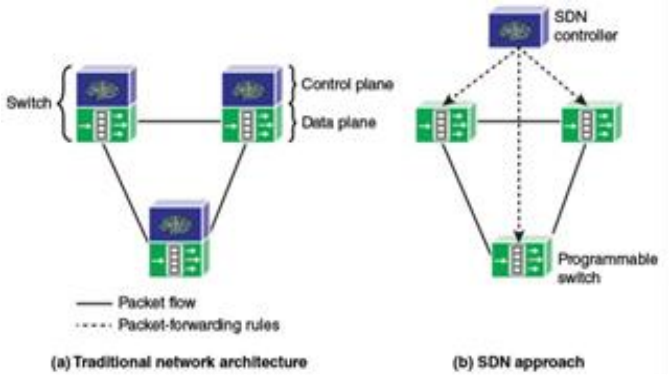

Figure 1:TraditionalNetwork VS. SDN[3].

III. SDN ARCHITECTURE

SDN structure consists of three layers and is connected to each other by two interfaces [4]. The SDN structure components are described as follows:

A. *Data Layer*:It formed from resources that communicate directly with customer traffic, in addition to the help resources you want to confirm simulation, communication, security, availability, and quality. It is accountable for treatment data packets based on the order that is provided by using the controller[4][5].Table 1 shows the number of controller types.
B. *Control Layer*: Is responsible for determining how packets are redirected by specific or larger modules [4][5]. Table is
C. *Application Layer*: is the top layer of SDN architecture and its construct from a set of application such as (network traffic management application and loading balancing application) that responsible for managing the network through control layer[4][5].
D. *Southbound Interface*: represents the connector between the controller and the forwarding devices[4].

E. *Northbound Interface*:represents the connector between two layers of the application and the control layer[4].

F. OpenFlow PROTOCOL: is a telecommunication criterion for SDN and it knows a protocol for dispatch messages between the controller and the data plane (switch).[6].

Table 1: Controller's features[2]

Controller name	NOX	POX	RYU	Floodl-ight	Open-Dayli ght
Language	C++	Pytho n	Pytho n	Java	Java
Performan ce	High	Low	Low	High	High
Distribute d	No	No	Yes	Yes	Yes
OpenFlow support version	1.0	1.0	1.0-1. 4	1.0	1.3
Cloud support	No	No	Yes	Yes	Yes
Learning	Mediu m	Easy	Mediu m	Hard	Hard

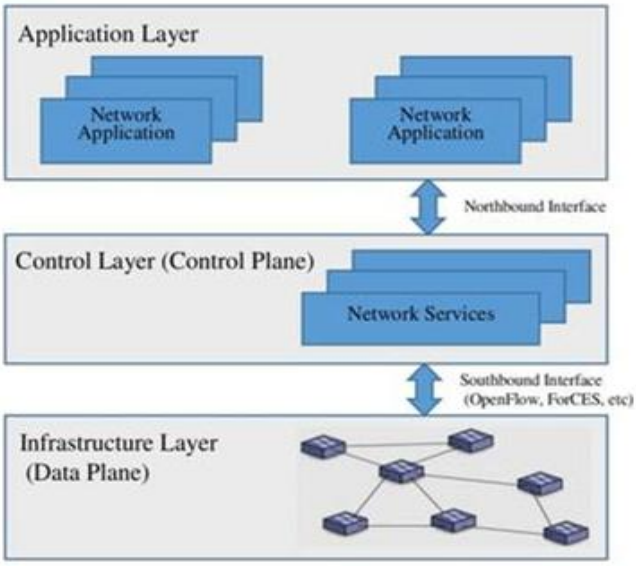

Figure 2: SDN Architecture [17]

IV. RELATED WORK

SDN has become an important technology in the scope of telecommunications. In the last few years. The researchers organized a number of published papers on the various important aspects of the SDN concept and the solvability of the problems involved. This section describes some of these works.

- Kreutz et al. 2015 Solutions to vendor security issues have been addressed to network infrastructure owners, severe restrictions on change and innovation through open southbound interfaces, separation of control and data, and global network visibility through logical centralization of "network mind". Control level elements are now represented by One entity is the console or network operating system. SDN represents a major shift in network development and development, offering a new speed of innovation in network infrastructure. An in-depth look at the fundamental aspects of the SDN problem, hardware architectures, Southbound interfaces, virtualization network, network operating systems, northbound interfaces, network programming languages, and, finally, network applications [7].

- Himanshu Kumar 2017 suggested the appropriate security solution for the weaknesses in SDN that could be caused by some attack vectors that threaten the network. SDN was run next to NFV. This is a new period in building networks and securing them from attacks. Secure and powerful encryption [8].

- Rego et al. 2017 They provided an analysis of how the Dynamic Routing Protocol works as Open Shortest Path First (OSPF) in SDN. And how the network is stabilized through parameters such as convergence time, (RTT) and (QoS) when the video is transmitted between peripherals. Results were compared with a traditional network to assess similarity in terms of stability and performance. Experiments show that OSPF offers a higher convergence time in a default topology. However, the network offers a lower delay and RTT compared to the physical network with the traditional OSPF routing solution [9].

- Lu et al. 2019 Provide an overview of the problem of locating and controlling networks in programs and categorizing them on a web site (latency, mileage, cost, multiple targets) depending on the target and analyzing algorithms in different application methods [10].

V. TECHNIQUES IN SDN

In this section Will be offered several new protocols and techniques in SDN.

1. **SafeFlow (SF)**[11] Hosting networks have unreliable devices that may be hacked by viruses. When the console is connected with OpenFlow (OF), which is considered reliable for traffic, the Safeflow protocol is used as the first line of attack and the first defender against attacks on the (OF) switch without reliable digital data and is useful in solving the problem of identity-based security and security capability. The Trust adds the trust in OF and SF that guarantees the same infrastructure security for (OF) and is designed to support authentication between the OpenFlow switch and the OpenFlow controller in software-defined networks and the way they work. Is where the controller sends a message NegotiationRequest (NR) to the converter and answers the converter

message other (NR) contain the information contained resource if they are not encrypted then must approve OpenFlow switch and control unit in OpenFlow first on trust policies. This protocol is a supplement to the protocol OpenFlow.

2. **Adsense**[12] SDN based graph is useful of the multi-hop wireless networks like Wireless Sensor Network (WSN) then endorse a reliable, adaptive then efficient SD-WSN structure referred to as a sense of a principled way. A WSN consists of a set of resource-constrained sensor devices as are linked via a wireless medium. SDNs may provide large benefits in accordance with WSNs by means of allowing the community in conformity with stand configured after an efficient state. However, that also introduces some modern challenges appropriate to the potential characteristic of the resources.
3. **Software-Defined Networks based Smart Grid Communication**[13]: The standard electric control grid in the main helps 4 operations: electric control generation, electric-powered control transmission, electric-powered control distribution, then the control on generated electricity. The final aim of these devices is according to provide purposes to the cease users (either clients and utility operators). SDN meets its standards then be able to help according to structure the foundation because of SG control. Moreover, by way of making use of SDN among SG systems, efficiency or elasticity be able probably to stay improved.

4. **Improving Power Efficiency in Partially Deployed (SDN)**[14] The use of Internet networks leads to greater power efficiency and because of the distributed control of traditional networks it is difficult to find a strategy to reduce energy consumption. Here comes the role of SDN and because of the central control which leads to more efficient energy and better performance. In order to reduce the impact of the technology industries on the environment through an effective network system, a great effort is made to reach this. In this way, we conclude that the number of more specific nodes in the SDN leads to a better performance of the SDN network because of its central nature with the presence of the controller.
5. **Placing Controllers in Software-Defined Wireless Mesh Networks**[15]:Due to the central nature of the SDN, SDWMNs are able to make centralized decisions as they are a new phenomenon and they also suffer from the problem of the location of the control unit because the site has an importance in increasing efficiency in the service of incoming requests. A new utility function is used that gives weight to many different parameters such as the number of interconnecting links and the average delay for all nodes. This algorithm identifies the location of the wireless network controller that is defined by the software and provides a better location solution for the controller.
6. **Comparison of Routing Algorithms with Static and Dynamic Link Cost in SDN**[16] : Since the central control unit in the software-defined networks (SDN) has an overview of the information and the state of the network so within the SDN context there are three routing algorithms which are) Routing Algorithms with Static Link Cost) RA-SLC), Dynamic Link Cost (RA-DLC), and Dynamic Link Cost with Minimum Interference (RA-DLCMI) and after comparing them by gathering the status of network status information (NSI) where one of the problems is how to obtain NSI. This is because it is difficult to achieve high accuracy. The algorithms are compared with the assumption that NSI exists continuously and With less precision and when results emerge, RA-DLC and RA-DLCMI are superior to RA-SLC, in terms of productivity and service delivery.

VI. RESULTS

Software-Defined Networks (SDNs) improve and simplify network performance and management and scalability based on open-source software and a centralized control unit that manages the entire network and makes routing decisions instead of distributing them among network segments. Therefore, they are useful in several fields, One of the techniques used in SDN's work is that the network can be secure against attacks, manageable wireless networks, standard electrical control operations (transfer, generation, distribution) based on Smart Grid, because of its central nature produces more efficient and efficient energy better, help SDWMN make decisions Centrally, when comparing three routing algorithms we show RA-DLC and RA-DLCMI better than RA-SLC, in terms of productivity and service delivery.

VII. CONCLUSIONS

Because of the programmability and separation of the control plane from data plane and the formation of a central unit called the controller that leads to control of all parts in the network and secure it better and also can be used in several areas such as wired and wireless networks, as well as in the fieldsof energy and electrical processes. In this work, a brief introduction to SDN technology was presented, and the difference between them and traditional networks was explained. A number of techniques/protocols used in SDN were also discussed.

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