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A STUDY ON SOFTWARE DEFINED NETWORKING

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Abstract

In today's scenario the use and need of internet is vital. Information and communication through various applications are new challenges to the future of internet. In traditional approach, manual configuration of devices are tedious and error prone. Software defined Networking (SDN) approach gives promising solution to overcome the drawbacks of traditional approach. This paper focuses on basic architecture of SDN and its importance over communication technologies.

Keywords: *Traditional network, Software Defined Networking, Control Plane, Data plane, SDN architecture.*

1. INTRODUCTION

TRADITIONAL WAY OF NETWORKING:

In traditional way, network functionality is mainly implemented using dedicated appliances. In this case, dedicated appliance refers to one or multiple switches or router or application deliver controllers. The basic functions of router are receiving the packets, checking the routing table, forwarding packets out. These functions are done by control plane and data plane of the router as shown in the figure 1 and 2 [1].

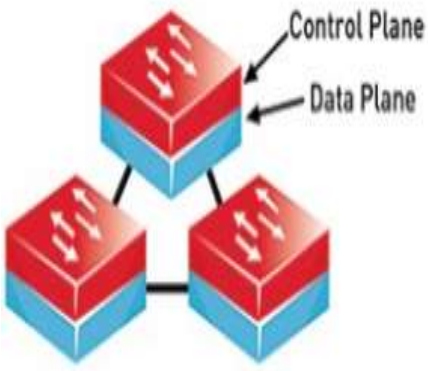

Fig.1 Control plane

Fig.2 Router data plane in Router

The main limitation in current or traditional way of networking is data communication is growing day by day and this growth brings the need of new technologies [1]. For example, Take a scenario, when new network devices are added to the existing network, reconfiguration is required. In traditional network reconfiguration is done manually. As when the network size grows, it becomes extremely difficult to manage the huge

network infrastructures. To address this issue the network changes should be maintained and updated dynamically. This is done by SDN

WHAT IS SDN?

Software-defined networking (SDN) is a new approach to design, build and make networks agile and flexible. The goal of SDN is to shape traffic from a centralized control console without having to touch individual switches in the network [3]. SDN is nothing but physically separating the control plane from data plane (forwarding plane) as shown in figure 3. Here the control plane acts as a brain or decision maker while transferring the packets and the data plane acts a packet forwarder in dedicated hardware. A single control plane controls several forwarding plane. The centralized SDN controller directs the switches to deliver network services wherever they're needed, regardless of the specific connections between a server and devices as shown in the figure 4 [2]. The main benefit of centralizing the control plane is allowing forwarding decision to be made globally across the SDN domain rather than at each hop.

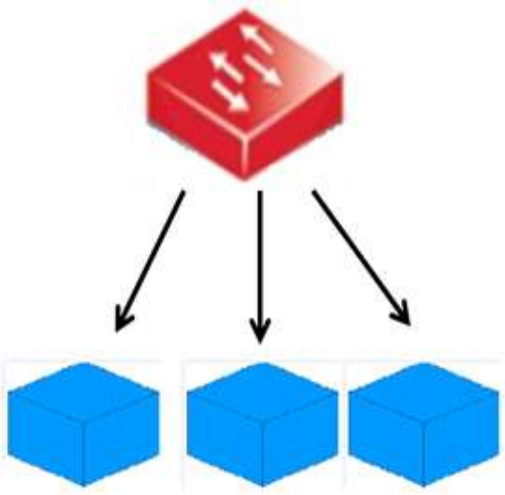

Fig.3 Separating control plane from data plane

This process is a move away from traditional network architecture, in which individual network devices make traffic decisions based on their configured routing tables

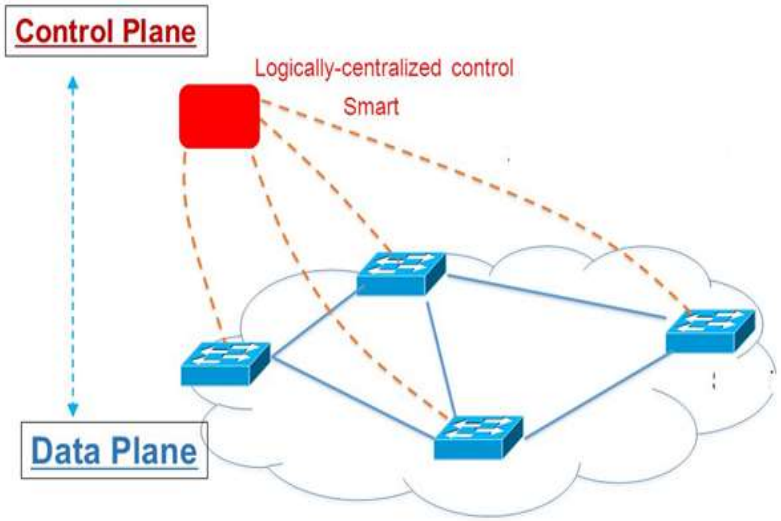

Fig.4 Centralizing the Control Plane

SDN ARCHITECTURE

A SDN architecture defines how a networking and computing system can be built using a combination of open, software-based technologies and commodity networking hardware that separate the SDN control plane and the SDN data plane of the networking stack [2].

SDN architectures generally have three components or groups of functionality as shown in the figure 5 [2, 3, 5]:

- SDN Applications: SDN Applications are programs that communicate behaviours and needed resources with the SDN Controller via application programming interfaces (APIs). In addition, the applications can build an abstracted view of the network by collecting information from the controller for decision-making purposes. These applications could include networking management, analytics, or business applications used to run large data centres. For example, an analytics application might be built to recognize suspicious network activity for security purposes.

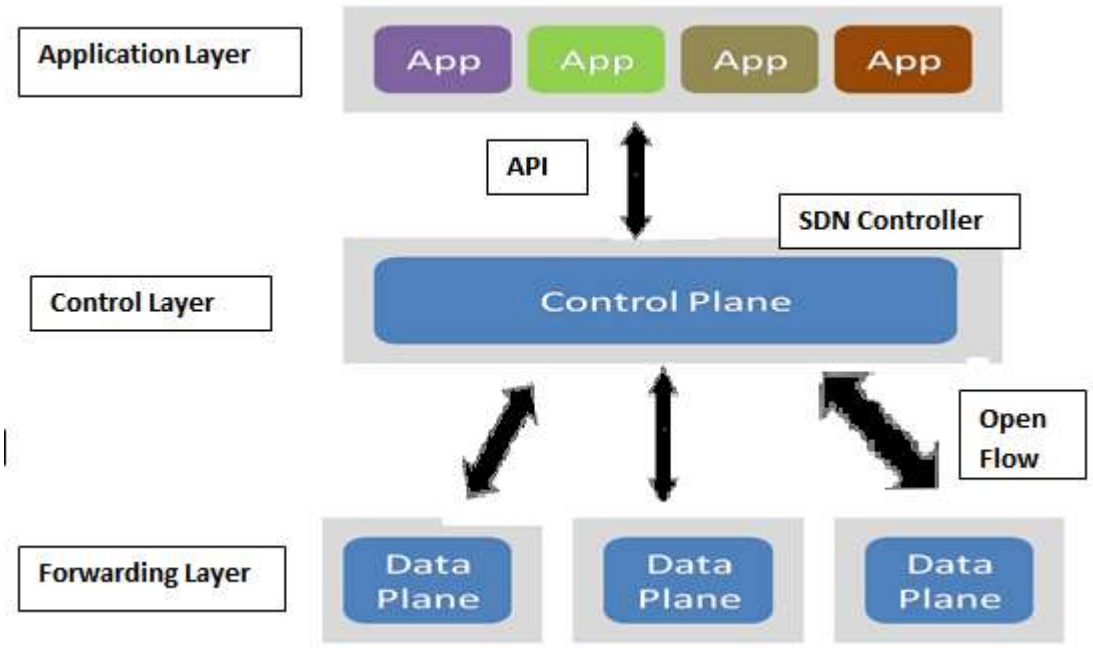

Fig.5 SDN Architecture

- SDN Controller: The SDN Controller is a logical entity that receives instructions or requirements from the SDN Application layer and relays them to the networking components. The controller also extracts information about the network from the hardware devices and communicates back to the SDN Applications with an abstract view of the network, including statistics and events about what is happening.

- SDN Networking Devices: The SDN networking devices control the forwarding and data processing capabilities for the network. This includes forwarding and processing of the data path.

The SDN architecture APIs are often referred to as northbound and southbound interfaces, defining the communication between the applications, controllers, and networking systems. A Northbound interface is defined as the connection between the controller and applications, whereas the southbound interface is the connection between the controller and the physical networking hardware. Because SDN is a virtualized architecture, these elements do not have to be physically located in the same place.

WHY WE NEED SDN?

- **Orchestration:** In SDN one to many relationship exists to control and manage thousand number of devices with one command. It enables centralized management of networking devices. It is termed as Orchestration [4].
- **Abstraction:** This is the most awesome thing about the SDN. The centralized controller abstracts the network. So any changes to be made can be done in one location (ie) controller. You don't have to bother about the underlying data plane [4].
- **Virtualization:** Abstraction derives the virtualization. Without really knowing where and what my resources are, I am able to get my things done [4].
- It helps in automation of networking devices
- It offers flexibility scalability and efficiency
- It is widely used by social networking websites (FB, twitter, google plus, etc) and large db search engines(Google, Yahoo, Ask, etc)

CONCLUSION

Traditional network working principles and its drawbacks are overcome by SDN. SDN architecture has centralized control console over network which has greater impact on network performance.

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