Abstract—In a line with the noteworthy growth of the networks (e.g., networks properties and features,) the design of the network become more complex and maybe we cannot achieve these properties and features with the traditional architecture of the networks (e.g., architecture of dedicated monolithic routers and switches that implement both data and control plane.) In some cases, we need to take more complex decisions for routing process and security and managing the network flow and prevent some of the undesirable issues, with relying on the old architecture of the networks we can’t make these decisions. The way we can go through to make these properties of the network easy to achieve is making a change in the ordinary network architecture, making it \_the architecture\_ easier to be configured and be modified and by the way enhance its performance. Making use of the SDN (software defined network) is a great way to get benefit of the desired features of the expected and desired network architecture. SDN is a very rising architecture in today’s networks that is been adapted by a very influential technical institution (e.g., Google that uses SDN to manage the data center from inside and between data centers from outside).

**What is SDN (software defined network)**

SDN is the separation of the control plane and data plane. Control plane (i.e., the area where the routing protocols is performed) functions is performed by the SDN controller and network-controlled applications network, and the data plane (i.e., the area where the forwarding decision is performed) function is performed by the network routers and switches. This separation makes the process of modifying the network state and protocols done in an easier way than the old architecture (with monolithic data and control plane.) Also, we should mention that this separation allows more security options (i.e., firewall) that we can now achieve by SDN, simply by defining which packets from which sources will be dropped and another function this article will cover like traffic control.

SDN forwarding function is done in a different way. As we learned from the traditional routing algorithms, the packet forwarding decision depends only on the destination IP address (i.e., 3rd layer address). In SDN forwarding scheme, the forwarding decisions depends on many fields not only the IP address, and these fields not only from the IP layer (i.e., but it can also be from data link layer and/or transport layer.) fields from 2nd later like source and destination addresses and from 4th later like source and destination port. And this forwarding decision is done using protocols like OpenFlow protocol that depend on the “match-plus-action” scheme that will be discussed soon.

**SDN and router-based network**

The main difference between the SDN and monolithic data and control plane architecture is that the SDN dedicate the control plane function to some hardware devices (i.e., SDN controller that deliver configuration data to the underlying routers, and the network-controlled applications which perform the routing algorithms and network state updates and packet flow decisions.) leaving the only function performed in the network router and switches is the data plane functions which is not the case in the other architecture which the two planes are merged and done in the routers and switches.

**SDN architecture**

This discussion will be divided into two parts as the SDN consists of two main parts (i.e., the data and control plane.) First, we will talk about control plane and control plane components and the functionality of each component as a part of interactive cooperative system.

Control plane is divided into two parts, the SDN controller and the network-controlled application:

* Network-controlled application: the part of the control plane that is responsible for the routing function. These applications take the network information (e.g., the links states and the nodes states form the SDN controller and perform the defined routing algorithm to determine the shortest path also it is triggered by the SDN controller if there is any change in the network state, in this case the applications make the decision depending on the changes in the network state and pass the appropriate decision to the SDN-controlled routers and