

# Efficient Network Architectures Based On Software-Defined Networking (SDN)

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**Abstract:** The Software-defined networking (SDN) is an approach to computer networking that provides an opportunity for the network administrator to initialize, control, change, and manages networks programmatically via open interfaces and abstraction of lower level functionality. The old network architecture (NA) has been using the traditional networks, thus inefficient due to internetworking devices inability to support scalable computer requirements is digitalized and real time. The newest of NA is designed as a platform efficient to resolve the issue of traditional networks by decoupling and disassociating of NA responsibility is to control and making decisions in order to traffic concerns. Some of the typical systems associated with SDN include OpenFlow protocol, Cisco Systems, Open Network Environment, and network virtualization platform. The changes in technology signifies the important for the new NA that acts as a response to select in traffic patterns. Besides, the new network architecture must respond by providing a traffic pattern for the managements and flexibility of users traffic. The network architectures need to take advantage of the new cloud services and create a network that suits the interests of the potential users. This study focuses on showing how SDN deployments can be used to improve the manageability of NA, and OpenFlow can be used to create end-to-end switches and allow users to attain their objectives using efficient network architectures. The study utilizes the use of multi-case research method in analyzing the measures to be implemented for improving the efficiency of SDN. Also, investigates the different management networks traffics and their role in bolstering networking ability. The study is proposing the most harmonious method that network managers need to prioritize when it comes to deploying their network architectures. This is for ensuring so they select a NA that is easier to manage and affordable. SDN is an important tool used in improving networks and efficiency of a network. This paper, therefore, uses SDN in convincing network managers and other concerned partners about the importance of ensuring that their network is deployed on SDN. The paper further uses OpenFlow model as the primary simulation method.

**Index Terms:** SDN, OpenFlow, network virtualization, efficiency, network management, network measurement

## 1 INTRODUCTION

The world has been subjected to profound changes that have played a fundamental role in improving people's lives. One of the greatest developments includes technological advancement. Software-Defined Networking is one of the examples that has also played a critical role in defining a clear and promising future in the computer networking world through integration of better technologies and solution-oriented software and programs. The network is associated with unusual and unique capabilities with essential features such as centralized control, efficient and updated forward rule, and flow obstruction. The network application is an important area; therefore, architectures are working to ensuring that the world can realize the SDN-based networks have become an essential element, used in not only creating efficiency in network architectures but also improving performance through integration and deployment of technologies that make it possible for network architectures to achieve their objectives. The study uses scholarly sources, books, and the internet that provide critical and valuable information towards the understanding of SDN-based networks. Software Defined Networking (SDN) is a new networking paradigm, with a great potential to increase network efficiency, ease the complexity of network control and management, and accelerate the rate of technology innovation. One of the central ideas of SDN is the division of the network's control and data plane.

The intelligence and the control of the network operation and management, such as routing, is removed from the forwarding elements (switches) and is concentrated in a logically centralized component, which is called the SDN controller. In order for the controller to configure and manage the network, it needs to have latest information about the state of the network, in particular, its topology. In this study, we assess the cost and overhead of the accepted standard way to deal with network architectures effectiveness and decreased control overhead. We have produce our new disclosure approach on the NA, by means of investigations utilizing the Mininet network emulator.

## 2 MATERIAL AND METHODS

### 2.1 Research design

Research design can be described as the strategies that are used in the overall research course to integrate different components of the research study logically and coherently contrary to the research problem at hand. In the manner of the source of the underlying research content in the documentation of this paper. We have divide it to primary and secondary sources. For the case of primary data, explorations are made of journals, books, magazines and internet sources and gathered different pieces of helpful information that could assist in the research. As for secondary, a research questionnaire is developed to collect some opinions regarding the use of SDN to improve the efficiency of network architectures.

### 2.2 Questionnaire for quantitative

A questionnaire was designed and consequently used to gather different pieces of information that were supplemented by the respondents. Prior to the documentation of the final survey, questionnaires that have been developed by other researchers were reviewed. The measure was used to ensure that all significant aspects of the project were put into consideration. It is also vital to note that the questions that

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were used in the questionnaire were not only precise but also logical to ensure that issues of misinterpretations of the questions were not there. In that respect, a research questionnaire developed to gather some of opinions regarding the use of SDN to improve the efficiency of network architectures.

**2.3 hypothesis**

The improvement of network architecture, by the use of SDN. That means that the research hypothesis will be as follows:  
 H1: SDN cannot be used to improve network architecture.  
 H2: SDN can be used to improve network architecture.

**2.4 Questionnaire**

This paper made use of a four-point Likert scale to measure and consequently understand the items that were involved. All significant aspects that could provide the basis for providing a better understanding of the implications of SDN in the development of efficient networking interfaces have been put into consideration and consequently documented in the Likert scale. The scale was anchored by:

1=strongly disagree, 5=strongly agree

In this study:

- SDN management skills and attitude: SDN management will be assessed in various capacities in as far as the provision of efficient network architecture is concerned.
- Infrastructure Effectiveness and Availability: infrastructure is described as the physical and the organizational facilities and structures that are required for the development of network architecture that is based on SDN
- Technical Support/Quality of Service: it will be described as the technical aspects that are likely to support the development of efficient network architectures
- Network instructor's willingness and competency: instructors will be defined as the groups of network professionals whose duty is to necessitate the adoption of efficient networking interface that is based on SDN

Factors	Item code	Objects
SDN management skills and attitude	TM1	Improving SDN network architecture does not require a lot of technical skills
	TM2	Using SDN to manage a network is more cost-effective compared to the traditional methods.
	TM3	Success in the development of SDN based network architecture depends on the attitudes of the management partners in necessitating the project
	TM4	SDN provides the management with greater platforms for engaging all the partners
	TM5	The cooperation of the management is inherently a core success factor for the development of an efficient network architecture based on SDN
Infrastructure Effectiveness and Availability	I1	The development of efficient network architecture solemnly depends on the ability of the involved partners to pull their

		efforts and resources together.
	I2	Efficient network architecture was difficult to attain without the deployment of the necessary SDN infrastructure
	I3	A higher level of networking efficiency can only be attained through the use of SDN
	I4	Areas with poor SDN infrastructure still lag behind in the implementation of effective networks
	I5	The use of SDN provides a pathway for the development of better and improved network infrastructure
Technical Support/Quality of Service	TS1	The use of SDN provides the researchers and technologists with effective ways of coming up with improved networking infrastructure
	TS2	The use of SDN to develop an active network interface requires constant engagement of the technical experts
	TS3	The use of SDN in the development of efficient network infrastructure depends on the effectiveness of the technical partners in supervising the use of SDN
	TS4	Success in the development of suitable network interface is inherently associated with the abilities of the required partners in ensuring that quality services are delivered
	TS5	Effective implementation an efficient e-learning platform requires constant engagement of the technical team
Network instructor: willingness and competency	IN1	SDN based network architectures is easier to manage compared to traditional techniques concerning technical support that is required
	IN2	Success in the development of efficient network architecture will solemnly depend on the abilities of the network instructors to deliver the right content to the rest of the team members
	IN3	The use of efficient network architecture is likely to attain success through constant cooperation and engagement of the network instructors at hand
	IN4	Competent network instructors are inherently the foundations of successful implementation of efficient networking platforms that are based on SDN
	IN5	The use of SDN in the development of efficient e-learning interfaces provides the instructors with sufficient time of implementing their duties compared to the traditional techniques

**2.5 Algorithm Questionnaire policies that provide the basis for the development of efficient networking interfaces based on SDN**

The algorithm policy is providing an overview of how packets are routed in contrast to the way the associated tables are configured. Consequently, all the networks that enters into the packets were invoked conceptually to ensure that the state of networking environment could also be accessed. From the research analysis, it is noted that java, python and Haskell programming languages could be deployed in the implementation of efficient network architectures that were fundamentally SDN based. The programming languages are represented in the form:

$$F: (packet *env) = route.$$

**i. Using java for algorithm policy to test SDN**

The problem that is associate with this language is the fact

that it does not specify the underlying table of configuration. Consequently, the model makes the life of the programmer to be easy since one is only required to take a given packet and choose what to do with it.

## ii. Techniques that are usually used to test and implement algorithmic policies

In the due course of researching for this study, it was evident that a coherent understanding of algorithmic policies is a necessity. There are two methods that were used to implement algorithmic policies in the development of this study. They include simple solutions and static analysis. The former performs poorly since it has been designed to process all the packets that are contained in the controller or consequently opt to use the exact match rules. The latter, on the other hand, has been designed in a manner in which it is easy to determine the layout of the underlying flow table. However, it is equally associated with many drawbacks. For instance, it makes the system at hand to be dependent on the source language. It is also conservative and typically hard.

## 3 RESULTS

The results provide the guidance on how efficient networking interfaces can be attained through effective utilization of SDN. The study explains Implementing an SDN approach for network architecture, is actually reduces the complexity of the network by allowing network manager to control networks service from a central management tool, so now you can control all your devices through one a single tool without growing the cost and more efficiency. Besides, you don't need to add more equipment nor more the need of human interventions to optimize the control network, now it can be done all automatically with SDN. In a traditional network architecture, it has a certain limited hardware and the human collaborations with the network devices used to be with each other manually. With SDN, the network is inattentive on software, leaving more choice and flexibility in growing network more easily.

## 4 CONCLUSION

It is fundamentally evident that SDN can be used to improve the efficiency of network architectures. Consequently, the study has explained the concept of software-defined networking (SDN) features and specifications that should be used in the implementation of SDN-based network architectures. It has also provided how SDN use can be improved to attain overall efficiency in networking tasks. It is important to note that the consent of developing network architecture is essentially based on the various management and operation interfaces can be redesigned to attend to the current societal needs. Additionally, significant networking components such as middle box routing, inter-domain routing, security issues, and enterprise networking are great examples of some of the platforms that can be improved to attain an overall efficiency concerning operational abilities to network interfaces. This study has also provided a productive platform for illustrating some of the SDN techniques that are in place to improve networking activities including some of the disadvantages that are associated with them. Precisely, the thesis provides a clear justification that some of the technological realizations that have been attained so far have not been exploited to the fullest to attain the level of Information Technology efficiency that every individual and

organization could be aspiring to attain. Moreover, the thesis asserts that despite being realized a couple of years ago, SDN has not yet been exhausted regarding the technological capacities that it offers. Thus, the fact that SDN can be used as the core foundation for the development of network architectures are more efficient and flexible for today's needs.

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