Availability Modelling for SDN switch in Cloud based Infrastructure

May Thae Naing, Aye Myat Myat Paing
University of Information Technology, Yangon, Myanmar
maythae@uit.edu.mm, ayemyatmyatpaing@uit.edu.mm

Abstract

Attaining continuity and high availability of data transactions for cloud computing services are necessary for SDN architecture. The high-speed and complicated network of hosts and network devices often meet with a variety of failures due to links or system components. This failure affects the availability of the system. The proposed system uses a two-level availability model that is used to evaluate the availability of SDN concept in cloud based infrastructure. This paper offer availability solution for software defined network (SDN) in cloud computing Infrastructure and then describe the markov model for availability in SDN switches. Moreover, the impact of software and hardware failures on the overall availability of SDN switches is evaluated by SHARPE Tool.

Key Words- Cloud computing, Software Defined Networks, Availability

1. Introduction

Cloud computing has emerged as a widely accepted computing paradigm built around core concepts such as elimination of up-front investment, reduction of operational expenses, on-demand computing resources, elastic scaling, and establishing a pay-per-usage business model for information technology and computing services. There are different models of cloud computing that are offered today as services like Software as a Service (SaaS), Platform as a Service (PaaS), Network as a Service (NaaS) and Infrastructure as a Service (IaaS) [1]. In spite of all recent research and developments, cloud-computing technology is still evolving. Several remaining gaps and concerns are being addressed by alliances, industry, and standards bodies.

Software-Defined Networking (SDN) is an emerging networking paradigm that gives hope to change the limitations of current network infrastructures. First, it breaks the vertical integration by separating the network's control logic (the control plane) from the underlying routers and switches that forward the traffic (the data plane). Second, with the separation of the control and data planes, network switches become simple forwarding devices and the control logic is implemented in a logically centralized controller (or network operating system), simplifying policy enforcement and network (re)configuration and evolution [2], [3].

The key concept of the cloud computing is virtualization. Virtualization is the abstraction of the physical resources needed to complete a request and underlying hardware used to provide service. And also, the idea of the SDN is adopted from the concept of virtualization, where controls and managements of software subsystems are completely decoupled from hardware infrastructure. The decoupled components of the SDN are separated into three layers of the SDN architecture; (i) Data plane: SDN enabled network devices on a data plane reside at the bottom of the SDN architecture as the underlying physical layer, (ii) Control plane: network operating systems and hypervisors on the control plane resides at the middle layer to provide a bare virtualized environment; and (iii) Management plane: network applications running on the management plane resides at the upper-most layer. This virtualization approach brings three key attributes to the SDN: logically-centralized intelligence, programmability and high-level abstraction. Nevertheless, there are still many issues to use SDNs [4]. In fact, physically centralized network infrastructure still requires adequate levels of system availability and reliability.

High availability refers to the ability of a system to perform its function continuously (without interruption) for a significantly longer period of time than the reliabilities of its individual components would suggest. High availability is mostly often achieved through fault tolerance. Therefore, the effort in the proposed system will offer availability model by a comprehensive evaluation of the SDN in cloud infrastructure. To evaluate the model using SHARPE tool simulation is presented.

This paper organizes as follows: Section II describes the related work of the proposed system, Section III presents the two-level availability model, and Section IV describes the case study for the model. Finally, Section V concludes the paper.

2. Related Work

One of the main reasons of hesitating to adopt SDNs is the concern on availability. There are a few works on the availability of SDNs. In paper [5], the authors considered