Enhancing Availability on IP Network using Active-Active Replication of SDN controllers

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Abstract

The exponential growth of mobile devices and server virtualization and cloud computing technologies are the key computing trends which need new networking architecture. Nowadays, Software Defined Networks (SDN) has established a lot of attention as a new technology which provides more flexibility than conventional network which has programmability, configurability and manageability from its unique character of centralized software control. Therefore, this paper focus on enhance system availability using SDN concept for IP network. Since the controller is centralized, it will be a potential single point of attack and failure. The SDN controller affects the overall availability of SDN. To overcome the single point of failure, SDN controller is replicated with active-active replication. The SDN controller can suffer software failure as well as hardware failure. To prevent system failures caused by software, software rejuvenation can be applied. The impact of failure on SDN controllers is illustrated the analytic model and evaluate with the steady-state system availability through the use of numerical analysis.

Keywords: Software Defined Networking, Availability, Proactive software rejuvenation.

1. Introduction

The lack of flexibility and programmability of legacy network architecture has been the concern of many networking enthusiast over the years. The necessity to overcome these lapses in today's network has been the focus of many industry and academic research efforts [3]. Consequent upon these remarkable contributions is the requirement to deliberately isolate the functionality of the data plane from that of the control plane. The current standard, in which the data forwarding functions and the control functions are built into a single hardware, is the reason for and the basis of the lack of flexibility and programmability of the current network structure. The argument has been made and reasonably so, that if the data and control functions are decoupled and isolated from the single plane. During recent year, SDN is the decoupling of the data plane from the control plane. In addition, the control plane is logically centralized in a software defined controller (network brain), while the data plane is composed of network devices (network arms) [4].

SDN centralized control, logically centralized SDN controllers are potentially focused to a different set of risks and threats compared to traditional IP network architectures. The availability of SDN controller is more important issue for the overall system availability. The SDN controller can face from hardware and software failure. In order to solve the software failure, proactive software rejuvenation is applied. When SDN controller suffers hardware failure, we will switch to another replicated active SDN controller in order to reduce the downtime. Furthermore, with two controllers functioning as active production servers, you can make better use of resources by balancing workloads.