بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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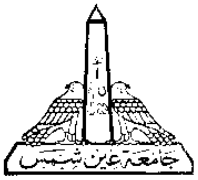

AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Computer Engineering and Systems

Reliability and Scalability in SDN network

By

Mohamed Abbas Baioumy Aglan

Postgraduate Diploma in Computer Engineering and Systems

Faculty of Engineering, Ain Shams University, 2016

A Thesis

Submitted in partial fulfilment of the requirements of the degree of

Master of Science in Electrical Engineering

(Computer Engineering and Systems)

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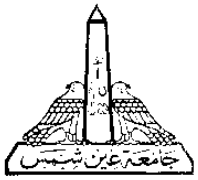

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Degree: Master of Science in Electrical Engineering

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Abstract

Mohamed Abbas Baioumy Aglan

Reliability and Scalability in SDN network

Master in Electrical Engineering, Computers Engineering and Systems

Ain Shams University 2020

Software Defined Networking (SDN) is a software-based solution which setup a unified control plane, as an intelligent network manager, to control the whole network devices that only forward data, instead of controlling each device alone which wastes time and effort. The conversion from the traditional networks to the SDN network has significant challenges that need a deep consideration regarding to reliability and scalability issues. The main core of SDN is the controller which participate and dominate in all logics and decision making. This big rule for controller has multiple issues should be clarified and fixed due to its centralization which affects negatively the Reliability and scalability during the heavy-duty tasks in SDN.

This thesis focuses on finding a network architecture enhance Reliability and Scalability issues through Multiple Domains with multiple controllers and Failover “MDCF” to eliminate the problem by dividing network Devices to multiple domains. Each domain is supervised by controller with failover controller.

This model made SDN more robust by improving the Reliability and Scalability in SDN by increasing the availability and decreasing the delay and lost packets.

Key words: Software Defined Networking (SDN), Reliability, Scalability, Failover, multiple controllers

Thesis Summary

Reliability and Scalability in SDN network

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Keywords: Software Defined Networking (SDN), Reliability, Scalability, Failover, multiple controllers

In Chapter 1, we give an introduction about SDN and background, context, purposes and significance, scope and Definitions mentioned in this thesis.

In Chapter 2, we discuss literature review and historical background regarding this thesis including criticizing the traditional models as hierarchical controllers, distributed controllers and failover controller. Finally, we summarize these architectures and mention the implication that leads us to develop a new model in this thesis.

In Chapter 3, we describe in details our proposed model MDCF. We make an introduction about Reliability solution without Scalability and Scalability solution without reliability. After that, we go deeply in our model design and indicate the states of model and system implementation.

In Chapter 4, we give a comprehensive evaluation with results and compare our model MDMCF with single controller.

In Chapter 5, we make conclusion and discuss future work.

Thesis supervisors:

Prof. Dr. Ayman Bahaa Eldin Sadek

Dr. Mohamed Ali Ali Mustafa Sobh

Acknowledgement

I would like to thank God for his blessings and that I’m able to finish this thesis.

Also, I would like to thank my supervisors Prof. DR. Ayman Bahaa and Dr. Mohamed Sobh for their advice, guidance and inspiration.

Also, I would like to thank my wife for supporting me and her cooperation.

Finally, I gift this thesis to my deceased parents to be satisfied with me.

Statement

This thesis is submitted as a partial fulfilment of Master of Science in Electrical Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

Mohamed Abbas Baioumy Aglan

Signature

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Date: 5 October 2021

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List of Abbreviations

ACI: Application centric Infrastructure

APIC: Application Policy Infrastructure Controller

D-ITG: Distributed Internet Traffic Generator

IDS: Intrusion detection system

IOT: Internet of Things

IT: Information technology

LAN: Local Area Network

MDCF: Multiple Domains with Multiple Controllers and Failover

NetFPGA: Network field programmable gate array

NIB: Network information base

P2P: Peer to Peer

SDN: Software defined network

SSL: Secure Sockets Layer

STP: Spanning tree protocol

TLS: Transport Layer Security

UPS: uninterruptible Power Supplies

Vlans: Virtual Local Area Networks

Wan: Wide area network