



**WEB BASED SDN CONTROLLER MANAGEMENT USING
OPEN NETWORK OPERATING SYSTEM**

UNDERGRADUATE THESIS

**Submitted as one of the requirements to
obtain
Sarjana Komputer**

By:

ASYAADIL RAJA HASSAN AL-IMAN

001201800113

FACULTY OF COMPUTER SCIENCE

INFORMATICS STUDY PROGRAM

CIKARANG

MAY, 2023

Copyright by

Asyaadil Raja Hassan Al-Iman

2023

**WEB BASED SDN CONTROLLER MANAGEMENT USING
OPEN NETWORK OPERATING SYSTEM**

By

Asyaadil Raja Hassan Al-Iman

001201800113

Approved:



Abdul Ghofir, S.Kom, M.Kom

Final Project Advisor



Cutifa Safitri, B.Sc, M.IT, Ph.D

Program Head of Informatics



Rila Mandala, Ph.D

Dean of Faculty of Computing

STATEMENT OF ORIGINALITY

In my capacity as an active student of President University and as the author of the final project stated below:

Name : Asyaadil Raja Hassan Al-Iman

Student ID number : 001201800113

Study Program : Informatics

Faculty : Computing

I hereby declare that my final project entitled **“WEB BASED SDN CONTROLLER MANAGEMENT USING OPEN NETWORK OPERATING SYSTEM”** is to the best of my knowledge and belief, an original piece of work based on sound academic principles. If there is any plagiarism detected in this final project, I am willing to be personally responsible for the consequences of these acts of plagiarism and will accept the sanctions against these acts in accordance with the rules and policies of President University.

I also declare that this work, either in whole or in part, has not been submitted to another university to obtain a degree.

Cikarang, May 24th, 2023



Asyaadil Raja Hassan Al-Iman

SCIENTIFIC PUBLICATION APPROVAL FOR ACADEMIC INTEREST

As an academic community member of the President's University, I, the undersigned:

Name : Asyaadil Raja Hassan Al-Iman

Student ID Number : 001201800113

Study Program : Informatics

For the purpose of development of science and technology, certify, and approve to give President University a non-exclusive royalty-free right upon my final report with the title:

WEB BASED SDN CONTROLLER MANAGEMENT USING OPEN NETWORK OPERATING SYSTEM

With this non-exclusive royalty-free right, President University is entitled to converse, to convert, to manage is a database, to maintain, and to publish my final report. There are to be done with the obligation from President University to mention my name as the copyright owner of my final report.

This statement I made in truth.

Cikarang, May 24th, 2023



Asyaadil Raja Hassan Al-Iman

ADVISOR APPROVAL FOR JOURNAL/INSTITUTION'S REPOSITORY

As an academic community member of the President's University, I, the undersigned:

Name : Abdul Ghofir, S.Kom, M.Kom

ID number : 2002090020

Study program : Informatics

Faculty : Computing

Declare that following final project:

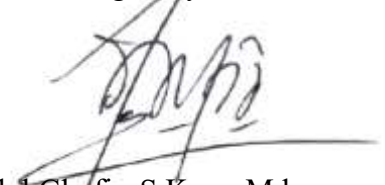
Title of thesis : WEB BASED SDN CONTROLLER MANAGEMENT
USING OPEN NETWORK OPERATING SYSTEM

Final project author : Asyaadil Raja Hassan Al-Iman

Student ID number : 001201800113

Will be published in **journal / institution's repository / proceeding / unpublsh.**

Cikarang, May 24th, 2023



Abdul Ghofir, S.Kom, M.kom

SIMILARITY INDEX REPORT

Final Project

ORIGINALITY REPORT

15%

SIMILARITY INDEX

14%

INTERNET SOURCES

4%

PUBLICATIONS

0%

STUDENT PAPERS

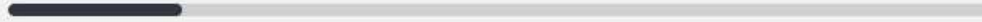
PRIMARY SOURCES

1	repository.president.ac.id Internet Source	5%
2	www.seedim.com.au Internet Source	2%
3	www.ibm.com Internet Source	1%
4	www.bezkoder.com Internet Source	1%
5	Pro Express js, 2014. Publication	1%
6	docs.sms.to Internet Source	<1%
7	"Pro Oracle Application Express", Springer Science and Business Media LLC, 2008 Publication	<1%
8	pdfcoffee.com Internet Source	<1%
9	community.particle.io Internet Source	<1%

GPT ZERO CHECK

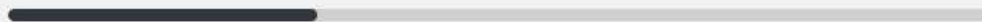
Stats

Average Perplexity Score: 176.870



A document's perplexity is a measurement of the randomness of the text

Burstiness Score: 315.695



A document's burstiness is a measurement of the variation in perplexity

Your sentence with the highest perplexity, "*All of h*", has a perplexity of: 1438

ABSTRACT

Effective management and monitoring of networks are essential for ensuring their optimal performance and availability. Managing and ensuring availability in traditional networks requires network engineers to deal with high complexity and high risk of errors. To reduce this, it is necessary to use Software Defined Networking (SDN) architecture that allows centralized management of network devices to make it easier for network engineers to ensure that the network is always at its optimal state. SDN controllers, such as the Open Network Operating System (ONOS), provide a simplified yet powerful of managing and monitoring networks. In this regard, ONOS provide a set of REST API that can be used to interact with its controller.

This project shows the development of a web-based application for managing a network using the ONOS SDN controller's REST API. The application was built using Vue.js web framework and ONOS's REST API. The application will provide a user-friendly interface for network engineers to interact with the ONOS controller, allowing them to configure and manage network devices, to view real-time network metrics, and to perform various network management tasks. Overall, the application serves as a useful tool for network administrators to efficiently manage and monitor their network using the ONOS SDN controller.

DEDICATION

The author dedicates this final project to his family and friends who always support the author during his studies at President University.

ACKNOWLEDGMENT

All praises are only to God Almighty because only by His grace and guidance the author can finish his final project as one of the requirements to complete the Information Technology study program at President University. The author would like to express his sincere gratitude to:

1. His Family
2. Mr. Abdul Ghofir, S.Kom, M.Kom as Final Project Advisor
3. Mr. Tjong Wan Sen as Academic Advisor
4. All of his friends
5. All of Information Technology Lecturer and Staff

TABLE OF CONTENT

ABSTRACT	i
DEDICATION	ii
ACKNOWLEDGMENT	iii
TABLE OF CONTENT	iv
LIST OF FIGURES	vi
LIST OF TABLES	viii
CHAPTER I INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Problem Objective	3
1.4 Scope and Limitation	3
1.5 Methodology	4
1.6 Project Report Outline	5
CHAPTER II LITERATURE REVIEW	8
2.1 Software Defined Network	8
2.2 Open Network Operating System	8
2.3 Representational State Transfer	9
2.4 Vue.js Web Framework	11
2.5 Similar Work	12
CHAPTER III SYSTEM ANALYSIS	14
3.1 System Overview	14
3.2 Functional Analysis	15
3.3 Hardware and Software Requirement	15
3.4 Use Case Diagram	18
3.5 Use Case Narrative	18
3.6 Swim lane Diagram	22
CHAPTER IV SYSTEM DESIGN	28
4.1 User Interface Design	28
4.2 Class Diagram	31

4.3	Database Design	33
CHAPTER V	SYSTEM IMPLEMENTATION.....	34
5.1	User Interface Development.....	34
5.2	Application Login Details.....	37
5.3	Monitoring Feature Details.....	41
5.4	Configuration Feature Details	43
5.5	Network Topology Details.....	61
CHAPTER VI	SYSTEM TESTING	63
6.1	Testing Environment	63
6.2	Testing Scenario	63
CHAPTER VII	CONCLUSION AND FUTURE WORK.....	80
7.1	Conclusion	80
7.2	Future Work.....	80

LIST OF FIGURES

Figure 1.1 Waterfall methodology Diagram [2]	4
Figure 3.1 Use Case Diagram	17
Figure 3.2 How to access and logged in to the application	22
Figure 3.3 How to access Monitoring Page	22
Figure 3.4 How to access Configuration Page	23
Figure 3.5 How to send configuration parameter to the controller	23
Figure 4.1 Login Page UI Design	24
Figure 4.2 Monitoring Page UI Design	25
Figure 4.3 Configuration Page UI Design	26
Figure 4.4 Class Diagram for Control-Plane Manager	28
Figure 4.5 Database Diagram for Control-Plane Manager	29
Figure 5.1 Login Page Interface	31
Figure 5.2 Monitoring Page Interface	32
Figure 5.3 Configuration Page Interface	33
Figure 5.4 Username validation method	34
Figure 5.5 Password validation method	34
Figure 5.6 Password validation method	35
Figure 5.7 Token generation secret key	36
Figure 5.8 Role validation method	36
Figure 5.9 Data request method to the ONOS controller	38
Figure 5.10 Sending Data to the Client	39
Figure 5.11 Application List Request	40

Figure 5.12 Activation Application Request	42
Figure 5.13 Deactivation Application Request	44
Figure 5.14 Hosts Information Request	45
Figure 5.15 Port Naming Configuration Request	47
Figure 5.16 Configured Port List Request	48
Figure 5.17 Configured Port Delete Request	50
Figure 5.18 VPLS Instance Creation Request	52
Figure 5.19 VPLS Instance Creation Request.....	54
Figure 5.20 VPLS Instance Creation Request	55
Figure 5.21 VPLS Instance Delete Request	57
Figure 5.22 Network Topology.....	62
Figure 6.1 User Accessing the Application	65
Figure 6.2 User Enters Credentials	66
Figure 6.3 Monitoring Page	67
Figure 6.4 User does not fill the Username	67
Figure 6.5 User does not fill the Password	68
Figure 6.6 User enters Invalid Username	69
Figure 6.7 User enters Invalid Password	69
Figure 6.8 Controller Application Section	74
Figure 6.9 User Presses “Activate” Button	74
Figure 6.10 User Presses “Deactivate” Button	75
Figure 6.11 Hosts Section	75
Figure 6.12 Port Configuration Section	76
Figure 6.13 Delete Port Configuration	76
Figure 6.14 VPLS Configuration Section	77
Figure 6.15 Add New VPLS Instance	78
Figure 6.16 Add Associated Ports	78
Figure 6.17 Delete VPLS Instance	79

LIST OF TABLES

Table 3.1 Functional Analysis.....	15
Table 3.2 Hardware System	15
Table 3.3 Software Tools	16
Table 3.4 User Login Use Case Narrative	18
Table 3.5 Network Monitoring Use Case Narrative	19
Table 3.6 Network Monitoring Use Case Narrative	20
Table 4.1 Login Page Description.....	25
Table 4.2 Monitoring Page Description.....	26
Table 4.3 Configuration Page Description.....	27
Table 6.1 Login Scenario	62
Table 6.2 Monitoring Scenario	68
Table 6.3 Configuration Scenario	69