International Journal of Computer Sciences and Mathematics Engineering Vol. 2 No. 2 (2023)
Published by: CV. HAWARI
International Journal of Computer Sciences and Mathematics Engineering
Journal homepage: www.ijecom.org

Implementation Of Wireless Controller Using Capsman (Controller Access Point System Manager) In Computer Laboratory Of SMK Negeri 9 Medan

Muhammad Donni Lesmana Siahaan
Universitas Pembangunan Panca Budi
donilesmana@dosen.pancabudi.ac.id

Article Info

Article history:

Received Nov 25, 2023
Revised Nov 27, 2023
Accepted Nov 31, 2023

Keywords:

Mikrotik Proxy,
Capsman Management,
Centralized Configuration

ABSTRACT

In facilitating network configuration and user devices that are very often used are proxy. Because in proxy it is very easy to operate when compared to other routers. Basically, in Mikrotik, there are several features, including Capsman (Controller Access Point System Manager), which is a wireless controller feature to make it easier to centrally manage all wireless access point devices on the network. Setting up the network centrally Wireless AP Mikrotik will make it easier for operators to operate or manage the network, so that the configuration is only network speed traffic based on distance by limiting the user's distance using the Capsman facility, and monitoring more easily using the proxy and can minimize unused bandwidth so that can be used in rooms that are active in the internet network.

Corresponding Author:

Muhammad Donni Lesmana Siahaan,
Computer System Studies Program, Faculty of Science and Technology, University Pembangunan Panca Budi, Medan, Indonesia
Email: donilesmana@dosen.pancabudi.ac.id

1. Introduction

Wireless network technology allows computers to connect to each other via air, so it is widely used for internet access media because wireless networks provide easy access to mobile networks without the need to pull long and complicated cables. The development of this wireless network can be seen from the increasing number of wireless devices in the form of Access Points at each point. Usually for large office buildings, large wireless coverage is also needed. This need can be met by installing more than one access point, especially if the building conditions are on different floors or there are barriers that hinder the spread of wireless signals. [1]

With the installation of many access points (APs), the usual network concept is to use a Main Router for centralized network management. All APs are connected to the Main Router and set up a bridge, so that clients get service directly from the Main Router. However, problems arose later, the setting for each AP was

done manually, meaning that the network admin one by one, either during initial installation or maintenance when the net was running, had to log in to the AP system. [2]

This will make it difficult for administrators to remotely configure Access Points one by one, for this reason a technique is needed to manage Access Points centrally. This is where the need for CAPsMAN. One of the features in the Mikro Tik Router is CAPsMAN (Controlled Access Point service Manager). CAPsMAN will answer all of this. By using CAPsMAN, controlling tens or hundreds of Access Points will be much easier on one controller device, because wireless configurations can be done on the CAPsMAN Mikro Tik Router, and this configuration will be spread to every existing Access Point. [4]

2. Method

2.1 Research Stages

At this stage of research, it will be explained one by one how the system of this entire research will be built.

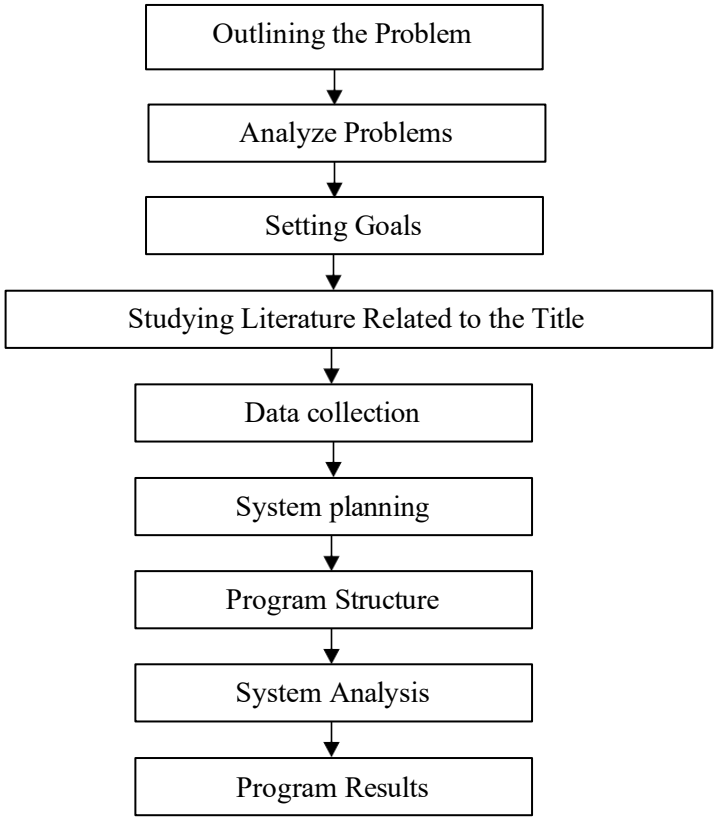

Figure 1 Design Research Stages

1. Outline the Problem
   Describing the problem properly to support working on and implementing wireless controllers using Capsman as a media interface to be examined should describe the problem, ensure that it defines the limitations of the problem to be analyzed, for that there is no good solution to the existing problem. So the next beginning is the most important thing in researching. [3]
2. Problem Analysis
   Decisions in case analysis are steps to understand the problems that have been explained. By describing

the cases set, it is desired that the problems can be understood. [7].

3. Determination of Final Goals
   In this research, there are problems that will determine the ultimate goal to be achieved in research. This research aims to overcome the problems that exist in research. [8]
4. In this study, there is some literature related to the research title. In order to achieve the goal, the researcher studies some literature that can be used in research. Then the literature studied is selected which can be used for this research
5. Data Collection
   The data needed is data that is at the Deli Serdang company and the data that will be received is manual data. [6]
6. System analysis
   In this research, system analysis is needed because here the author is asked to look for system deficiencies, problems experienced by the system, so that after being analyzed in order to find alternative ways to solve a problem. [10]
7. System Design
   The author will measure the wireless controller system using capsman. [8]
8. Program Flow
   The program flow model is the course of the program structure which describes the similarities between a program design and other systems. [9]
9. Program Results
   In this application, it will be explained about the teacher and employee attendance system at SMK Pab 5 Kelambir Lima based on Android and the Web media interface as an admin or Android smartphone.. [11]

2.2 Research design

At this stage a physical topology design and a logical topology of the system to be built will be made, with the aim of being able to implement an access point controller (CAP) using the CAPsMAN (Manager*)*.

1. Design of Physical Topology

The design of the physical topology is carried out using the availability of existing network equipment. This design is intended so that implementing an access point controller using the CAPsMAN feature will be easy to understand and can be used for needs when troubleshooting the network. The physical topology design to be built consists of 1 (one) Mifi as an internet source, 1 (one) wireless station, 1 (one) router gateway which also becomes CAPsMAN, 1 (one) unmanaged switch, 4 (four) wireless access points as CAP, 2 (two) clients. [4]

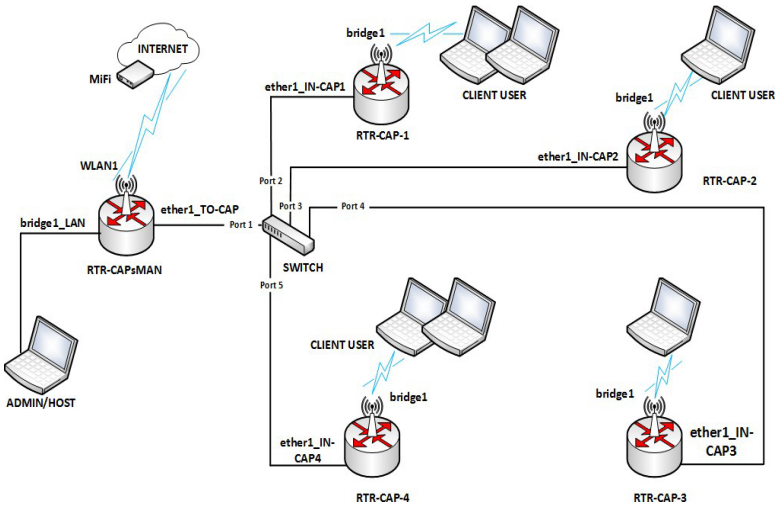

Figure 2 Physical Topology Design

2. Logic Topology Design

The design of the logical topology is the design of the IP address from the physical topology design that has been made. List of IP addresses can be seen in the table 1.

Tabel 1 List of IP Addresses

No	Device	Interface	IP Address	Gateway
1	MiFi	WLAN	192.168.21.1	-
2	Router GW (CAPsMAN) MikroTik hAP lite RB941-2nD	WLAN	DHCP Client	192.168.21.1
		ether1_TO-CAP	192.168.10.1	DHCP Client
		bridge1_LAN	192.168.11.1	DHCP Client
		cap1	192.168.30.1	192.168.30.1
		cap2	192.168.31.1	192.168.31.1
		cap3	192.168.32.1	192.168.32.1
		cap4	192.168.33.1	192.168.33.1
3	Router CAP 1 (Access Point) MikroTik hAP lite RB941-2nD TC	ether1	192.168.10.2	192.168.10.1
4	Router CAP 2 (Access Point) MikroTik hAP lite RB941-2nD TC	ether1	192.168.10.3	192.168.10.1

5	Router CAP 3 (Access Point) MikroTik hAP lite RB941-2nD TC	ether1	192.168.10.4	192.168.10.1
6	Router CAP 4 (Access Point) MikroTik hAP lite RB941-2nD TC	ether1	192.168.10.5	192.168.10.1
7	Client-CAP1	Wi-Fi	DHCP Server	192.168.30.1
8	Client-CAP2	Wi-Fi	DHCP Server	192.168.31.1
9	Client-CAP3	Wi-Fi	DHCP Server	192.168.32.1
10	Client-CAP4	Wi-Fi	DHCP Server	192.168.33.1
11	Admin/Host	Wi-Fi	DHCP Server	192.168.11.1

There are 3 (three interfaces that will be used on the CAPsMAN (Manager) router) which are also gateways for access to the internet with the following explanation :

a. *WLAN interface, is an interface that is connected to the internet with station mode connected to the Andromax M3Y MiFi and also as the main internet connection line.*
b. *Interface ether1_TO-CAP*, merupakan *interface* yang terkoneksi ke *switch* yang menjadi jalur untuk menjadi *controller* bagi *Router CAP*
c. *The bridge1_LAN interface is an interface that is connected to the admin/host and client computers via an ethernet cable.*

IP address design from the physical topology design that has been made. can be seen in figure 3

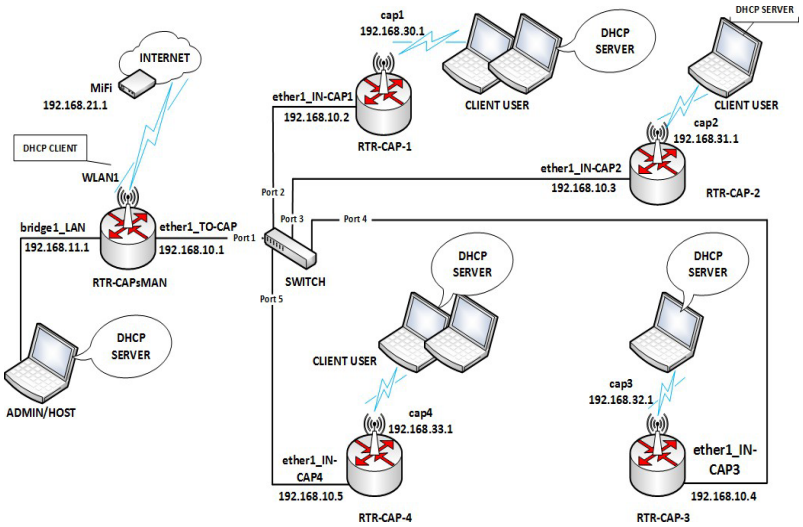

Figure 3 Logic Topology Design

3 Results and Discussion

The results and discussion are the results of the implementation of the Wireless Controller Using Capsman. The author conducted trials using data provided by the company. However, before testing, there are several device requirements for the information system.

a. MiFi Device Configuration

From the results of the analysis of the running system and the weaknesses of the running system, it is found that the Mifi device is used to provide internet access which will be passed through the wireless station which will later enter the CAPsMAN router which is also the gateway for the access point (CAP) below it. . For configuration of MiFi devices can be seen in the table 2.

Tabel 2 MiFi Device Configuration

ISP	Smartfren
MiFi	Andromax M3Y
SSID	WIFIKU
Channel	1
Security Mode	WPA2-PSK
Wi-Fi Key	bacot!
IP Address	192.168.21.1
Subnet Mask	255.255.255.0
DHCP Start IP	192.168.21.10
DHCP End IP	192.168.21.254

b. Wireless Station Device Configuration

The wireless station device will use the MikroTik hAP lite RB941-2nD, this device was chosen because it has good enough specifications to be used as a wireless station connected to MiFi devices. Configuration for wireless station devices can be seen in the table 3.

Tabel 3 Wireless Station Device Configuration

Device	Wireless Station Router CAPsMAN
Interface	wlan1
Mode	station
Band	2GHz-only-N
Channel Width	20MHz
Frequency	auto
SSID	WIFIKU
Scan List	default
Security Profile	WPA2 PSK
WPA2 Pre-Shared Key	bacot!
Bridge	bridge1
Ports	all

IP Address	192.168.21.10
Gateway	192.168.21.1
DNS	192.168.21.1

c. CAPsMAN Router Device Configuration
The CAPsMAN router device will use the MikroTik hAP lite RB941-2nD, this device was chosen because it has good enough specifications to be used as a CAPsMAN router. This device will also later become a gateway for the CAP (access point) to be connected to the internet. This router will be configured as a CAPsMAN (Manager) router which will become a wireless controller for CAP (access point) in accordance with the design of the physical topology and logical topology..

d. IP Address Configuration
The configuration for the IP address on the CAPsMAN GW router interface can be seen in the table 4.

Table 4 GW Router IP Address Configuration

Interface	ether1_ISP-A	ether2_ISP-B	ether3_LAN
Address	192.168.10.2	192.168.20.2	192.168.88.254
Network	192.168.10.0	192.168.20.0	192.168.88.0

e. DNS Server Configuration
Configuration for the DNS server on the CAPsMAN Gateway router will use the DNS server from the ISP and the public DNS server. The configuration can be seen in the table 5.

Tabel 5 Konfigurasi DNS Server Router GW

DNS Server	
192.168.21.1	CAPsMAN
1.1.1.1	Cloudflare DNS
8.8.8.8	Google Public DNS

f. Konfigurasi Scheduler
The scheduler configuration on the GW router will be configured into 12 (twelve) rules, each of these rules functions to activate the 512kbps or 1M threshold according to the specified time and will repeat every day. The configuration for the scheduler on the GW router can be seen in the table 6

Tabel 6 Konfigurasi Scheduler Router GW

Rule	**Start Time**	**Comment**	**On Event**
1	01.00.00	Threshold 1M	/tool traffic-monitor disable 0,1 /tool traffic-monitor enable 2,3
2	03.00.00	Threshold 1M	/tool traffic-monitor disable 0,1 /tool traffic-monitor enable 2,3

3	05.00.00	Threshold 1M	/tool traffic-monitor disable 0,1 /tool traffic-monitor enable 2,3
4	07.00.00	Threshold 1M	/tool traffic-monitor disable 0,1 /tool traffic-monitor enable 2,3
5	09.00.00	Threshold 512k	/tool traffic-monitor disable 2,3 /tool traffic-monitor enable 0,1
6	11.00.00	Threshold 512k	/tool traffic-monitor disable 2,3 /tool traffic-monitor enable 0,1
7	13.00.00	Threshold 512k	/tool traffic-monitor disable 2,3 /tool traffic-monitor enable 0,1
8	15.00.00	Threshold 512k	/tool traffic-monitor disable 2,3 /tool traffic-monitor enable 0,1
9	17.00.00	Threshold 512k	/tool traffic-monitor disable 2,3 /tool traffic-monitor enable 0,1
10	19.00.00	Threshold 512k	/tool traffic-monitor disable 2,3 /tool traffic-monitor enable 0,1
11	21.00.00	Threshold 512k	/tool traffic-monitor disable 2,3 /tool traffic-monitor enable 0,1

g. Route Configuration and Failover

Configuration for routes and failover on the GW router is made into 6 (six) rules by using ping as a check gateway and scope/target scope parameters to create a recursive gateway. Failover will work if there is a connection break on the MiFi device at one of the ISPs, then the connection will be transferred to another ISP that is still active. Configuration of routes and failover can be seen in the table 7.

Tabel 7 GW Router Configuration Routes and Failover

No	Dst. Address	Gateway	Check Gateway	Distance	Scope	Target Scope	Routing Mark
1	103.76.22.141	192.168.20.1 reachable ether2_ISP-B		1	10	10	-
2	103.248.25.241	192.168.10.1 reachable ether1_ISP-A		1	10	10	-
3	0.0.0.0/0	103.248.25.24 1 recursive via 192.168.10.1 ether1_ISP-A	ping	1	30	10	ISP-A_ROUTE

4	0.0.0.0/0	103.76.22.141 recursive via 192.168.20.1 ether2_ISP-B	ping	2	30	10	ISP-A_ROUTE
5	0.0.0.0/0	103.76.22.141 recursive via 192.168.20.1 ether1_ISP-B	ping	1	30	10	ISP-B_ROUTE
6	0.0.0.0/0	103.248.25.24 1 recursive via 192.168.10.1 ether1_ISP-A	ping	2	30	10	ISP-B_ROUTE

4. Conclusions

The business process data collection information system for MSME in the village of Klambir Lima Kebun Deli Serdang has several conclusions that can be presented, including:

1) With the establishment of a wireless network security system using the WPA2-PSK feature at SMK Negeri 9 Medan, it can minimize the occurrence of wireless network breaches.
2) With the design of the Controller Access Point System Manager (CAPSMAN) it can help teachers, staff and students at SMK Negeri 9 Medan carry out daily activities at school and learn to teach without the thought of breaking up the internet network and no longer needing to log in again when moving to another place.
3) Monitoring using a proxy and using the Winbox application for configuration so that the admin can limit users and share bandwidth, so that rooms that are more concerned with the Internet network are given a large enough bandwidth.

Reference

[1] Arianto Tri. 2009. Implementasi Wireless Local Area Network Dalam RT/RW Net. Teknologi informasi DINAMIK,Vol.14, No.2, ISSN.0854-9524. nOUVv0JB_jhoHDU0RwC, diakases pada tanggal 25 juli 2017.

[2] Amron, K. Eko, S dan Mahendra. 2016. Pemodelan dan Analisis Wireless Mesh Network Dengan Arsitektur Publish-Subscribe Dan Protokol MQTT. Jurnal Teknologi informasi dan ilmu komputer Vol.3, No.2. ISSN. 2355-7699

[3] Benriwati, Maharmi. 2014. Analisa Gangguan Frekuensi Radio dan Frekuensi Penerbangan Dengan Metoda Simulasi.journal Teknologi Informasi, Vol 6, No 2, ISSN 1979-4657

[4] Helmy F. dan Amri, W. 2013. Simulasi Kinerja Jaringan Nirkabel IEEE-802.11a dan IEEE- 802.11g Menggunakan NS-2.Jurnal Rekayasa Elektrikal Vol.10, No.4, ISSN. 2252-6200

[5] Ismail, Nanang Adam Faroqi, Lia Kamelia dan Rina Mardiati, 2011, Simulasi Wireless Mesh Network (Wmn) Untuk Mendukung Implementasi Next Generation Network (Ngn), jurnal

kajian islam, sain dan teknologi. Vol 5, No. 1-2, ISSN. 1979-8911.

[6] P. Hasan Putra and M. Syahputra Novelan, "PERANCANGAN APLIKASI SISTEM INFORMASI BIMBINGAN KONSELING PADA SEKOLAH MENENGAH KEJURUAN," *Jurnal Teknovasi*, vol. 07, pp. 1–7.

[7] Sopandi, dede. 2009, intalasi jaringan komputer, Bandung : Informatika Bandung

[8] Sukmaaji, Anjik dan Rianto, 2008, Jaringan Komputer,Yogyakarta: Cv. Andi Offset.

[9] M. Syahputra Novelan and P. H. Putra, "Penerapan Aplikasi Resep Makanan Khas Toba Berbasis Android," 2020.

[10] W. Jonathan and S. Lestari, "SISTEM INFORMASI UKM BERBASIS WEBSITE PADA DESA SUMBER JAYA," 2015.

[11] M. Kristiyanti Jurusan KPN STIMART and S. Lisda Rahmasari, "Website sebagai Media Pemasaran Produk-Produk Unggulan UMKM di Kota Semarang," 2015.