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Ipv4 Lan Mapping Using Vlsm At Pt Bimasakti Mandiri Perkasa Indonesia

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ABSTRACT

The selection of the topology used is based on devices that have a non-stop work rate with network devices that have a low level of work being a method of grouping within the network topology. The company has 500 employees and consists of 17 branch offices and 1 head office, while the IP addresses used on all network devices use IPv4 using class B, which is 172.16.0.0 with a subnet mask of /24 or 255.255.255. With the use of class B subnet blocks 172.16.0.0/24, 18 subnet blocks are needed, namely subnet blocks 172.16.0.0/24 to 172.16.17.0/24 because PT Bimasakti Mandiri Perkasa has 1 head office and 17 branch offices. spread throughout Indonesia. Furthermore, when viewed from the side of the use of IP addresses, many IP addresses are not used because they equally divide the provision of addresses at the 18 company offices as many as 254 IP addresses, while the use of IP addresses in each office is different. To make efficient use of IP addresses that will be applied to computer networks, a good method is to use VLSM.

1. Introduction

PT Bimasakti Mandiri Perkasa is a logistic-oriented company. The system and methods on the network used must be able to support the running of network hardware and business processes carried out by the company. The network system in the selection of topology, the use of IP addresses and addressing techniques becomes a single unit in the implementation of a computer network that is used as a form of how to manage the network at the company.

Topology selection used based on devices that have a non-stop work rate with network devices that have a low-level working rate is become a method of grouping in a network topology. The selected network topology should make it easier for us to level the needs, needs of the network to be built [1]. PT Bimasakti Mandiri Perkasa has 2 servers: Development Server and Production Server, there are also 4 Routers: Main Head Office Router, Main Office Distribution Router, Main Office Client Router and Branch Office Routers, and also has 3 Switches: Central office Server Switch, Head Office Client Switch and Branch Office Client Switch, and other supporting devices.

The company has 500 employees and consists of 17 branch offices and 1 head office, while the IP addresses used on all network devices use IPv4 using class B, which is 172.16.0.0 with a subnet mask that is subnetting /24 or 255.255.255 then .0. IP address mapping with the VLSM (Variable Length Subnet Mask) calculation method provides a solution for assigning user ip addresses corectly and also tidier recorded so that there is no longer the same ip address between two or more users which causes interference in the data transmission process [2]. With the use of class B subnet blocks 172.16.0.0/24 it requires 18 subnet blocks, that is subnet blocks 172.16.0.0/24 to 172.16.17.0/24 because PT Bimasakti Mandiri Perkasa has 1 head office and 17 branch offices spread throughout Indonesia. Furthermore, when viewed from the side of the use of ip addresses, many ip addresses are not used because they divide equally the address provider at the company's 18 offices as many as 254 ip addresses, while the use of ip addresses in each office is different.

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2. Research Method

The Action Research method used in research, which is a form of research design, researchers describe, interpret, and explain a social situation at the same time by making changes or interventions with the aim of improvement or participation [3]. The need for this research, the researcher conducted an observation to the company PT Bimasakti Mandiri Perkasa and conducted an interview with Mr. Tri Agus Widodo as the head of the company's IT division.

2.1 Network Topology

In making observations, researchers directly observed computer network devices, the connection lines of wired transmission media (Wire) and wireless transmission media (Wireless). The topology used is by combining star and bus topologies to form a tree topology (trees or branches). Network topology is a design pattern to make a network architecture [4]. So that a network administrator in designing, creating, monitoring, and evaluating computer networks uses this method as an illustration of the relationship between one network device and another. There are several main topologies that are often used: Bus Topology, Star Topology, Ring Topology, Tree Topology, Mesh Topology [5].

2.2 IP Address

To be able to connect one computer network device to another computer network device to make a topology and each network device has its own unique address, this unique address is known as an IP address. This IP address becomes an identity in a computer network on every computer network device. IP Address is a unique number which is a binary number assigned to each device (for example, a computer, router, printer, etc) that participates in a computer network that uses the Internet Protocol as a means of communication[6]. IP Address has several classes, there are [7]:

Table 1
Ip Address Class

Network Class	Number of Hosts	Octet Summary	First Octet Value
Class A	16.777.214	n.h.h.h	1-126
Class B	65.534	n.n.h.h	128-191
Class C	254	n.n.n.h	192-223

n: network, h: host

The IP address class has the following details [8] :

a. Class A: IP Address Restriction: 1.0.0.1 to 126.255.255.254, Default Subnet mask: 255.0.0.0 or /8, Network ID (n): Group 1, Host ID (h): Group 2, Group 3, Group 4, Number of hosts in the network: 16,777,214.
b. Class B: IP Address Limit: 128.0.0.1 to 191.255.255.254, Default Subnet mask: 255.255.0.0 or /16, Network ID (n): Group 1. Group 2, Host ID (h): Group 3, Group 4, Number of hosts in the network: 65,534.
c. Class C: IP Address Limit: 192.0.0.1 to 223.255.255.254, Default Subnet mask: 255.255.255.0 or /24, Network ID (n): Group 1. Group 2, Group 3, Host ID (h): Group 4, Number of hosts in the network: 254

An IP address contains a Network ID, and a Host ID. Network ID is an address for a group of network devices, while the Host ID is the address of a network device. In determining the network id address and host id, the ip address requires a subnet mask that can map the two addresses (network id and host id). The subnet mask owned by an ip address has a subnet mask by default (according to table 1) or the subnet mask is subnetting. Subnetting is a technique of borrowing the host part to be used as part of the network, which results in increasing the number of subnets and reducing the number of hosts [9]. To be able to identify the network id address and host id on the subnet mask, is to convert the decimal number in the subnet mask into binary.

Example: subnet mask 255.255.0.0 if converted into binary, subnet mask becomes 11111111.11111111.000000000000000. Furthermore, the identification of the network id address on the subnet mask is binary 1 (one) on the subnet mask and binary 0 (null) on the subnet mask becomes the host id address. So it can be concluded that the network id address on the subnet mask 255.255.0.0 is group 1 and group 2 on the ip address while group 3, and group 4 on the ip address are the host id addresses [8]. If the

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subnet mask 255.255.0.0 is subnetting at the expense of one host binary, the subnet mask binary format will be 11111111.11111111.10000000.000000000 and if it is converted to a decimal number the subnet mask that is subnetting will be 255.255.128.0With this, the network id and host id addresses will change to [10]:

a. Network id address: group 1, group 2, some group 3.
b. Address host id: partly group 3 and group 4.

To be able to detail in detail the address of the network id and host id that is subnetting, as follows:

Table 2
Subnetting Ip Address

	Group 1	Group 2	Group 3	Group 4
IP Address	172	16	0	0
Subent Mask	255	255	0	0
Binary Subnet	11111111	11111111	00000000	00000000
Description	N	N	H	H
Subnetting	11111111	11111111	10000000	00000000
Subnet Mask	255	255	128	0
Subnetting Description	N	N	N dan H	H
Net ID Binary	172	16	00000000	00000000
Net ID Des	172	16	0	0
Host ID	172	16	0	1
	172	16	127	254
Net ID Binary	172	16	10000000	00000000
Net ID Des	172	16	128	0
Host ID	172	16	128	1
	172	16	255	254

There are several formulas for extracting the information contained in subnetting:

a. Looking for the number of network id : 2^N [11]
b. Looking for the number of host id: 2^H-2

If referring to the rules in performing subnetting, the provisions that must be used are based on the CIDR table. CIDR or Classless Inter-Domain Routing is a standard that is used to categorize by using the "/" sign behind an IP address and behind it there is the number 1 of the netmask In the CIDR standard, the provisions for subnetting on all classes of IP addresses have been determined, so that in the implementation on a computer network the subnetting that you want to use, you just need to make adjustments. Variable Length Subnet Mask (VLSM). To make efficient use of IP addresses that will be applied to computer networks, a good method is to use VLSM. Variable Length Subnet Masking (VLSM) is the development of a subnetting mechanism, where in VLSM an improvement is made from the weakness of classic subnetting, which is in classic subneting, subnet zeroes, and subnet-ones cannot be used, besides that in classic subnets, the IP number location is not efficient [13].

To create a VLSM quickly and efficiently, it is necessary to understand how the ip address block size is to create a VLSM mask. VLSM will provide a method of using IP addresses to minimize unused IP addresses, so this method can save IP addresses in their use on a computer network [10]. In the VLSM method, the number of host id address allocations is the basis for determining the IP address to be used. Furthermore, the number of host id addresses will be poured into the subnet mask, so that the subnet mask formed will follow the number of host id addresses.

3. Result and Discussion

The offices owned by the company are 32 offices spread throughout Indonesia, and these offices have a few different network devices according to the needs of the business processes in the office. The table explains that PT Bimasakti Mandiri Perkasa using an IP address with class B is appropriate because the number of computer network devices that require IP addresses is 500. The reason for using a class B ip address can provide 65,534 ip addresses, while for a class C ip address it only provides an ip address of 254 less than the required ip address and if using class, A provides 16,777,214 too many ip addresses available to the company. The ip address used by PT. Bimasakti Mandiri Perkasa by dividing all head offices and branch offices equally using a subnet mask /24 or 255.255.255.0 has a weakness that is there are still many wasted IP addresses according to the data in table 4. So, it is better if the use of a subnet mask must adjust to the needs of the IP address in every office in the company, so that the IP address is not much wasted, or minimize

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the unused IP address on the subnet mask in each company office. The next step in this research is to map the IP addresses that will be used by the company using the VLSM (Variable Length Subnet Mask) method. In this VLSM method, the subnet mask benchmarks are:

a. In the priority process of calculating the subnet mask to be used, based on the number of ip addresses at all offices, either head offices or branch offices.
b. The number of IP addresses required for each office in the company. The VLSM method uses the formula:

$$\sqrt{ip\ requirement} \leq or \geq bit\ host\ id$$

Note:

a. Ip requirement is the number of ip addresses required.
b. ≤or≥ is the result can be smaller or equal to or greater (a number that is close to the root of the IP requirement).

The following are the steps for the IP address mapping process:

a. Determine the priority for calculating the IP needs of the company, based on the highest number of ip addresses needed at the company offices of PT Bimasakti Mandiri Perkasa (Head office and branch offices):

Table 3
Calculation Priority Determination

No	Office Name	IP Address Requirement
1.	Head Office	220
2.	Branch Office E	27
3.	Branch Office C	27
4.	Branch Office B	26
5.	Branch Office D	21
6.	Branch Office F	20
7.	Branch Office G	20
8.	Branch Office P	14
9.	Branch Office L	14
10.	Branch Office A	13
11.	Branch Office J	13
12.	Branch Office N	13
13.	Branch Office Q	13
14.	Branch Office O	13
15.	Branch Office K	13
16.	Branch Office M	12
17.	Branch Office H	11
18.	Branch Office I	10

b. Calculation of subnet mask requirements for each office Head Office, 220 ip addresses, for this head office can use a /24 subnet mask, because the number of host ids available on the subnet mask is 254. So, the unused ip addresses are 34 host id.

Table 4
Head Office Ip Address Mapping

No	Office Name	IP Requirement	IP Address	Remaining IP
1.	Head Office	220	172.16.0.0/24	34

c. Branch Office E 27 ip address
Known:
   a. Ip requirement = 27
   b. Formula =

$$\sqrt{ip\ requirement} \leq or \geq bit\ host\ id$$

$$\sqrt{27} \leq or \geq 5, or\ 6$$

Then it is calculated based on the need for the IP address on the host id bit totaling 5:

a. Bit host id = 5, h is the number of 0 bits in the class B /24. subnet mask.

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b. So that the subnet mask is 11111111.11111111.11111111.11110000 or 255.255.255.224 (bold number of host id bits because of the calculation).
c. Calculation of available ip addresses on the /27 subnet, using the formula:

$$2^h - 2, \text{ h} = 5$$
$$2^5 - 2$$
$$32 \quad - 2$$

d. The result of the calculation Bit host id = 5 is 30 host ids or available ip addresses, and this subnet mask can be used because the host id is sufficient for the needs of the ip address that you want to use and has 3 ip addresses that are not used because of the need for an ip address for the office branch A /27 and available ip address on host id 5 is 30 ip address.

Next is calculated based on the need for the IP address on the host id bit totaling 6:

a. h = 6, h is the number of 0 bits in the class B /24. subnet mask.
b. So that the subnet mask is 11111111111111.11111111.11000000 or 255.255.255.192 (bold number of host id bits because of the calculation).
c. Calculation of available ip addresses on the /26 subnet, using the formula:

$$2^h - 2, \text{ h} = 6$$
$$2^6 - 2$$
$$64 \quad - 2$$

d. The result of the calculation Bit host id = 6 is 62 host ids or available ip addresses, the number of host ids is more sufficient than the ip address you want to use. And later resulted in more and more unused ip addresses.

So, it can be concluded that the ip address that can be used is the host id bit totaling 5 and the assignment of the ip address at office E is:

Table 6
Branch Office E Ip Address Mapping

No	Office Name	IP Requirement	IP Address	Remaining IP
1.	Head Office	220	172.16.0.0/24	34
2.	Branch Office E	27	172.16.1.0/27	3

Branch Office C 27 ip address At office C, if you look at the results of the calculations carried out at branch office A, the number of available host ids is still sufficient for the needs of IP addresses at branch office C, so the subnet mask 172.16.1.0/27 is still used, the following is the calculation: IP address 172.16.1.0 with subnet mask 255.255.255.224. The number of subnets formed on the subnet mask is :11111111.11111111.11111111.11100000. Taking the subnet mask based on /24, then the number 1 bit inserted is 3 bits, then the available subnets are:

$$\text{n} = 3$$
$$2^n = number\ of\ subnets$$
$$2^3 = 8\ subnets$$

a. 172.16.1.1.000000/27 (a combination of bold letters as subnet numbers) or 172.16.1.0/27 has been used for branch office E.
b. 172.16.1.00100000/27 (a combination of bold letters as subnet numbers) or 172.16.1.32 /27.
c. 172.16.1.01000000/27 (combination of bold letters as subnet numbers) or 172.16.1.64/27.
d. 172.16.1.01100000/27 (combination of bold letters as subnet numbers) or 172.16.1.96/27.
e. 172.16.1.10000000/27 (combination of bold letters as subnet numbers) or 172.16.1.128/27.
f. 172.16.1.10100000 (combination of bold letters as subnet numbers) or 172.16.1.160/27.
g. 172.16.1.11000000 (combination of bold letters as subnet numbers) or 172.16.1.192/27.
h. 172.16.1.11100000 (combination of bold letters as subnet numbers) or 172.16.1.224/27.

Then set the ip address for the branch office branch office C, B, D, F, and G is point 2). i.e., 172.16.1.64/27

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Table 7.
Branch Office C, B, D, F And G Ip Address Mapping

No	Office Name	IP Requirement	IP Address	Remaining IP
1.	Head Office	220	172.16.0.0/24	34
2.	Branch Office E	27	172.16.1.0/27	3
3.	Branch Office C	27	172.16.1.32/27	3
4.	Branch Office B	26	172.16.1.64/27	3
5.	Branch Office D	21	172.16.1.96/27	9
6.	Branch Office F	20	172.16.128/27	10
7.	Branch Office G	20	172.16.160/27	10

At branch office P, due to the need for an ip address of 14, the calculation process will be carried out again, considering that if you use a /27 subnet mask, there are too many unused ip addresses. The subnet calculation process for branch office P is still based on calculating branch office C by inserting the number 1 in the subnet mask bit 172.16.1.192/27 or at point 7). The calculation process at branch office P is:

Known:

a. Ip requirement = 14

b. Formula =.

$$\sqrt{\text{Ip requirement}} \leq or \geq bit\ host\ id$$

$$\sqrt{14} \leq or \geq 4, or\ 5$$

Then, it is calculated based on the need for the IP address on the host id bit totaling 4: Bit host id = 4, h is the number of 0 bits in the class B /28. subnet mask. So that the subnet mask is 11111111.11111111.11111111.11110000 or 255.255.255.248 bold number of host id bits because of the calculation). Calculation of available ip addresses on the /28 subnet, using the formula:

$$2^h - 2, \text{ h = 4}$$

$$2^4 - 2$$

$$16 - 2$$

The result of the calculation Bit host id = 4 is 14 host ids or available ip addresses, and the subnet mask can be used because the host id is sufficient for the needs of the ip address that you want to use and in accordance with the needs of the ip address at the branch office P as many as 14 ip addresses. Based on the calculation of branch office C, the unused subnet is 172.16.1.192/27, so that when combined with the calculation process for finding the subnet that you want to use at branch office P with a host id of 4, a new subnet of 172.16.1.1000000 will be formed (bold letters or bold print is the new subnet) a fraction of the results of the branch office subnet C. It can be seen here that the 0 bits in bold are 2 digits. So, this is the number of new subnets formed:

n = 2

$$2^n = number\ of\ subnet$$

$$2^2 = 4\ subnets$$

Therefore, the 4 subnets are:

a. 172.16.1.11000000 (combination of bold letters as subnet numbers) or 172.16.1.192/28 have not been used.

b. 172.16.1.11010000 (combination of bold letters as subnet) or 172.16.1.208/28, have not been used.

c. 172.16.1.11100000 (combination of bold letters as subnet) or 172.16.1.224/28, have not been used.

d. 172.16.1.11110000 (combination of bold letters as subnet) or 172.16.1.240/28, have not been used.

So, from the new subnet formed with the /28 subnet mask, can be used as the ip address for branch offices P, L, A and J, which are:

Table 8.
Pemetaan Alamat Ip Branch Office P, L, A Dan J

No	Nama Kantor	Kebutuhan IP	IP Address	Sisa IP
1.	Head Office	220	172.16.0.0/24	34
2.	Branch Office E	27	172.16.1.0/27	3
3.	Branch Office C	27	172.16.1.32/27	3

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4.	Branch Office B	26	172.16.1.64/27	3
5.	Branch Office D	21	172.16.1.96/27	9
6.	Branch Office F	20	172.16.128/27	10
7.	Branch Office G	20	172.16.160/27	10
8.	Branch Office P	14	172.16.192/27	0
9.	Branch Office L	14	172.16.208/27	0
10	Branch Office A	13	172.16.224/27	1
11	Branch Office J	13	172.16.240/27	1

Branch Office N 13 ip address, Because the subnet capacity at the ip address 17216.1.0/24 has run out, then a recalculation is carried out to get a subnet from ip 172.16.2.0/24 and which can accommodate the number of host ids according to the needs of the ip address in Branch Office J.

a. The needs of ip address = 13
b. Formula =

$$\sqrt{ip\ requirement} \leq or \geq bit\ host\ id$$

$$\sqrt{13} \leq or \geq 3, or\ 4$$

Then it is calculated based on the need for the IP address on the host id bit totaling 3:

a. Host bit id = 3, h is the number of 0 bits in the class B /24 subnet mask.
b. So, the subnet mask is 11111111.11111111.11111111.11111000 or 255.255.255.248 (bold number of host id bit count result).
c. Calculation of available ip addresses on the /29 subnet, using the formula:

$$2^h - 2, \text{ h} = 4$$

$$2^3 - 2$$

$$8 \quad - 2$$

d. The result of calculating host id bits = 3 is 6 available host id or ip address, and this subnet cannot be used because the host id is less than the required ip address to be used for Branch Office N totaling 13 ip address.

Furthermore, it is calculated based on the need for the IP address on the host id bit totaling 4:

a. h = 4, h is the number of 0 bits of class B /24 subnet mask.
b. So, the subnet mask is 11111111.11111111.11111111.11110000 or 255.255.255.240 (bold number of host id bit count results).
c. Calculation of available ip addresses on the /27 subnet, using the formula:

$$2^h - 2, \text{ h} = 4$$

$$2^4 - 2$$

$$16 \quad - 2$$

The result of setting Bit host id = 4 is 14 host ids or available ip addresses, the number of host ids is sufficient for the ip address that can be use in Branch Office N. So the total IP address that can be used are 4 hosts id in Branch Office N.

Table 9.
Branch Office N Ip Address Mapping

No	Nama Kantor	Kebutuhan IP	IP Address	Sisa IP
1.	Head Office	220	172.16.0.0/24	34
2.	Branch Office E	27	172.16.1.0/27	3
3.	Branch Office C	27	172.16.1.32/27	3
4.	Branch Office B	26	172.16.1.64/27	3
5.	Branch Office D	21	172.16.1.96/27	9
6.	Branch Office F	20	172.16.128/27	10
7.	Branch Office G	20	172.16.160/27	10
8.	Branch Office P	14	172.16.1.192/28	0
9.	Branch Office L	14	172.16.1.208/28	0
10	Branch Office A	13	172.16.1.224/28	1
11	Branch Office J	13	172.16.1.240/28	1
12	Branch Office N	13	172.16.2.0/28	1

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Branch Office Q 13 ip address, In office Q, if you look at the results of the calculations carried out at Branch Office N, the number of available host ids is still sufficient for the IP address needs of Branch Office Q, so that the subnet mask of 172.16.2.0/28 is still used, the following is the calculation:

a. Ip Address 172.16.1.0 with subnet mask 255.255.255.240
b. The number of subnets formed on the subnet mask is:11111111.11111111.11111111.11110000
c. Taking the subnet mask based on /24, then the number 1 inserted is 4 bits, then the available subnets are:

n = 4

$$2^n = number\ of\ subnet$$

$$2^4 = 16\ subnets$$

So of the 16 subnets formed are:

a. 172.16.2.00000000/28 (combination of bold letters as subnet) or 172.16.2.0/28 already used for Branch Office N.
b. 172.16.2.00010000/28 (combination of bold letters as subnet) or 172.16.2.16/28, have not been used.
c. 172.16.2.00100000/28 (combination of bold letters as subnet) or 172.16.2.32/28, have not been used.
d. 172.16.2.00110000/28 (combination of bold letters as subnet) or 172.16.2.48/28, have not been used.
e. 172.16.2.01000000/28 (combination of bold letters as subnet) or 172.16.2.64/28, have not been used.
f. 172.16.2.01010000/28 (combination of bold letters as subnet) or 172.16.2.80/28, have not been used.
g. 172.16.2.01100000/28 (combination of bold letters as subnet) or 172.16.2.96/28, have not been used.
h. 172.16.2.01110000/28 (combination of bold letters as subnet) or 172.16.2.112/28, have not been used.
i. 172.16.2.10000000/28 (combination of bold letters as subnet) or 172.16.2.128/28, have not been used.
j. 172.16.2.10010000/28 (combination of bold letters as subnet) or 172.16.2.144/28, have not been used.
k. 172.16.2.10100000/28 (combination of bold letters as subnet) or 172.16.2.160/28, have not been used.
l. 172.16.2.10110000/28 (combination of bold letters as subnet) or 172.16.2.176/28, have not been used.
m. 172.16.2.11000000/28 (combination of bold letters as subnet) or 172.16.2.192/28, have not been used.
n. 172.16.2.11010000/28 (combination of bold letters as subnet) or 172.16.2.208/28, have not been used.
o. 172.16.2.11100000/28 (combination of bold letters as subnet) or 172.16.2.224/28, have not been used.
p. 172.16.2.11110000/28 (combination of bold letters as subnet) or 172.16.2.240/28, have not been used.

So, from the new subnet that is formed with a 4-bit host id, this can be used as an ip address for Branch Office Q, O, K, M, H and I, which are:

Table 9.
Pemetaan Alamat Ip Branch Office Q, O, K, M, H, Dan I

No	Nama Kantor	Kebutuhan IP	IP Address	Sisa IP
1.	Head Office	220	172.16.0.0/24	34
2.	Branch Office E	27	172.16.1.0/27	3
3.	Branch Office C	27	172.16.1.32/27	3
4.	Branch Office B	26	172.16.1.64/27	3
5.	Branch Office D	21	172.16.1.96/27	9
6.	Branch Office F	20	172.16.128/27	10
7.	Branch Office G	20	172.16.160/27	10
8.	Branch Office P	14	172.16.1.192/28	0

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9.	Branch Office L	14	172.16.1.208/28	0
10	Branch Office A	13	172.16.1.224/28	1
11	Branch Office J	13	172.16.1.240/28	1
12	Branch Office N	13	172.16.2.0/28	1
13	Branch Office Q	13	172.16.2.16/28	1
14	Branch Office O	13	172.16.2.32/28	1
15	Branch Office K	13	172.16.2.48/28	1
16	Branch Office M	12	172.16.2.64/28	2
17	Branch Office H	11	172.16.2.80/28	3
18	Branch Office I	10	172.16.2.96/28	4

4. Conclusion

From the table on the use of IP addresses using the VLSM (Variable Length Subnet Mask) method, the IP address used is more efficient, this is because this method can reduce unused IP addresses to a minimum. With the use of class B IP addresses, it can accommodate 500 IP address mappings in all offices, both Head Office and all Branch Offices. And the use of the IP address block in class B only uses 3 IP address blocks for the allocation of 500 IP addresses and the class B IP address blocks used are: 172.16.0.0, 172.16.1.0, and 172.16.2.0. It can also be said that by using this VLSM method, the IP address block can be streamlined, especially in this study, class B IP addresses. With the use of this VLSM method, all network devices will follow the topography based on the IP address used so that the network devices used will form a star topology as a reflection that the existing network has a centralized data distribution system, then to connect with one network to another using this topology. bus so that the overall topology used will be in the form of a tree (branching), namely the bus topology as the network center and the star topology as a broadcast from the central network.

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