

**AIM OF THE EXPERIMENT:-**

Study of classful addressing and classless addressing scheme for subnetting and routing of given network (CDR) and needs for classless addressing. benefits / drawbacks of classless addressing

**Classful addressing:-**

- (i) Classful addressing is an IP addressing scheme in which the 32-bit IP address space is divided into five fixed classes: A, B, C, D and E (discussed in table 5.1)
- (ii) Each class has a predefined number of network and host bits, which determines the range of IP address that can be assigned to a network.

**Characteristics of classful addressing:-**

- (i) Each class has a fixed subnet mask that determines how many bits are reserved for network and how many for hosts.
- (ii) Originally, subnetting was not allowed, networks had to use their default class, leading to wastage of IP address.
- (iii) The rigid structure of classful addressing made it difficult to efficiently allocate IP address for different sized networks.

**Disadvantages of classful addressing:-**

- (i) Wastage of IP address space as class A has very large number of hosts.
- (ii) Each class has a fixed subnet mask (class C has 254 hosts).
- (iii) It doesn't allow VLSM (Variable Length Subnet Masking) which means networks can't have different-sized subnets based on their need.
- (iv) Classful addressing doesn't allow combining multiple small networks into one.

Teacher's Signature \_\_\_\_\_

output table 5.1

Class	Range of IP address	Network size	Network bits	Host bits	Default subnet mask	Example
A	1.0.0.0 - 126.255.255.255	Very large network	8	24	255.0.0.0 (18)	10.0.0.0
B	128.0.0.0 - 191.255.255.255	Medium network	16	16	255.255.0.0 (116)	182.16.0.0
C	192.0.0.0 - 223.255.255.255	Small networks	24	8	255.255.255.0	192.168.0.0
D	224.0.0.0 - 239.255.255.255	Multicast	-	-	No subnet mask	-
E	240.0.0.0 - 255.255.255.255	Experimental	-	-	No subnet mask	-

large network (superNetworking)

- (iv) IPv4 has only 4.3 billion addresses and classful addressing leads to massive underutilization of space

Classless addressing:

Classless addressing introduced with CIDR (classless inter-domain routing) eliminates the fixed class A, B and C structure and allows variable length subnet masks (VLSM).

This means network can be divided into smaller subnets (Subnetting).

Or combined into larger networks (superNetworking) based on actual requirements. As shown in output (table 5.2)

Subnetting in Classless addressing:

- (i) Subnetting in Classless addressing involves CIDR which allows variable length subnet masks (VLSM) which means different subnets can have different sizes. This ensures efficient allocation of address.
- (ii) In classful addressing, subnetting was restricted to fixed class boundaries (e.g. Class C = 255.255.255.0) as shown in output
- (iii) In Classless addressing, subnetting was restricted to fixed class boundaries and any network can be divided into smaller subnets using a custom subnet mask as shown in (table 5.2)

Example of subnetting:

Given 192.168.1.0 /24, we need 4 subnets

Convert /24 (default subnet mask = 255.255.255.0) to a /26 subnet mask: /26 (6 bits for subnetting, 2 bits for hosts that is (255.255.255.102))

$2^6 - 2 = 62$  usable host address per subnet

Teacher's Signature \_\_\_\_\_

Output table 5.2

CIDR Notation	Subnet mask	Hosts per subnet
18	255.0.0.0	16, 777, 214
116	255.255.0.0	65, 534
124	255.255.255.0	254
126	255.255.255.192	62
130	255.255.255.252	2

Output table 5.3

Subnet	Subnet mask	Hosts per subnet
192.168.1.0/26	255.255.255.192	62
192.168.1.64/27	255.255.255.224	30
192.168.1.96/28	255.255.255.240	14

Supernetting in classless addressing:

- (i) Supernetting was not supported earlier in classful addressing
- (ii) Supernetting was the process of combining multiple smaller networks into a larger network. This reduces the number of routing table entries and improve efficiency
- (iii) In classless addressing, CIDR allows merging networks using a shorter subnet mask e.g. - combining 4 /24 networks into one /22 network example:

Consider the following 4 class C networks

- 192.168.1.0/24
- 192.168.2.0/24
- 192.168.3.0/24
- 192.168.4.0/24

Instead of keeping 4 separate routes, they can be combined into one supernet

- 192.168.0.0/22 (subnet mask: 255.255.252.0)
- This covers all addresses from 192.168.0.0 to 192.168.3.255

Subnetting in classful addressing:

Subnetting in classful addressing involves borrowing bits from the host portion of an address. However it is limited because the subnet mask cannot be adjusted freely.

example:

A class B network (172.16.0.0/16) can be divided into smaller subnets using a /26 subnet mask (255.255.255.192) as shown in output (Table 5.4)

Teacher's Signature \_\_\_\_\_

Output Table 5-4

Subnet	First IP	Last IP	Broadcast Address
172.16.0.0/26	172.16.0.1	172.16.0.62	172.16.0.63
172.16.0.64/26	172.16.0.65	172.16.0.126	172.16.0.127

Expt

10

11)

### Advantages of classless addressing over classful addressing:

- (I) In classful addressing, fixed network size leads to wastage of IPs whereas in classless addressing flexible subnet masks allows for precise allocation of IP, reducing wastage.
- (II) In classful addressing, it is restricted to default class subnet masks but classless addressing supports variable length subnet masking (VLSM) allowing efficient division of IP space.
- (III) In classful addressing, there is wastage of IP addresses due to fixed class boundaries, but in classless addressing, there is more efficient use of IP addresses.
- (IV) In classful addressing, it is not possible to assign IPs based on actual needs, forced to use default class ranges but in classless addressing, it allows custom subnet masks, adjusting network sizes as needed.

### Drawbacks of classless Addressing:

- (I) With variable-length subnet masks, the flexibility makes network design more complex since it requires careful planning of subnet sizes.
- (II) CIDR allows route aggregation but poorly designed addressing can lead to fragmented routes. Since CIDR allows variable subnet masks, routers must perform more complex lookups as compared to classful routing.
- (III) Managing a CIDR-based networks requires detailed IP allocation planning. Incorrect subnetting can lead to inefficient address utilization or conflicts.

Teacher's Signature \_\_\_\_\_

### CONCLUSION:-

Classless Addressing (CIDR) provides better IP efficiency, improved routing and scalability compared to classical addressing. It is crucial improvement that enables modern internet routing, subnetting and supernetting making networks more manageable and efficient.

Submitted by

Reja Rani Panda

2302040029

CSE-1