Classless IP

This illustration we are covering is Classless IP. The demonstration will be depicted using PowerPoint.

Scenario: We will be taking a Class C network 192.168.1.0 and illustrating how you can maximize nearly all the IPs in the IP range using a subnet of /24 which is equivalent to 255.255.255.0. Each device IP will be written in either of the two formats 192.168.1.0/24 or 192.168.1.0 255.255.255.0.

Current Topology

Top left corner:

This table depicts the values of CIDR notation, along with the value and subnet mask for the fourth octet of an IPv4 address.

CIDR	/25	/26	/27	/28	/29	/30	/31	/32
Value	128	64	32	16	8	4	2	1
Subnet Mask	128	192	224	240	248	252	254	255

We start with a network of 192.168.1.0/24, this means that there are 256 possible IP addresses ranging from 192.168.1.0 through 192.168.1.255.

In this scenario, we are going to start off by creating three subnets and allocating the 256 original IPs.

Network A has 100 users. This means that we would have to use the /25 notation to access 128 IPs, also remember that the first and last IP address associated with a network (the network address and broadcast address) cannot be assigned to a user. The /26 notation only allows for 64 IP addresses, so we have to go a step up. The result would be:

Network IP	192.168.1.0
Subnet Mask	255.255.255.128
IP Range	192.168.1.0 – 192.168.1.127

At this point, we have used half of the available IP addresses of the 192.168.1.0/24 network

Network B has 50 users. This means that we would use the /26 notation which result in:

Network IP	192.168.1.128
Subnet Mask	255.255.255.192
IP Range	192.168.1.128 – 192.168.1.191

Remember that we will start with Network A left off, which is where we get 192.168.1.128. If we were to take the IP addresses from Network A and add them to Network B, we have effectively used 75% of the 192.168.1.0/24 network, which leaves us with 64 IP addresses remaining.

Network C has 15 users. For this, we would have to use the /27 notation. The reason that we don't use /28 is because that only allocates for 16 IP addresses which would only give us enough IPs to support 14 users. The /27 notation would result in:

Network IP	192.168.1.192
Subnet Mask	255.255.255.224
IP Range	192.168.1.192 – 192.168.1.223

We have now used IPs 0 through 223, which is about 87.5% of the original network.

Now, if we were to connect Network A to Network B, we would require each network to have a router with a usable IP address assigned. In this scenario, routers were not included as part of the initial allocation.

To assign an IP address to each router, we would need to create another subnet. We would have to use the /30 notation which will give us four IP addresses, but only two are usable. Again, remember the network and broadcast addresses. The /30 is the smallest usable subnet size.

Building off the assigned IP numbering, the network for Router A would be:

Network IP	192.168.1.224
Subnet Mask	255.255.255.252
IP Range	192.168.1.224 – 192.168.1.227

This means that Router A could be assigned either 192.168.1.225 or 192.168.1.226.

The same concept goes for Router B, so the network for Router B would be:

Network IP	192.168.1.228
Subnet Mask	255.255.255.252
IP Range	192.168.1.228 – 192.168.1.231

This means that Router B could be assigned either 192.168.1.229 or 192.168.1.230.