subnetting is taking a network and dividing it into sub-networks.

A screenshot of a graph

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This is the 10.0.0.x network, it includes every IP address from 10.0.0.0 to 10.0.0.255, this set of IP addresses contains 256 IP addresses. This network is referred to as a /24 network.

Now when we subnet, we split this network into sub-networks:

A screenshot of a graph

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So, as we can see here, we split /24 into 2 equal /25’s. the first /25 includes every IP address from 10.0.0.0 to 10.0.0.127, the second /25 includes every IP address from 10.0.0.128 to 10.0.0.255.

The initial /24 can be broken down even further into like 4 equal parts, or even 8 equal parts. We can also mix and match, for example we can break it up to one /25, two /27’s and one /26:

A screenshot of a graph

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When you divide a network into sub-networks, there are 7 pieces of information you can extract from each subnet:

* Network ID
* Broadcast IP
* Fire Host IP
* Last Host IP
* Next Network
* # (no. of) IP address
* CIDR/Subnet

To solve for # (no. of) IP address, it’s simply the number of IP addresses in each block, the /24 network had a total of 256 IP addresses, we then broke them up into 2 halves, so each /25 contained 128 IP addresses. Then we broke the /24 into 8 equal subnets so each block (/27) contained 32 IP addresses.

To solve for CIDR/subnet, this is simply the size of the particular subnet (/25). We can also define the size of the subnet, which is known as the subnet mask, it is important to know how to convert between CIDR and Subnet Mask. For example, /25 can be represented as 255.255.255.128. And /27 can be represented as 255.255.255.224. The subnet mask just tells us the size of the subnet.

The network ID is the first IP address in each sub-network.

The broadcast IP is the last IP address in each sub-network.

Both the network ID and broadcast IP serve a special purpose in each subnet, therefore they are not allowed to be assigned to any user who’s receiving an IP address within the IP block.

A screenshot of a graph

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In the /25, 128 Ips exist but only 126 are usable and they can be assigned to hosts. The un-usable IP’s are 10.0.0.0 and 10.0.0.127 and they cannot be assigned to hosts.

The function of the network ID along with the CIDR/subnet mask is to identify a specific subnet. For example, looking at the picture, to refer to the first /27 subnet, we can say 10.0.0.128 /27. We have to be careful because the network ID (10.0.0.128) isn’t enough, it has to be coupled with the CIDR. Because if we say 10.0.0.0 /24, this refers to all 256 addresses (the whole thing). But if we use the same network ID but with the CIDR of /25 so 10.0.0.0 /25, we are referring to just the whole chunk of 128 addresses (blue /25 subnet box).

The broadcast IP is a special address in each subnet that allows a user to speak to every other IP within the subnet.

A screenshot of a thermometer

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For example, if there were 10 hosts here, we could speak to all of them at the same time by sending a packet to the IP address 10.0.0.127

The first host IP is the IP address that comes right after the network ID. In the /25 example, the network ID is 10.0.0.0, the broadcast IP is 10.0.0.127. the first host IP would be 10.0.0.1. the last host IP is the last IP address right before the broadcast IP. So the last host IP here would be 10.0.0.126.

Next network is the network ID of the next subnet.

A thermometer with numbers and a blue square

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The next subnet after the /25 is the /27. So, the next network here would be the network ID of the following subnet (/27) would be 10.0.0.128. there is an easier way to solve for the next network which is to look at the broadcast IP of the current subnet, then add one. So, for the /25, the broadcast IP is 10.0.0.127, so the next network would be the network ID of the following subnet which is just doing +1 to the current subnets broadcast IP, meaning that the next network is 10.0.0.128.

A screenshot of a computer

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