Article published on January 29th 2012 | Business

Whenever youâ€™re designing your network, keep in mind that youâ€™ll always want to have room to gro In this case, you have room for two more net- works. Thus, if you add more sites, you will be able to accommodate a few more networks without having to reorganize your entire structure.

So, you had to travel down four digits in binary in order to reach a number greater than six, your required amount of networks. Now, because you have this number, you can allocate the network portion of your subnet mask! Remember, the first bits of the subnet mask are the network portion, and the second bits are the host portion. So, instead of your default mask, shown in Figure 2.2, you move 4 bits in to subdivide your CCNA Certification, as shown in Figure 2.3.

And thus, you now have a subnet mask for the entire network! Pretty cool, huh? How- ever, this isn?t the end of the process.

Whenever you subdivide a network into different portions, you have to understand what the range of your IP addresses is. This is because, naturally, a subnetted network cannot communicate with an IP address that is out of the range of its own subnet without a router. Finding these address ranges is actually a pretty simple process. You just take the last num- ber of your subnet mask and see what it corresponds to in decimal notation.

In this case, you take the value shown here:

11111111.11111111.11111111.111 10000

This value of 1 in the fourth spot in the mask is actually 32 in decimal notation. What this number means to you is that by starting at zero in the octet of concern (the first octet for Class A, the second octet for Class B, and the third octet for Class C), you add by 32 until you reach the number 256, which is outside the scope of a single octet of numbers. This will give you the network addresses (or network IDs) for the available subnetworks. This is a lot easier to understand if you see it. All it means is that you can take your starting address and find your network identi?ers by starting at CompTIA and adding 32 like this:

209.81.3.0

209.81.3.32 (0 +32)

209.81.3.64 (32 + 32)

209.81.3.96 (64 + 32)

209.81.3. 128 (96 + 32)

209.81.3. 160 (128 + 32)

209.81.3. 192 (160 + 32)

209.81.3.224 (192 + 32)

Then, after you have your network identi?er, you can find the broadcast address (the address that allows information to be sent to all devices within the subnet) by subtracting 1 from the last octet in all these numbers, with the exception of 0:

209.81.3.31 (32 ?1)

209.81.3.63 (64 ?1)

209.81.3.95 (96 ?1)

209.81.3. 127 (128 ?1)

209.81.3. 159 (160 ?1)

209.81.3. 191 (192 ?1)

209.81.3.223 (224 ?1)

209.81.3.254 (256 ?1)

Then, you can find your usable addresses by looking at all the addresses between! You can see this illustrated in Table 2.3.

TABLE 2.3 Defining Network Address Ranges

Network Address Broadcast Address Usable Addresses

209.81.3.0 209.81.3.31 209.81.3.1?30

209.81.3.32 209.81.3.63 209.81.3.33?62

209.81.3.64 209.81.3.95 209.81.3.65?94

209.81.3.96 209.81.3.127 209.81.3.97?126

209.81.3.128 209.81.3.159 209.81.3.129?158

209.81.3.160 209.81.3.191 209.81.3.161?190

209.81.3.192 209.81.3.223 209.81.3.193?222

Most network administrators will steer you away from using the first and last subnet ranges, called the subnet zero and all-ones subnets. The reason behind this is that in the all-ones subnet, there can be confusion because you have a subnet with an identical broad- cast address. Using the subnet-zero subnet was discouraged because you could have a sub- net that was just 0. So, imagine seeing an IP address like 172.16.1.11 and having it be in the 172.16.0.0 subnet. Therefore, in practice, most administrators will say there are 2N-2 usable subnets.

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MCITP, MCITP certification

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