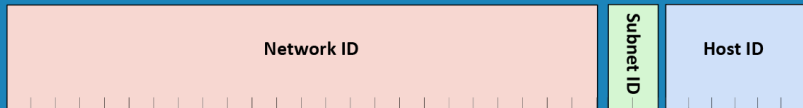


ITFreeTraining

11000000.10101000.10010110.00000000



11000000.10101000.10010110.00 000000 to 111111

11000000.10101000.10010110.01 000000 to 111111

11000000.10101000.10010110.10 000000 to 111111

11000000.10101000.10010110.11 000000 to 111111

Working With Subnets

For the free video please see

<http://itfreetraining.com/ipv4/subnetting2>

Working With Subnets

This video will look at IPv4 subnetting in more detail. Subnetting in IPv4 is the process of taking a network and dividing it in smaller networks. This allows the administrator to divide the IP Addresses that they have been given and use them more effectively.

Access the rest of the course: <http://ITFreeTraining.com/ipv4>

Download the PDF handout:

<http://ITFreeTraining.com/handouts/ipv4/subnetting2.pdf>

Subnet Example

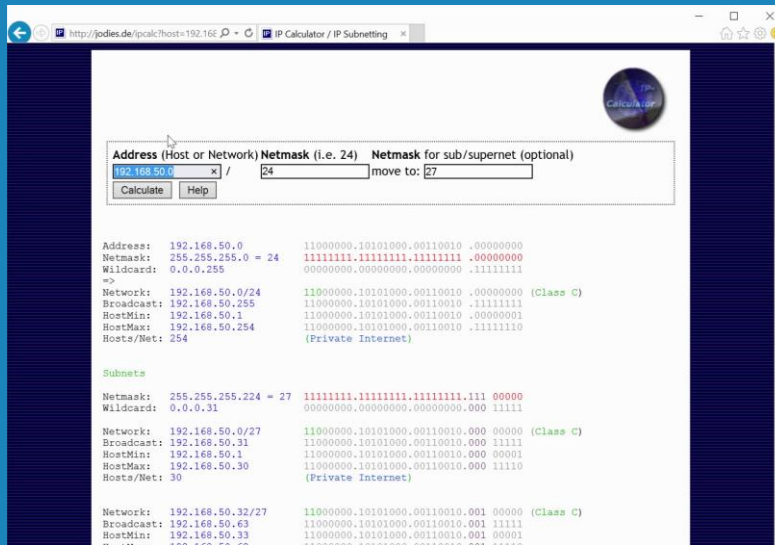
- With the following 192.168.150.0/24
- Create 5 networks
- <http://jodies.de/ipcalc>

Power of 2	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8
Decimal	1	2	4	8	16	32	64	128	256

Subnet Example

In this example the administrator has been allocated the network 192.168.150.0/24. This network needs to be divided into five separate networks. When subnetting networks, binary is used. For this reason, everything works in powers of two. Looking at the powers of two, the required number of bits would be 3; 2 to the power of 3 gives 8 networks; 2 to the power of 2 would give four networks. This does mean that this will be three more networks than required. There is often this kind of wastage in a network, however, having extra networks does allow for future expansion.

Online Subnet Calculator



Online Subnet Calculator

To use the online calculator, open the address <http://jodies.de/ipcalc> Once open enter the address you wish to subnet, in this example 192.168.150.0 is being used. Following this, is the subnet mask before subnetting, and in this example this value is 24. In this subnet calculator is the option 'move to'. This will allow the administrator to enter in the number of bits they want to allocate to new subnets. In this case, 3 bits are required so 24 plus 3 is 27 so the move to value is 27. Once the values have been entered in, press Calculate.

Once Calculate is pressed, all the subnets will be calculated and displayed. A full breakdown is given. The breakdown shows useful information like the network, broadcast, number of hosts, first and last host on the network. The important point to notice is that originally there were 254 hosts on one network. Now there are eight networks with 30 hosts per network.

Subnet Example 2

- With the following 192.168.150.0/24
- Create 4 networks

Power of 2	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8
Decimal	1	2	4	8	16	32	64	128	256

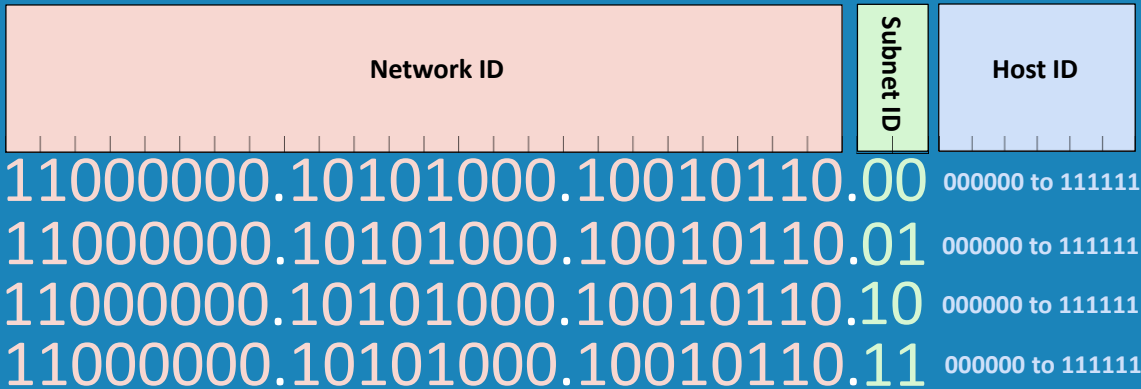
Subnet Example 2

In this example the administrator has been given the network 192.168.150.0/24. In this case, the administrator wants to divide the network into four subnets. Using the powers of two table this gives 2 to the power of 2. This means that two bits are required.

192.168.150.0 Breakdown

192.168.150.0

11000000.10101000.10010110.00000000



192.168.150.0 Breakdown

To break the address down into four subnets, first change the network address into binary. Looking at the binary, the first 24 bits will be the original network ID. The next two bits will be allocated to subnets. The last six bits will be allocated to hosts.

To work out the new subnets, copy and paste the first 24 bits from the original network ID. The next two bits are allocated to the subnet ID. It is just a matter of starting from zero and adding 1 and converting it to binary. For the first network this will be zero which is 00 in binary. Adding one will give one which is 01 in binary. Adding one again will give two which is 10 in binary. The last subnet will be three which is 11 in binary.

The last six bits are the host ID. This can range from all zeros to all ones to anything in between.

Subnetting Results

Subnet 1

Network ID: 11000000.10101000.10010110.00000000
Network ID: 192.168.150.0
Broadcast: 11000000.10101000.10010110.00111111
Broadcast: 192.168.150.63
1st IP Address: 11000000.10101000.10010110.00000001
1st IP Address: 192.168.150.1
Last IP Address: 11000000.10101000.10010110.00111110
Last IP Address: 192.168.150.62

Subnet 2

Network ID: 11000000.10101000.10010110.01000000
Network ID: 192.168.150.64
Broadcast: 11000000.10101000.10010110.01111111
Broadcast: 192.168.150.127
1st IP Address: 11000000.10101000.10010110.01000001
1st IP Address: 192.168.150.65
Last IP Address: 11000000.10101000.10010110.01111110
Last IP Address: 192.168.150.126

Subnet 3

Network ID: 11000000.10101000.10010110.10000000
Network ID: 192.168.150.128
Broadcast: 11000000.10101000.10010110.10111111
Broadcast: 192.168.150.191
1st IP Address: 11000000.10101000.10010110.10000001
1st IP Address: 192.168.150.129
Last IP Address: 11000000.10101000.10010110.10111110
Last IP Address: 192.168.150.190

Subnet 4

Network ID: 11000000.10101000.10010110.11000000
Network ID: 192.168.150.192
Broadcast: 11000000.10101000.10010110.11111111
Broadcast: 192.168.150.255
1st IP Address: 11000000.10101000.10010110.11000001
1st IP Address: 192.168.150.193
Last IP Address: 11000000.10101000.10010110.11111110
Last IP Address: 192.168.150.254

Subnetting Results

The network ID for all the subnets is the same. So the 24 bits are copied for all the different subnets. The next step is to add the network ID. The first subnet will be 00 in binary, followed by 01 in binary, 10, and lastly 11. The first address on each subnet will be all zeros. This is known as the network ID. This is not a useable IP Address. The network ID is used in routing and generally found on network diagrams. The last address of each subnet will be all ones. This is not a usable IP Address and is used for broadcasts. If you sent traffic to the broadcast address, the traffic will be sent to all nodes on the network. All the rest of the addresses are useable IP Addresses.

See <http://YouTube.com/ITFreeTraining> or <http://itfreetraining.com> for our always free training videos. This is only one video from the many free courses available on YouTube.

References

“Installing and Configuring Windows Server 2012 R2 Exam Ref 70-410” pages 202-203
“IP Calculator” <http://jodies.de/ipcalc>

Credits

Trainer: Austin Mason <http://ITFreeTraining.com>

Voice Talent: HP Lewis <http://hplewis.com>

Companion Document: Austin Mason <http://ITFreeTraining.com>

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