

Network programming

IP Address

Three major types of IP addressing (classful, subnetted classful and classless).

sub-net calculation table

bits	value
0000,0000	0
1000,0000	128
1100,0000	192
1110,0000	224
1111,0000	240
1111,1000	248
1111,1100	252

you can't have 1111,1110, because if just one bit of hosts, it doesn't qualify the requirement that we need to reserve at least 2 host address (all zero or all ones)

http://www.tcpipguide.com/free/t_IPSubnettingStep4DeterminingSubnetIdentifiersandSu-5.htm

Subnet Formula Calculations With less Than 8 Subnet Bits

summary , suppose subnet bits = n, subnet # =N.

the formula is $...N*2^{(8-n)}...$

In our Class C network with 3 subnet ID bits, the formula from the table is " $x.y.z.N*25 = x.y.z.N*32$ ". (why 32? $32=2^{(8-3)}$) For this network, all subnets are of the form " $211.77.20.N*32$ ", with N going from 0 to 7. (why 7? $(7=2^{(3)}-1)$). So, subnet #5 is $211.77.20.(5*32)$, which is $211.77.20.160$, as we saw before.

Similarly, in our Class B network with 5 subnet ID bits, the formula is $x.y.N*2^3.0 = x.y.N*8.0$. (why 8? $8=2^{(8-5)}$) In this case "x.y" is 166.113. Subnet #26 would have the address $166.113.(26*8).0$, or 166.113.208.0.

Subnet Formula Calculations With More Than 8 Subnet Bits

When the number of subnet bits is greater than 8, we need to use / and %
summary , suppose subnet bits = $n+8$, subnet # = N .

the formula is $x.y.N/2^n.(N\%2^n)*2^{(8-n)}$

Let's take as an example our Class B network and suppose that we decided to use 10 bits for the subnet ID instead of 5.

In this case, $n=10-8=2$, the formula is " $x.y.N/4.(N\%4)*64$ ".

- Subnet #23 in this case ($N=23$), would have the address " $166.113.23/4.(23\%4)*64$ ". The $23/4$ becomes just 5 (the fractional .75 is dropped). 23 modulo 4 is 3, which is multiplied by 64 to get 192. So the subnet address is "166.113.5.192".

- Subnet #709 ($N=709$) would be " $116.113.709/4.(709\%4)*64$ ", which is 116.113.177.64.

Subnet Formula Calculations With More Than 16 Subnet Bits

summary , suppose subnet bits = $n+16$, subnet # = N .

the formula is $x.N/2^{(8+n)}.(N/2^n)\%256.(N\%2^n)*2^{(8-n)}$

Okay, If you subnet a Class A address using 21 bits for the subnet ID, you are crossing two octet boundaries. so $n=21-16=5$.

The formula for subnet addresses in this case, is " $x.N/2^{13}.(N/2^5)\%256.(N\%2^5)*2^3 = x.N/8192.(N/32)\%256.(N\%32)*8$ ".

let's take an example and see how it works, for, say, subnet #987654. The first octet is of course 21. The second octet is $987654/8192$, integer division. This is 120. The third octet is $(987654/32)\%256$. The result of the division is 30864 (we drop the fraction). Then, we take $30864\%256$, which yields a remainder of 144. The fourth octet is $(987654\%32)*8$. This is $6*8$ or 48. So subnet address #987654 is 21.120.144.48.

host-id

If there are more than 8 bits in the host ID, this only works for the first 255 hosts, after which you have to "wrap around" and increase the value of the third octet. Consider again subnet #13 in our Class B example, which has a base address of 166.113.104.0. Host #214 on this subnet has address 166.113.104.214,

but host #314 isn't 166.113.104.314. It is 166.113.105.58 (how do we get this? host # 314/ 256 = 1 add to 104=205, and $314\%256 = 58$ added to 0 = 58)

(host #255 is 166.113.104.255, then host #256 is 166.113.105.0, and we count up 58 more (314-256) to get to #314, 166.113.105.58).

Broadcast Address:

- The broadcast address for a subnet is always one less than the base address of the subsequent subnet.
- or all host-id bits = 1 in the subnet

net-id

http://www.tcpipguide.com/free/t_IPAddressClassABandCNetworkandHostCapacities.htm

http://en.wikipedia.org/wiki/Classful_network

class range ~ network

class A 0 ~126 0xxx,xxxx

class B 128~191 10xx,xxxx

class C 192~223 110x,xxxx

class D 224~239 1110,xxxx

class D 240~255 1111,xxxx

key concepts:

- Variable Length Subnet Masking (VLSM) is a technique where subnetting is performed multiple times in iteration, to allow a network to be divided into a

hierarchy of subnetworks that vary in size. This allows an organization to much better match the size of its subnets to the requirements of its networks.

example :
http://www.tcpipguide.com/free/t_IPVariableLengthSubnetMaskingVLSM-3.htm

- CIDR . In essence, classless addressing means that instead of breaking a particular network into subnets, we can aggregate networks into larger "supernets". CIDR is sometimes called supernetting for this reason: it applies the principles of subnetting to larger networks. It is this aggregation of networks into supernets that allowed CIDR to resolve the problem of growing Internet routing tables.

VLSM deals with subnets of a single network in a private organization. CIDR takes the concept we just saw in VLSM to the Internet as a whole, by changing how organizational networks are allocated by replacing the single-level "classful" hierarchy with a multiple-layer hierarchy.

private addressed

A: 10.0.0.0/8 - 10.255.255.255/8

B: 172.16.0.0/12 - 172.31.255.255/12

C: 192.168.0.0/16 - 192.168.255.255/16

Source: <http://manoftoday.wikidot.com/network#toc40>