

Mini-guide - Subnetting

Comprehensive guide to subnetting a network

Note: this is often used throughout my course and possible future reference, TLDR i should I learn this as thoroughly as possible!

Prequel Information

Binary to Decimal

Given an IP-ADDRESS: 192.168.30.10

This converts decimal octet addresses to their binary components, this will be needed later down the line! This totals to about 255 octet values.

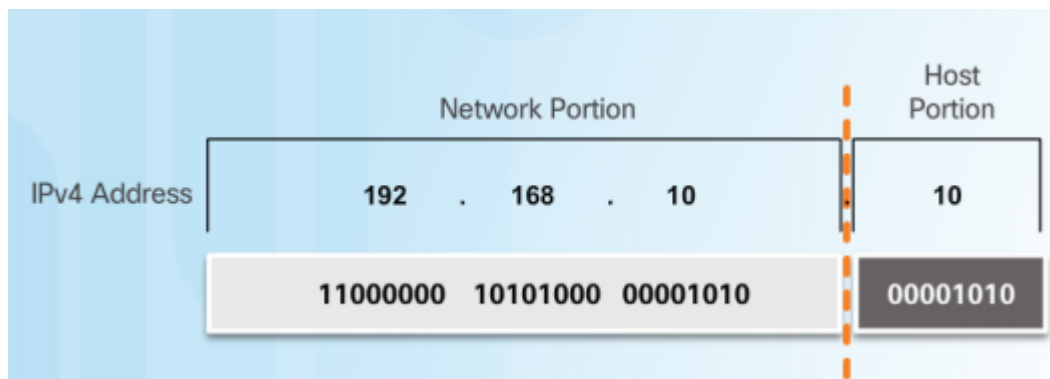
Positional Value	128	64	32	16	8	4	2	1
Binary	1	1	0	0	0	0	0	0
Calculation	128+	64+	0+	0+	0+	0+	0+	0+
Total	192							

Positional Value	128	64	32	16	8	4	2	1
Binary	1	0	1	0	1	0	0	0
Calculation	128+	0+	32+	0+	8+	0+	0+	0+
Total	168							

Positional Value	128	64	32	16	8	4	2	1
Binary	0	0	0	1	1	1	1	0
Calculation	0+	0+	0+	16+	8+	4+	2+	0+
Total	30							

Positional Value	128	64	32	16	8	4	2	1
Binary	0	0	0	0	0	0	0	0
Calculation	0+	0+	0+	0+	8+	0+	2+	0+
Total	10							

IPv4 Address Structure



Logical ANDING

Used to determine the network address, comparing the subnet mask binary bits to the IP address binary bits.

- 1 AND 1 = 1
- 1 AND 0 = 0
- 0 AND 1 = 0
- 0 AND 0 = 0

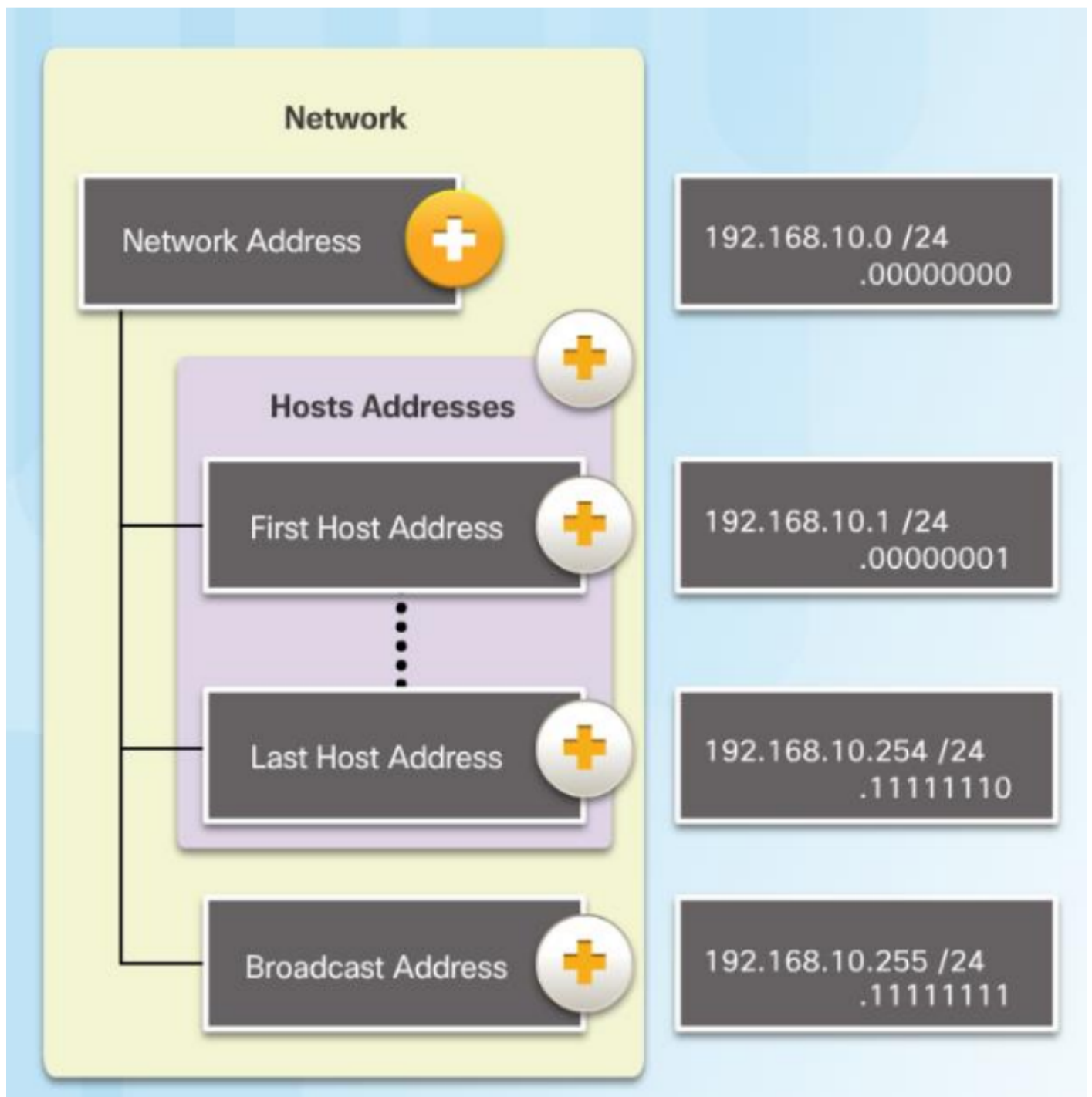
Pre-fixed length

Pre-fix length which is denoted by /24 or /16 is the numeral that determines how many 1 binarys are inside an network address.

Comparing the Subnet Mask and Prefix Length

Subnet Mask	32-bit Address	Prefix Length
255.0.0.0	11111111.00000000.00000000.00000000	/8
255.255.0.0	11111111.11111111.00000000.00000000	/16
255.255.255.0	11111111.11111111.11111111.00000000	/24
255.255.255.128	11111111.11111111.11111111.10000000	/25
255.255.255.192	11111111.11111111.11111111.11000000	/26
255.255.255.224	11111111.11111111.11111111.11100000	/27
255.255.255.240	11111111.11111111.11111111.11110000	/28
255.255.255.248	11111111.11111111.11111111.11111000	/29
255.255.255.252	11111111.11111111.11111111.11111100	/30

Address Types Determinations



Subnetting Formulas

Subnetting an IPv4 Network

Subnetting Formulas

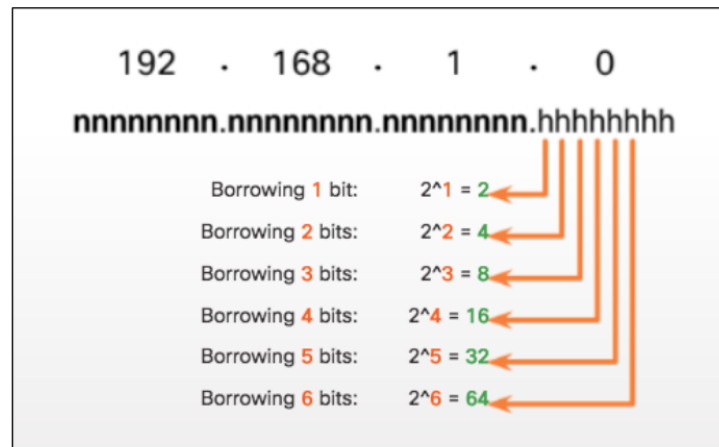
Calculate Number of Subnets Formula

$$2^n$$

n = bits borrowed



Subnetting a /24 Network



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Subnetting an IPv4 Network

Subnetting Formulas (Cont.)

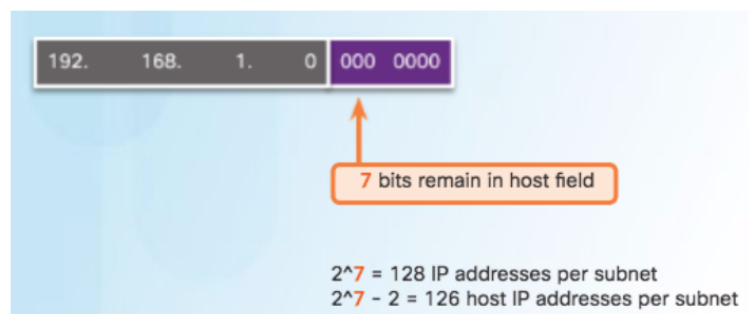
Calculate Number of Hosts Formula

$$2^n - 2$$

n = the number of bits remaining in the host field



Calculating the Number of Hosts



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Example (Using real tutorial work!) (VLSM?)

From prior experience you can only really subnet a IP address unless you're given the specifications.

Subnet the network 192.168.1.0/24 to meet the following requirements:

1. Subnet A : 58 Hosts
2. Subnet B : 28 Hosts
3. Subnet C : 12 Hosts

Requirements;

1. Maximum of 58 hosts
2. 3 Subnets must arrive.

Given that we have a /24 prefix we can determine that;

192.168.1 - is the network portion which is unchanged, using logical AND technique will reveal that all octets are the same and will not change. This leaves the next octet or 8 bits to play with.

192	168	1	Measurement
11000000	10101000	00000001	Binary Value
11111111	11111111	11111111	Subnet Mask

.0 - is the host portion in which we use this to assign our hosts and subnets!

Remember that subnets are calculating using bits borrowed and hosts are calculated using bits remaining.

Current configuration

.0

00000000

Borrowing Configuration

11000000 = 4 subnets and 62 hosts to deal.

First Address: 1

Last Address: 62

Broadcast Address: 63

this makes the prefix /26 making the subnet mask 192.

1100000 / 192 - now we require 28 hosts which means, we need 5 bits remaining.

1110000 / 224 - 30 hosts

Network Address = 64

first Address : 65

Last Address: 94

Broadcast Address: 95

11110000 - 14 hosts

Network Address : 96

first Address : 97

Last Address: 110

Broadcast Address: 111

VLSM AND NON VLSM!

VLSM = break it into smaller subnets (borrow more bits)

FLSM = just make it into even proportioned subnets (Don't borrow bits just use the network id to seperate them further...)