Binary Lesson 5
Usable Addresses
Class A, B, and C

Slash Notation

- **Consider a class A address of 1.2.3.4**
- **The network portion is the first octet**
  - **1**
- **This situation can be written**
  - **1.2.3.4/8**
  - **The number after the / is the number of bits in the network portion**

Subnet Mask

- **Consider a class A address of 1.2.3.4 /8 in binary**

- **The *subnet mask* is 255.0.0.0**

- **The network address is 1.0.0.0**

- **In Binary:**

```
IP:         00000001 00000010 00000011 00000100
Subnt Msk:  11111111 00000000 00000000 00000000
Net Addr:   00000001 00000000 00000000 00000000
```

Network Address

- **To find the network address, take a node's IP address and set all the host bits to 0**

```
IP:          00000001 00000010 00000011 00000100
Subnt Msk:   11111111 00000000 00000000 00000000
             NNNNNNNN HHHHHHHH HHHHHHHH HHHHHHHH
Net Addr:    00000001 00000000 00000000 00000000
```

- **In decimal:**

```
IP:                    1        2        3        4
Subnt Msk:           255        0        0        0
Net Addr:              1        0        0        0
```

Broadcast Address

■ **To find the broadcast address, take a node's IP address and set all the host bits to 1**

IP:	00000001	00000010	00000011	00000100
Subnt Msk:	11111111	00000000	00000000	00000000
	NNNNNNNN	HHHHHHHH	HHHHHHHH	HHHHHHHH
Brdc Addr:	00000001	11111111	11111111	11111111

■ **In decimal:**

IP:	1	2	3	4
Subnt Msk:	255	0	0	0
Brdc Addr:	1	255	255	255

Usable Addresses

- **All the other addresses are usable--starting at network address + 1 and ending at broadcast address -1**

```
Network Addr:          1.   0.   0.   0
Subnet Mask:         255.   0.   0.   0
Broadcast Addr:        1.255.255.255
First Usable Addr:     1.   0.   0.   1
Last Usable Addr:      1.255.255.254
```

Class B

- **Class B address: 147.144.1.212 /16**
- **The *subnet mask* is 255.255.0.0**
- **The network address is 147.144.0.0**
- **The broadcast address is 147.144.255.255**
- **In Binary:**

```
IP:          10010011 10010000 00000001 11010100
Subnt Msk:   11111111 11111111 00000000 00000000
Net Addr:    10010011 10010000 00000000 00000000
Brdc Addr:   10010011 10010000 11111111 11111111
```

Class B Usable Addresses

- **Class B address: 147.144.1.212 /16**
- **The *subnet mask* is 255.255.0.0**
- **The network address is 147.144.0.0**
- **The broadcast address is 147.144.255.255**
- **First usable address: 147.144.0.1**
- **Last usable address: 147.144.255.254**

Class C

- **Class C address: 192.168.1.10 /24**
- **The *subnet mask* is 255.255.255.0**
- **The network address is 192.168.1.0**
- **The broadcast address is 192.168.1.255**
- **In Binary:**

```
IP:          11000000 10101000 00000001 00001010
Subnt Msk:   11111111 11111111 11111111 00000000
Net Addr:    11000000 10101000 00000001 00000000
Brdc Addr:   11000000 10101000 00000001 11111111
```