

Local Area Networking

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My favorite WiFi link



My favorite WiFi link



What we'll cover

- What makes up a LAN?
- IPv4 Addressing & Subnet Masking
- Defining a network w/ the subnet mask
- The MAC Address, broken down into parts
- How an IP address, subnet mask, and MAC address are used on a LAN

What we'll cover

- IPv6 Addressing
- VLAN Fundamentals

What makes up a LAN

- External internet provider
- Router/Firewall
- Wired or wireless infrastructure
- Networked devices

IPv4 Addressing

- External Public or "Routable" Addresses
 - These are typically handed out by your ISP

0.0.0.0 - 255.255.255.255

IPv4 Addressing

- Internal Private or "Non-Routable" Addresses (IETF RFC 1918, and others)

10.0.0.0 - 10.255.255.255

10.0.0.0/8 (16,777,216 addresses)

172.16.0.0 - 172.31.255.255

172.16.0.0/12 (1,048,576 addresses)

192.168.0.0 - 192.168.255.255 192.168.0.0/16
(65,536 addresses)

fc00::/7

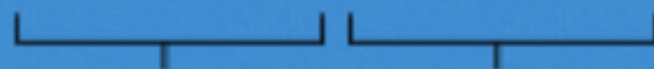
IPv4 Addresses

An IPv4 address (dotted-decimal notation)

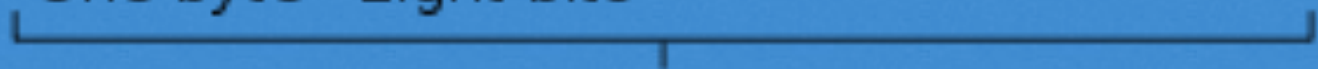
172 . 16 . 254 . 1



10101100 ,00010000 ,11111110 ,00000001



One byte = Eight bits



Thirty-two bits (4 x 8), or 4 bytes

IPv4 Subnet Masking

- Decoding Subnet Masks

Subnet mask	Bitcount	# of Subnets	Hosts/Subnet
255.255.255.0	/24	1	254
255.255.255.128	/25	2	126
255.255.255. 192	/26	4	62
255.255.255.224	/27	8	30
255.255.255.240	/28	16	14
255.255.255.248	/29	32	6
255.255.255.252	/30	64	2

Subnet Mask

IP address

172.16.0.100

Subnet Mask

255.255.255.0

Router

172.16.0.1

DNS Primary & Secondary

Subnet Mask

IP address

172.16.10.100

Subnet Mask

255.255.255.0

Router

172.16.0.1

DNS Primary & Secondary

How to plan a successful LAN, WAN and in-between

- NAT (Network Address Translation)
 - What does it do?
- Determining your private IP ranges and subnet masking best practices

How to plan a successful LAN, WAN and in-between

- How do unmanaged switches differ from managed switches?
 - Memory
 - Routing
 - Features
 - Management
 - Ability to control users, speed, destination
- Which to choose??

MAC Addresses

- The MAC Address, broken down into parts
 - What is a MAC address?
 - MAC address spoofing

MAC Address

Media Access Control Address

01:23:45:67:89:ab

01:23:45: manufacturer

device serial :67:89:ab

MAC Address

```
BigButWide:~ roger$ arp -a
```

```
? (10.43.1.1) at 54:75:d0:89:5:42 on en0 ifscope [ethernet]  
? (10.43.1.20) at 0:16:cb:a7:1b:23 on en0 ifscope [ethernet]  
? (10.43.1.102) at d8:d3:85:d4:3a:d5 on en1 ifscope [ethernet]  
? (10.43.1.108) at 28:37:37:43:46:17 on en1 ifscope [ethernet]  
? (10.43.1.255) at ff:ff:ff:ff:ff:ff on en0 ifscope [ethernet]  
? (10.43.1.255) at ff:ff:ff:ff:ff:ff on en1 ifscope [ethernet]
```

IPv6 Basics

- IPv6 addresses are written in eight groups of four hexadecimal digits separated by colons, such as

2001:0db8:85a3:0000:0000:8a2e:0037:7334

or

2001:db8:85a3:0:0:8a2e:37:7334

or

2001:db8:85a3::8a2e:37:7334

IPv6 Basics

- IPv6 unicast addresses other than those that start with binary 000 are logically divided into two parts:
 - a 64-bit network prefix, and a 64-bit interface identifier.

IPv6 Basics

- 2001:0DB8:AC10:FE01::
- No subnets, just CIDR
- fc00::/64 = private address range
- fe80::/64 = link local (like 169.254.x.x)
- ::1 = loopback
- See RFC5156 for more on addresses

VLAN Fundamentals

- What is a VLAN?
- How does a VLAN differ from a LAN?
- Who should be using them?
- Equipment requirements

VLAN Fundamentals

What is a VLAN?

- A VLAN is a logically separate IP network.
- It allows geologically diverse subnets.
- A VLAN splits and combines broadcast domains without regard to geography.
- A VLAN can split types of traffic - voice vs. data.
- Each VLAN corresponds to a unique IP subnet.

VLAN Fundamentals

How does a VLAN differ from a LAN?

- It is a *VIRTUAL* LAN.
- It may be spread across multiple switches.
- It requires a smart switch (or better).
- It requires prior planning to implement.
- It has to be explicitly created and numbered. Naming is optional.

VLAN Fundamentals

Who should be using them?

- Anyone needing subnet management.
- Anyone with internal security needs.
- Anyone with multiple classes of service.
- Anyone with logically complex and/or geographically complicated networks.

VLAN Fundamentals

Equipment requirements

- Smart switch(s) with VLAN capability.
- Fully managed switches for more complex cases.
- No dumb switches on the network.
- Router(s) with VLAN capability.

For more information

- www.smallnetbuilder.com
- www.wikipedia.com
- on VLANs: LAN Switching and Wireless;
Cisco Press; Chapter 3
- Internet specifications: www.ietf.org
<http://tools.ietf.org/html/rfc5156>