Devops: networking

Ip Address

-> Unique identifier
-> use to locate device on internet
-> use to identify devices

-> IPV4
-> IPv6

IPv4: 32 bit Address
IPv6: 128 bit Address
private Ip: used within internal network (not accessible from internet)
public Ip: used to access internet

static Ip: Does not change

Dynamic Ip: change periodically

Subnetting

-) Technique in networking to divide single network into smaller, more manageable sub-networks or subnets

-) Help to optimize performance
-) Improve security
-) Make more organize and manageable
-) smaller subnets reduce network congestion.
-) used to group devices on their role or departments

Subnet Mask

-) Subnet Mask tells us how many bits are used for network and how many are left for hosts (Devices)

Example:

For class C, Default subnet mask is:

255.255.255.0

In Binary:

11111111.11111111.11111111.00000000

So

First 24 bit = Network ID
Last 8 bit = Host ID.

IPv4 Address Classes

-> IPv4: Internet protocol version 4
eg: 192.168.1.1

-> Each number is from 0 to 255
-> 8 bit each
-> Whole is 32 bit

Why Do We Have IP classes?

-> Back in early days of internet, people needed a way to assign IPs to networks of different sizes.
Some networks were huge (IBM).
Some Medium (universities).
Some small (local Businesses).

So, They created IP classes (A to E).
to divide address space by network size.
Its like allocating
-> Big lands to big companies (class A)
-> Medium lands to universities (class B.)
-> small plots to homes

Class	Starting Bit	IP Range (1st octet)	
A	0xxxxxxx	1-126	
B	10xxxxxx	128-191	
C	110xxxxx	192-223	256
D	1110xxxx	224-239	N/A
E	1111xxxx	240-255	N/A

Note: 127.x.x.x is reserved for localhost.

→ Modern networking use CIDR (classless Inter-Domain Routing)

NOTE:

series of
10.0.0.0
172.16.0.0
192.168.0.0 are private

Mean Ip Addres start from 10, 172, 192 are private.

NOTE:

All decimals from 0 to 127 have binary start with 0. so that's why we say in class A starting bit is 0.

Subnet Mask

→ 256 IPs in class C network
192.168.1.0 To 192.168.1.255

Now,
Two Addresses need to used for special purposes.

Example:

192.168.1.0 – 192.168.1.255
Host Range 192.168.1.1 – 192.168.1.254

.0 Reserved – This is network
.255 Reserved (Send to all in network)

IPv4 Address classes

Class A:

-> start from 0 : After converting into binary.

-> First octet network
<=> 3 octet for host
Example : 10.0.0.0/8
(10.0.0.0/10.255.255.255)

Class B:

-> start from 10.
-> Two octets network
-> Two for hosts

-> Total number of hosts
: $2^{(host\ bits)} - 2$
: $2^{(16)} - 2$
: 65,534
Example : 172.16.0.0/16
(172.16.0.0

Class C:

-> Three octat for network
-> one for Host
-> start from 110.

[N | N | N | H]

: $2^{(8)} - 2$
: Total Host : 254

-> 192.0.0.0 to 223.255.255.255

-> How find total possible network

-> 110 - show that Class C.
-> 24 bit for network
- 3 bit
-> 21 remaining
-> 2^{21} : 2,097,152

Class D:

-> 224.0.0.0 to 239.255.255.255
-> Reserved for multicast Addressing
-> used for one-to-many communication
-> where data is sent from one sender to multiple recievers simultaneously.

Class E:

-> 240.0.0.0 to 255.255.255.254
-> Reserved for experiments.

Network interfaces

-> Network interface is hardware component (like ethernet card or wifi adapter) that connects your device to network.

-> Linux assigns name to each interface, typically starting with "eth" for ethernet (e.g. eth0) or "wlan" for wifi (e.g. wlan0)

Configuration Files:

-> Network configuration files define how your Linux device interacts with network

-> Common Configuration files include:

-> etc / hosts:

-> used to manually define hostnames and their corresponding IP address.

-> System check this file before contacting DNS servers like (Google DNS).

path: /etc/hosts

USE:

-> Instead of typing 192.168.1.10, you can type webserver.

-> you can make example.com open your project by pointing it to 127.0.0.1.

-> you can block facebook.com like this

127.0.0.1 facebook.com

/etc/resolv.conf

-> /etc/resolv.conf is a Configuration file that tells your Linux system which DNS server to use when it wants to convert a domain name like (google.com) into an IP Address

-> /etc/resolv.conf stores the DNS server Address your system should contact

~~/etc/sysconfig/network-scripts/~~

/etc/netplan OR
/etc/network/interfaces

Netplan

-> Netplan is default network configuration tool in Ubuntu 17.10 and later.

It uses YAML files to configure network interfaces like Wifi and Ethernet and applies those configurations using either:

1) Networkd (for servers)
2) NetworkManager (for desktops)

-> Replaced older /etc/network/interfaces method.
-> Easier to write and maintain.
-> Work well with cloud environments and modern systems.

-> Located in
/etc/netplan

-> Use to modify
01-network-manager-all.yaml

-> sudo netplan apply - Apply configuration
-> sudo netplan generate - Generate netplan configuration
-> sudo netplan try - Test configuration before applying
-> View Netplan status
sudo netplan status

Basic networking Commands

-> Essential for troubleshooting and monitoring tools,

01)

-> Ping

Check if host (IP or domain) is reachable and how long it takes.

Example: ping -c 4 google.com

ping google.com

-> Check reachability

-> Test internet connection.

-> Detect network latency or packet loss

02) -> ifconfig (older, replaced by ip a in newer distributions)

-> Shows and configure network interfaces

Example:

ip a

-> View IP addresses and MAC addresses

-> Enable or disable interfaces

-> & Manually Assigning an IP for testing

03 ss

. Display socket statistics, open ports and connections

Example:

ss -tuln

-> Monitor network performance and active connections

-> Display all open network connections

ss -a

-> Display all listening ports

ss -l

-> Display all TCP connections

ss -t

-> Display all UDP connections

ss -u

-> Display network statistics

ss -s

-> Display processes using network connections

ss -p