Day 1 : VPC

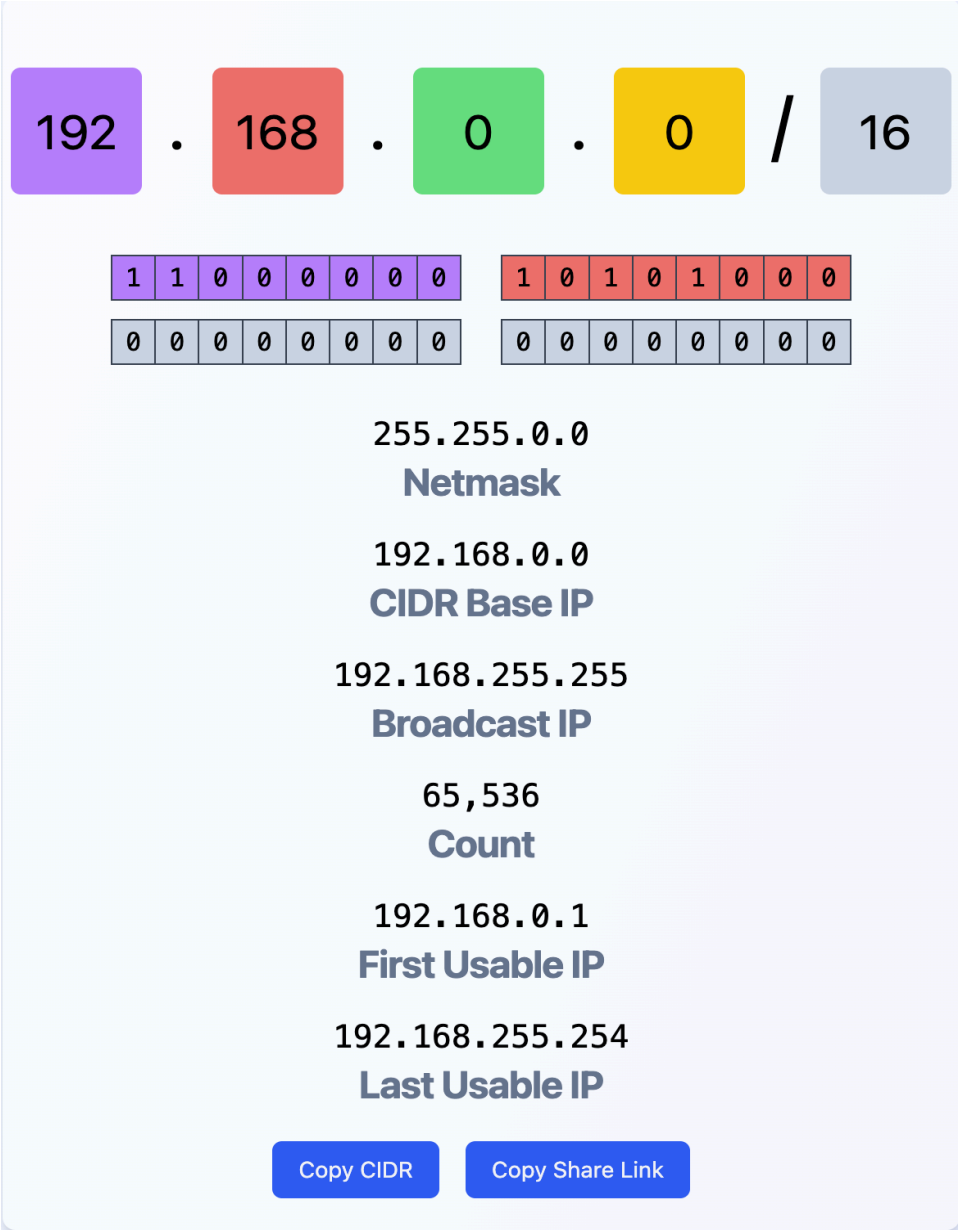
VPC (Virtual Private Cloud) : Networking Service in AWS

- VPC is a Network Boundary.
- Nothing but Secure and isolated network segment within AWS.
- In simple terms VPC is own private network in the cloud
- Every network has unique IP address.
- To create VPC we should create VPC in a region.
- If we create any resources (services) in one VPC they can't communicate with resources which are in other VPC. But we can manually setup to make them communicate.
- For every VPC there will be range of IP addresses (CIDR - Classless Inter Domain Routing - It gives range of IP addresses)

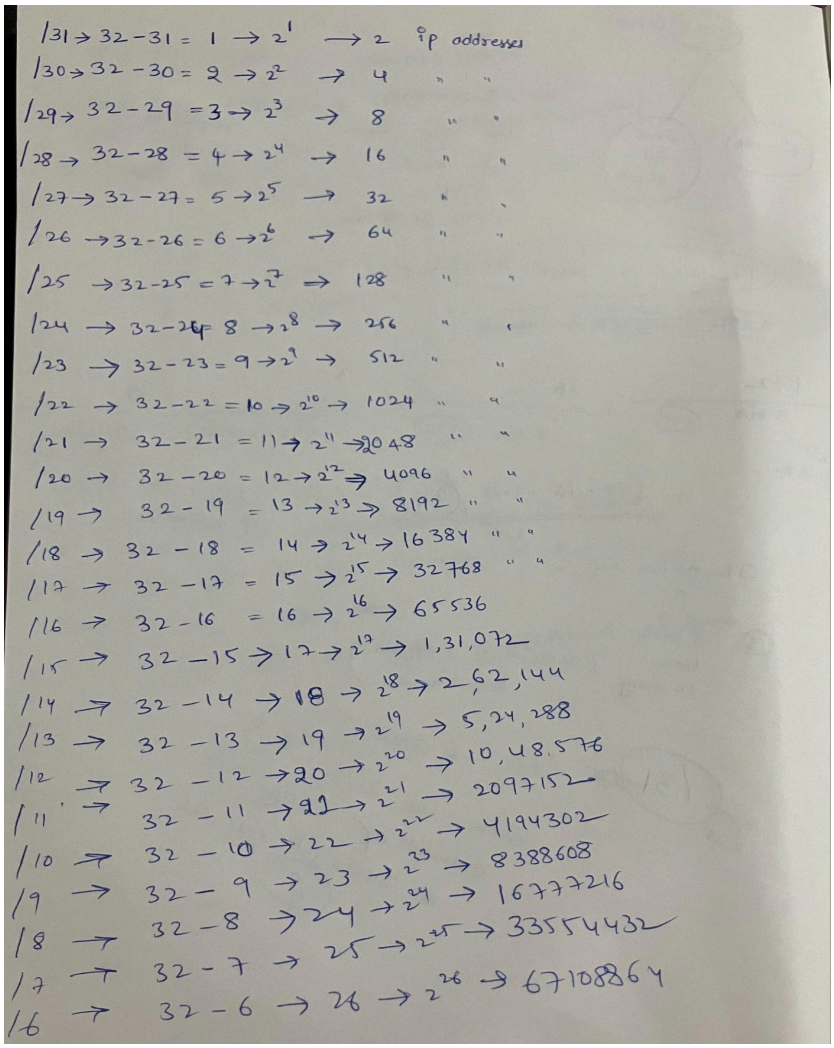
CIDR:

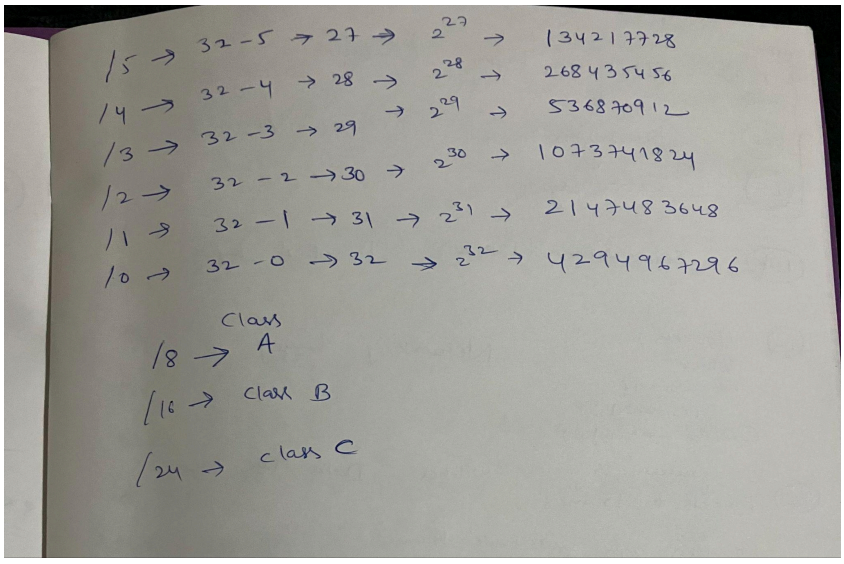
Website: CIDR.xyz

- Classless Inter-Domain Routing (CIDR) is a compact way to write IP address ranges and their network masks.



- If we see above number 192.168.0.0/16 – it represents ip address (4 bytes - 32 bit)
- To calculate CIDR => 2^{32-n} Here n is 16
- In real time we mostly use /16 or /28


/31 → 32-31 = 1 → 2^1 → 2 ip addresses
/30 → 32-30 = 2 → 2^2 → 4 " "
/29 → 32-29 = 3 → 2^3 → 8 " "
/28 → 32-28 = 4 → 2^4 → 16 " "
/27 → 32-27 = 5 → 2^5 → 32 " "
/26 → 32-26 = 6 → 2^6 → 64 " "
/25 → 32-25 = 7 → 2^7 → 128 " "
/24 → 32-24 = 8 → 2^8 → 256 " "
/23 → 32-23 = 9 → 2^9 → 512 " "
/22 → 32-22 = 10 → 2^10 → 1024 " "
/21 → 32-21 = 11 → 2^11 → 2048 " "
/20 → 32-20 = 12 → 2^12 → 4096 " "
/19 → 32-19 = 13 → 2^13 → 8192 " "
/18 → 32-18 = 14 → 2^14 → 16384 " "
/17 → 32-17 = 15 → 2^15 → 32768 " "
/16 → 32-16 = 16 → 2^16 → 65536
/15 → 32-15 → 17 → 2^17 → 1,31,072
/14 → 32-14 → 18 → 2^18 → 2,62,144
/13 → 32-13 → 19 → 2^19 → 5,24,288
/12 → 32-12 → 20 → 2^20 → 10,48,576
/11 → 32-11 → 21 → 2^21 → 2097152
/10 → 32-10 → 22 → 2^22 → 4194302
/9 → 32-9 → 23 → 2^23 → 8388608
/8 → 32-8 → 24 → 2^24 → 16777216
/7 → 32-7 → 25 → 2^25 → 33554432
/6 → 32-6 → 26 → 2^26 → 67108864


/5 → 32-5 → 27 → 2^27 → 134217728
/4 → 32-4 → 28 → 2^28 → 268435456
/3 → 32-3 → 29 → 2^29 → 536870912
/2 → 32-2 → 30 → 2^30 → 1073741824
/1 → 32-1 → 31 → 2^31 → 2147483648
/0 → 32-0 → 32 → 2^32 → 4294967296
Class
/8 → A
/16 → class B
/24 → class C

What is RFC (Request for Comments) 1918?

RFC 1918 is a standard by the **IETF** that defines **private IPv4 address ranges**. These addresses are **not routable on the public Internet** and are intended for use within **private networks**.

Purpose

- Provides **IP address space** for internal use (e.g., corporate LANs, cloud networks, home routers).
- Helps avoid IP address exhaustion by **reusing** the same ranges in different private networks.
- Supports **Network Address Translation (NAT)** to access the internet from private IPs.

Characteristics

- **Not routable** on the public Internet
- Can be used **freely** without registration
- Require **NAT** to communicate with external/public networks
- Often used in **VPNs**, **cloud VPCs**, and **internal company networks**

RFC 1918 in AWS

- AWS VPCs commonly use RFC 1918 address ranges.
- Examples:
    - `10.0.0.0/16` for a custom VPC
    - `172.31.0.0/16` is default for AWS default VPCs
    - 192.168.0.0/16 supported but its not used by default
    - NAT Gateways or NAT Instances used for outbound internet access

RFC Ranges :

- **10.0.0.0/8:** This range includes all IP addresses from 10.0.0.0 to 10.255.255.255.
- **172.16.0.0/12:** This range includes all IP addresses from 172.16.0.0 to 172.31.255.255.

- **192.168.0.0/16:** This range includes all IP addresses from 192.168.0.0 to 192.168.255.255.

Components in VPC:

- Subnets (Public, Private)
- Internet Gateway
- NAT Gateway (Network Address Translation)
- Security groups
- Route Tables

VPC Types:

There are two types

1. Default VPC – Which already AWS configured for us
2. Custom VPC - We configure it.