Assalam-u-alaikum

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This is my 10th video of DevOps

Network Layer

In the transport layer, the data will be transferred in segments.

In the network layer, the data will be transferred in packets.

In the data link layer, the data will be transferred in frames.

What works in the network layer?

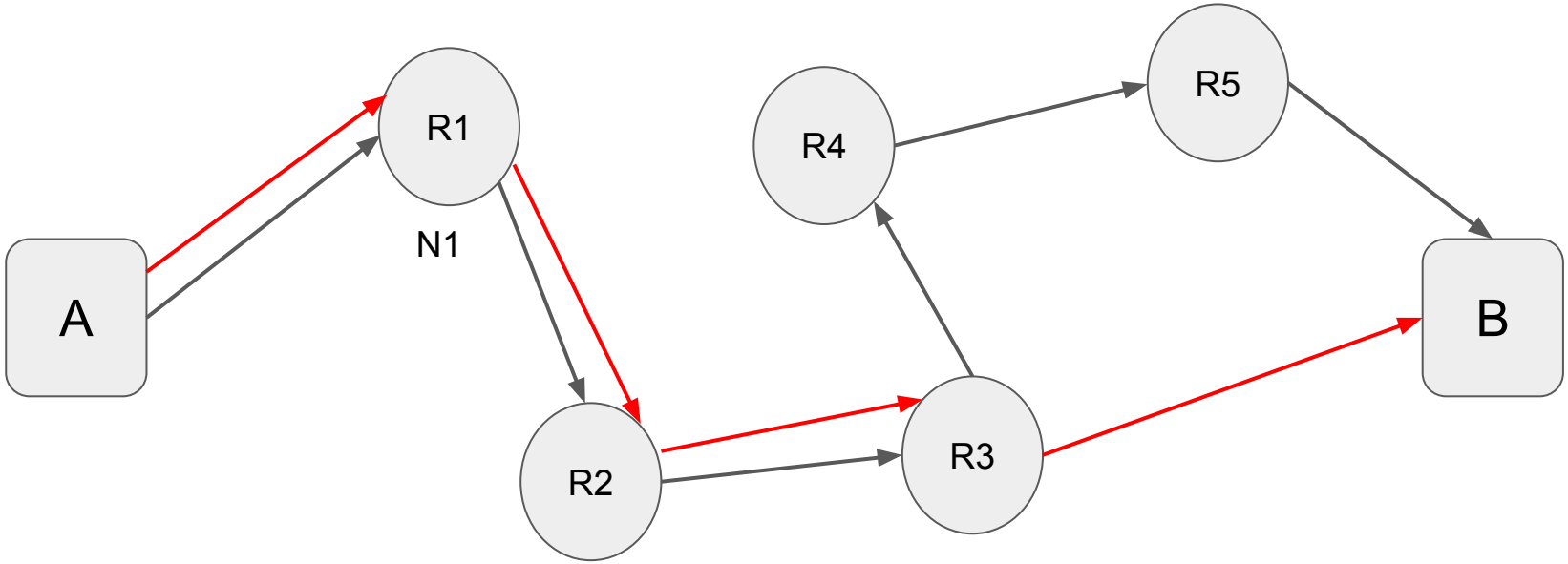
Routers work in the network layer. Every router is having its own network address. Each router has its own routing table.

Routing table contains a lot of information but all the routing tables have at least three information fields.

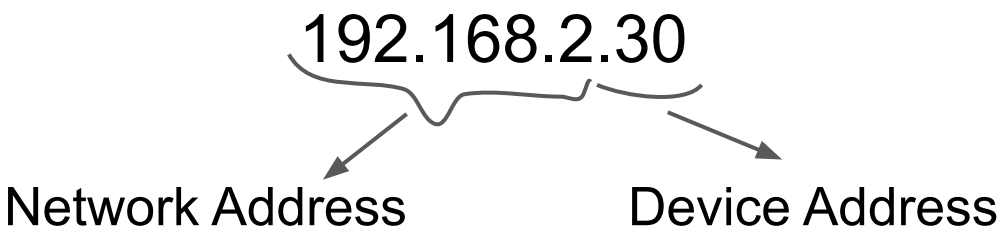
Network ID: The Destination subnet.

Metric: The routing metric of the path through which the packet is to be sent.

Next Hop: The address of the next device to which the packet is to be sent on the way to its final destination.



Forwarding table comes inside a routing table.
Routing table contains multiple paths. The information of different paths and their movement will be in the routing table.
Forwarding table only contains one path.
These tables are present inside the routers.



Who creates these tables?

Control plane which is in the network layer. Control plane refers to the all functions and processes that determine which path to use to send the packet or frame.

There are two types of routings that are used to create a table.

- **Static routing** → Administrator manually adds the addresses.
- **Dynamic routing** → Dynamic routing is a technique in which a router learns about routing information without an administrator's help and adds the best route to its routing table.

Network layer protocol is an internet protocol

Internet protocol (IP)

The Internet Protocol (IP) is a protocol, or set of rules, for routing and addressing packets of data so that they can travel across networks and arrive at the correct destination.

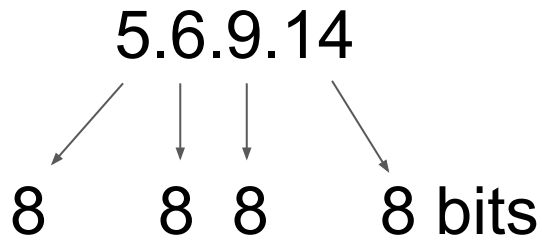
Every device or domain that connects to the Internet is assigned an IP address, and as packets are directed to the IP address attached to them, data arrives where it is needed.

IPv4 and IPv6

IPv4 and IPv6 are internet protocol version 4 and internet protocol version 6, IP version 6 is the new version of Internet Protocol, which is way better than IP version 4 in terms of complexity and efficiency.

IPv4 → 32 bits

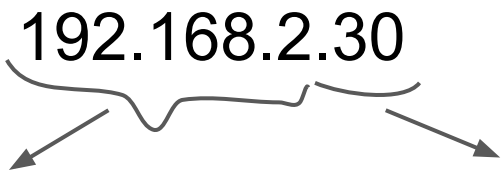
IPv6 → 128 bits



The hoping takes place in ISPs, not in the routers. The blocks of ip addresses are assigned to the ISPs and that is called **subnetting**.

An IP address consists of two components: a **network ID** and a **host ID.**

- **The network ID/subnet ID** identifies the network. The **host ID** is used to identify the number of supported hosts.
- **A host** can communicate directly only with other hosts on the same network segment. A network segment is a logical division of a network into unique numeric network IDs called subnets. A host must use a router to communicate with hosts on other subnets.



Network Address

Network ID

Device Address

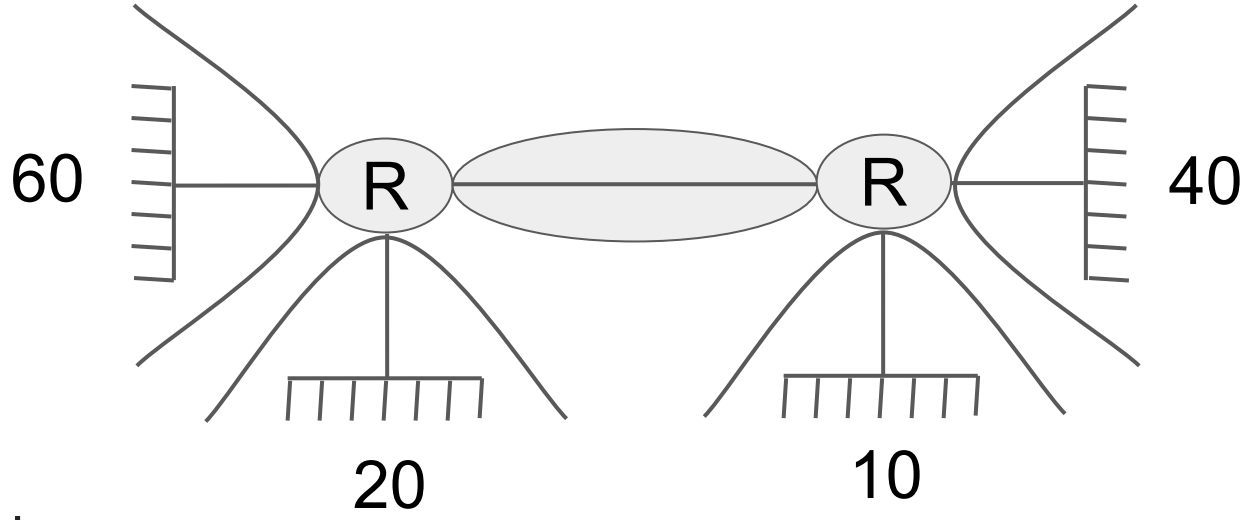
Host ID

IP designers carved the entire galaxy of IP addresses into classes to meet different addressing needs.

Class A	→	0.0.0.0	→	127.255.255.255
Class B	→	128.0.0.0	→	191.255.255.255
Class C	→	192.0.0.0	→	223.255.255.255
Class D	→	224.0.0.0	→	239.255.255.255
Class E	→	240.0.0.0	→	255.255.255.255

Subnetting

It is the method through which one network is divided so that router consider it different networks. It is dividing the ip address logically.



N.H.H.H

1. 12.0.0.0
2. 12.00000000.00000000.00000000

3. $2^n - 2 >= 60$

$2^1 - 2 = 0$

$2^2 - 2 = 2$

$2^3 - 2 = 8 - 2 = 6$

$2^4 - 2 = 16 - 2 = 14$

$2^5 - 2 = 32 - 2 = 30$

$2^6 - 2 = 64 - 2 = 62$

$62 >= 60$

4. n = 6

5. 12.00000000.00000000.00000000

Network Host

Network bit = 1, Host bit = 0

128+64+32+16+8+4+2+1

6. 12.11111111.11111111.11000000

7. 12.255.255.192

8. **Subnet Mask** → Class A → 255.0.0.0 → 255.255.255.192
A subnet mask is a 32 bits address used to distinguish between a network address and a host address in IP address. It helps the router to identify the network.

- Class A: 255.0.0.0
- Class B: 255.255.0.0
- Class C: 255.255.255.0

9. **Subnet ID** → 12.0.0.0/26
   Broadcast ID: 12.0.0.63/26

CIDR shows that how much network bits are present in an ip address.

10.2nd Subnet

Subnet ID: 12.0.0.64/26

Broadcast ID: 12.0.0.127/26

3rd Subnet

Subnet ID: 12.0.0.128/26

4th Subnet

Subnet ID: 12.0.0.192/26

5th Subnet

Subnet ID: 12.0.1.0/26

What we have learned?

Network Layer and its working

Routing and forwarding table

Internet protocol, IPv4, IPv6

Network and Host ID, Subnetting

That’s It

I hope you will like this video.

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