

What is Routing?

→ when router receives an IP packet on one interface, it determines which interface to use to forward the packet to the destination

→ use its IP routing table to determine which path

Best path (longest match)

Destination :- 172.16.0.16

10101100 . 00010000 . 00000000 . 00001010

Route

Prefix

1

172.16.0.0/12

10101100 . 00010000 . 00000000 . 00001010
12

2

172.16.0.0/18

10101100 . 00010000 . 00000000 . 00001010
18

✓ 3

172.16.0.0/26

10101100 . 00010000 . 00000000 . 00001010
26

choose this longest match

How Router building Routing table ?

① Directly connected Networks

② Remote Networks

(Network directly not connected with router)

(i) Static routing

(ii) Dynamic Routing

(Default routing -/0

no bits need to match the destination

Ip address for this route entry to be used)

Q How Routers build their Routing table?

Ans:-

Using protocol

① Static Routing

② Dynamic Routing

③ ~~Direct~~

① Static Routing

→ manually configure the routing table on each router

→ manually enters the routes and associated next hop information

Router A :-

① Network 192.168.1.0/24

directly connected to interface eth0

② Network 10.0.0.0/24 is reachable

via next hop Router B at IP 192.168.1.2

③ 172.16.0.0/16 is reachable

via next hop router C at 192.168.1.3

② Dynamic Routing :-

→ automate the process of building and maintzng routing table by allowing routers to exchange routing information each other

→ OSPF → open shortest path first

RIP → Routing Information protocol

BGP

→ Border Gateway protocol

Router A

- Recive Info from Router B, C and their connected network
- update routing table with received info

Router - B

- direct connected network (10.0.0.0/24) to Router A
- Learn about Router A, C

Router C

- directly connected network (172.16.0.0/16)
- Learn about B, A

Route source

L → identifies the address assigned to a router interface

C → identify a directly connected network

S → identify a static route created to reach a specific network

D → identify dynamic routing using OSPF protocol

* → Default route

Routing Principle

- ① Every router makes its decision alone based on the info. of its routing table
- ② Information in a routing table of one router doesn't match (necessarily) the routing table of another
- ③ Routing info of a path doesn't provide return routing info

Routing Table entries

- ① Route source
- ② Destination network (prefix length)
- ③ Administrative distance
(identify trustworthiness of source)
(lower value more worthy)
- ④ metric
- ⑤ Next hop
- ⑥ Route timestamp
- ⑦ exit interface

1 2 3 4 5
0 10.0.4.0/24 [110/50] via 10.0.3.2
6 7
00:13:29 Serial 0/1

Routing Table

what is default routing?

→ specify a next hop router to use routing table doesn't contain a specific route that matches the destination IP address

→ can either static or dynamic

IPv4 route :- 0.0.0.0/0
entry

IPv6 :- ::/0

Dynamic

static

complexity

Independent
of network
size

increases
with
network size

when
Topology
change

Automatically
adapts to change

Administration
intervention
required

Scalability

more
scalable

less

security

security must
be configured

security is
Inherent

Resource
usage

use cpu, memory
and link bandwidth

no addition
resource
needed

Network

large

small

path
predictability

automatically determine
best path

Explicitly defined
by administrator

use
case

- ① Network consists many routers
- ② networks frequently changes topology
(... automatically adjusts)
- ③ If network has possibilities to grow in future

- ① default route forwarding packets
- ② For routing between stub networks
- ③ when administrator wants to explicitly define the path for specific network
- ④ for routes outside routing domain
(not learned about others)