

Longest Match:

if there is more than one route to a network check the length of each route. If one route is more specific (has more significant bits $24 < 27 < 28$) then we choose the longest match and the other attributes do not matter.

if there is more than one route to a network and they have the same length then we evaluate how we learned them using Administrative Distance. If one has a better AD, then we choose that one and the other attribute does not matter.

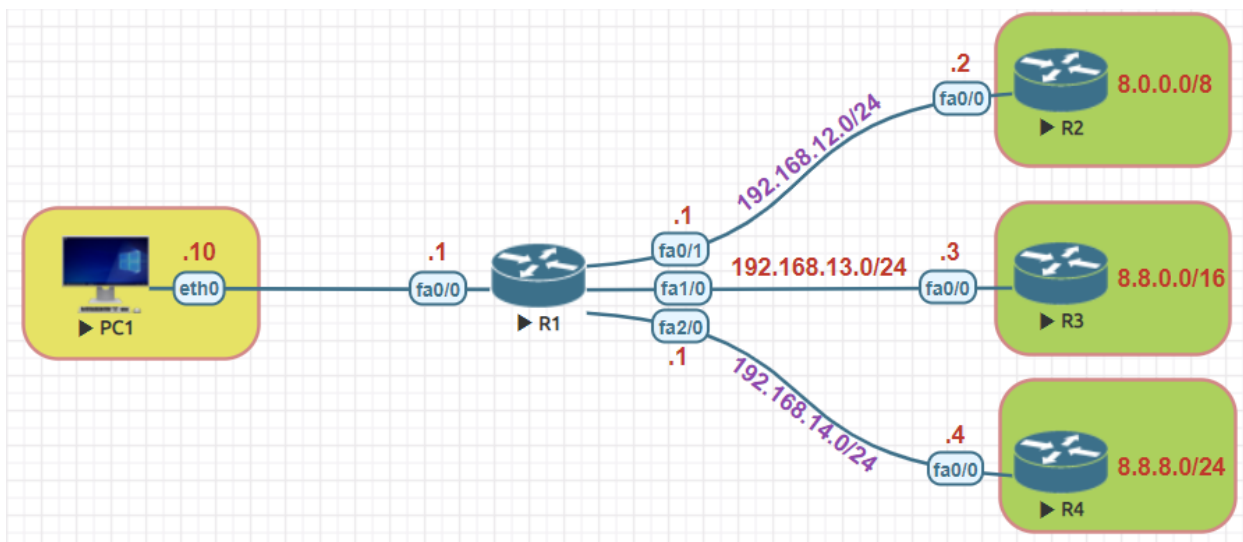
if there is more than one route to a network and they have the same length and the same AD then check the metric. If one route has a better metric, then put that one into the routing table and do not use the others. If more than one route has the same length, has the same AD, and has the same metric then put each of those routes into the routing table and perform load sharing using all of the eligible routes.

Longest Prefix Match is a best path selection mechanism used by routers. This mechanism basically compares the destination IP address and the routing table entry to determine the best available route alternative. When router receives a packet, it compares the destination IP address bit by bit with the entries in the routing table. The entry that has the longest number of network bits which matches the destination IP address, is selected as the best path.

When a Packet arrive on the interface of a router the router takes several logical decisions based on the data plane to process the packet. Then the router compares the destination IP address of the packet with the IP routing table matching the longest-prefix route that match the destination IP address. The best route is the longest match route to the destination IP address. The route lookup process matches the destination IP address with the route available in the routing table and chooses the longest match route as forwarding route.

IP Packet Destination	8.8.8.8	00001000.00001000.00001000.00001000
Route 1	8.0.0.0/8	00001000.00000000.00000000.00000000
Route 2	8.8.0.0/16	00001000.00001000.00000000.00000000
Route 3	8.8.8.0/24	00001000.00001000.00001000.00000000

Longest Match to IP Packet Destination 



Router Images	C3725-adventerprisek9-mz.124-15.T14.img
PC1	VPCS
R1 f0/0 Interface IP Address	192.168.11.1
R1 f0/1 Interface IP Address	192.168.12.1
R1 f1/0 Interface IP Address	192.168.13.1
R1 f2/0 Interface IP Address	192.168.14.1
R2 f0/0 Interface IP Address	192.168.12.2
R3 f0/0 Interface IP Address	192.168.13.3
R4 f0/0 Interface IP Address	192.168.14.4
R2 Loopback Interface IP Address	8.8.8.8/8
R3 Loopback Interface IP Address	8.8.8.8/16
R4 Loopback Interface IP Address	8.8.8.8/24

R1 Basic Configuration

```

Router(config)#hostname R1
R1(config)#interface f0/0
R1(config-if)#ip address 192.168.11.1 255.255.255.0
R1(config-if)#no shutdown
R1(config)#interface f0/1
R1(config-if)#ip address 192.168.12.1 255.255.255.0
R1(config-if)#no shutdown
R1(config)#interface f1/0
R1(config-if)#ip address 192.168.13.1 255.255.255.0
R1(config-if)#no shutdown
R1(config)#interface f2/0
R1(config-if)#ip address 192.168.14.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit

```

R2 Basic Configuration

```
Router(config)#hostname R2
R2(config)#interface Loopback1
R2(config-if)#ip address 8.8.8.8 255.0.0.0
R2(config-if)#interface f0/0
R2(config-if)#ip address 192.168.12.2 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#ip route 0.0.0.0 0.0.0.0 192.168.12.1
R2(config)#exit
R2#debug ip icmp
```

R3 Basic Configuration

```
Router(config)#hostname R3
R3(config)#interface Loopback1
R3(config-if)#ip address 8.8.8.8 255.255.0.0
R3(config-if)#interface f0/0
R3(config-if)#ip address 192.168.13.3 255.255.255.0
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#ip route 0.0.0.0 0.0.0.0 192.168.13.1
R3(config)#exit
R3#debug ip icmp
```

R4 Basic Configuration

```
Router(config)#hostname R4
R4(config)#interface Loopback1
R4(config-if)#ip address 8.8.8.8 255.255.255.0
R4(config-if)#!
R4(config-if)#interface f0/0
R4(config-if)#ip address 192.168.14.4 255.255.255.0
R4(config-if)#no shutdown
R4(config-if)#exit
R4(config)#ip route 0.0.0.0 0.0.0.0 192.168.14.1
R4(config)#exit
R4#debug ip icmp
```

PC1 Configuration

```
PC1> set pcname PC1
PC1> ip 192.168.11.10/24 192.168.11.1
```

R1 Route Configuration

```
R1(config)#ip route 8.0.0.0 255.0.0.0 192.168.12.2
R1(config)#ip route 8.8.0.0 255.255.0.0 192.168.13.3
R1(config)#ip route 8.8.8.0 255.255.255.0 192.168.14.4
```

Let's start continue ping from PC1 to destination 8.8.8.8

```
PC1> ping 8.8.8.8 -t
```

```
84 bytes from 8.8.8.8 icmp_seq=1 ttl=254 time=30.554 ms
84 bytes from 8.8.8.8 icmp_seq=2 ttl=254 time=18.179 ms
84 bytes from 8.8.8.8 icmp_seq=3 ttl=254 time=21.581 ms
```

Let's check out the routing table all three routes are in the routing table.

```
R1#show ip route static
      8.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
S       8.8.0.0/16 [1/0] via 192.168.13.3
S       8.8.8.0/24 [1/0] via 192.168.14.4
S       8.0.0.0/8 [10/0] via 192.168.12.2
R1#
```



Traffic is going to R4 which is the longest prefix

```
R4
*Mar 1 01:15:23.871: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:24.399: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:24.995: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:25.539: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:26.127: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:26.647: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:27.223: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:27.807: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:28.355: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:28.899: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:29.435: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:30.031: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:30.579: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:31.179: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:15:31.711: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
```

R1 shutdown Interface

```
R1(config)#interface f2/0
R1(config-if)#shutdown
```

When down R4 interface on second longest prefix match is R3 now traffic shift to R3

```
R3
*Mar 1 00:46:19.851: %SYS-5-CONFIG_I: Configured from console by console
*Mar 1 01:16:33.659: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:16:34.179: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:16:34.679: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:16:35.211: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:16:35.807: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:16:36.399: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:16:36.935: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:16:37.515: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:16:38.063: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:16:38.647: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
```

R1 shutdown Interface

```
R1(config)#interface f1/0
R1(config-if)#shutdown
```

When shutdown R3 interface traffic is diverted to the last option which is R2

```
R2
*Mar 1 01:18:08.331: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:18:08.871: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:18:09.451: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:18:09.983: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:18:10.599: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:18:11.135: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:18:11.727: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:18:12.271: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:18:12.847: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:18:13.419: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:18:13.967: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
*Mar 1 01:18:14.503: ICMP: echo reply sent, src 8.8.8.8, dst 192.168.11.10
```