Lab3 Report

Routing and Network Connectivity
in Cisco Packet Tracer

Albin Zahnér
Bingcheng Chen
Christian Lind

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Chalmers University of Technology
Computer communication - EDA344

1 Task 1

```
R6#show run
Building configuration...

Current configuration : 1276 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R6
!
!
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCil
!
!
ip dhcp excluded-address 191.89.181.1 191.89.181.10
!
ip dhcp pool LAN6
 network 191.89.181.0 255.255.255.128
 default-router 191.89.181.1
!
!
!
ip cef
no ipv6 cef
!
!
!
!
license udi pid CISCO2911/K9 sn FTX1524YGWA-
!
!
!
!
!
!
!
!
!
!
!
spanning-tree mode pvst
!
!
!
!
!
!
interface GigabitEthernet0/0
 ip address 191.89.181.1 255.255.255.128
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface GigabitEthernet0/2
 no ip address
 duplex auto
 speed auto
 shutdown
!
interface Serial0/2/0
 ip address 172.16.0.18 255.255.255.252
!
interface Serial0/2/1
 ip address 172.16.0.21 255.255.255.252
 clock rate 2000000
!
interface Vlan1
 no ip address
 shutdown
!
router rip
 version 2
 network 172.16.0.0
 network 191.89.0.0
 no auto-summary
!
ip classless
!
ip flow-export version 9
!
```

Figure 1: Shows what happens when you run "show run" on router 6

```
ip classless
!
ip flow-export version 9
!
!
!
no cdp run
!
!
!
!
!
!
line con 0
 password cisco
 logging synchronous
 login
!
line aux 0
!
line vty 0 4
 password cisco
 login
 transport input telnet
line vty 5 15
 password cisco
 login
 transport input telnet
!
!
!
end
```

Figure 2: Continuation from where figure 1 ended

(a) Yes in picture 1 we can see that the ip address of the default router is 191.89.181.1 and the address is the same for interface GigabitEthernet0/0.

(b) There are two interfaces that are important, those being interface Serial10/2/0 with ip address 172.16.0.18. The other one are interface Serial10/2/1 with ip address 172.16.0.21.

(c) The router has the protocol RIP defined for networks with ip addresses 172.16.0.0 and 191.89.0.0.

2 Task 2

```
Gateway of last resort is not set

     172.16.0.0/16 is variably subnetted, 10 subnets, 2 masks
R       172.16.0.0/30 [120/1] via 172.16.0.5, 00:00:08, Serial0/2/0
C       172.16.0.4/30 is directly connected, Serial0/2/0
L       172.16.0.6/32 is directly connected, Serial0/2/0
C       172.16.0.8/30 is directly connected, Serial0/2/1
L       172.16.0.9/32 is directly connected, Serial0/2/1
R       172.16.0.12/30 [120/1] via 172.16.0.10, 00:00:25, Serial0/2/1
R       172.16.0.16/30 [120/2] via 172.16.0.10, 00:00:25, Serial0/2/1
R       172.16.0.20/30 [120/3] via 172.16.0.10, 00:00:25, Serial0/2/1
R       172.16.0.24/30 [120/3] via 172.16.0.5, 00:00:08, Serial0/2/0
R       172.16.0.28/30 [120/2] via 172.16.0.5, 00:00:08, Serial0/2/0
     190.34.0.0/25 is subnetted, 1 subnets
R       190.34.131.0/25 [120/2] via 172.16.0.10, 00:00:25, Serial0/2/1
     191.89.0.0/25 is subnetted, 1 subnets
R       191.89.181.0/25 [120/3] via 172.16.0.10, 00:00:25, Serial0/2/1
     193.84.101.0/25 is subnetted, 1 subnets
R       193.84.101.0/25 [120/1] via 172.16.0.10, 00:00:25, Serial0/2/1
     197.44.117.0/25 is subnetted, 1 subnets
R       197.44.117.0/25 [120/1] via 172.16.0.5, 00:00:08, Serial0/2/0
     199.87.133.0/24 is variably subnetted, 2 subnets, 2 masks
C       199.87.133.0/25 is directly connected, GigabitEthernet0/0
L       199.87.133.1/32 is directly connected, GigabitEthernet0/0
     200.88.202.0/25 is subnetted, 1 subnets
R       200.88.202.0/25 [120/2] via 172.16.0.5, 00:00:08, Serial0/2/0
     202.43.132.0/25 is subnetted, 1 subnets
R       202.43.132.0/25 [120/4] via 172.16.0.5, 00:00:08, Serial0/2/0
                        [120/4] via 172.16.0.10, 00:00:25, Serial0/2/1
     207.31.182.0/25 is subnetted, 1 subnets
R       207.31.182.0/25 [120/3] via 172.16.0.5, 00:00:08, Serial0/2/0
```

Figure 3: Shows output from terminal running "show ip route"

(a) It is directly connected to router 3, this is written in text "172.16.0.4/30 is directly connected, Serial0/2/0", it also has the connection "172.16.0.8/30 is directly connected, Serial0/2/1", "199.87.133.0/25 is directly connected, GigabitEthernet0/0"

(b) There are one interface that we can follow from router 3 to router 6, this being 172.16.0.10. From this we get the route: 199.87.133.0/25, 193.84.101.0/25, 190.34.131.0/25, 191.89.181.0/25.

(c) The screenshot shows that it has selected a route with [120/3] for the route and this is also the best route, going through router 5 and 4. It would also be possible to take the route through router 7, 8, 1, 2 but this would give [120/5].

3 Task 3

(a) Two examples are from router 1 to router 5 or from router 3 to router 7.

(b) We would need to add a connection between router 1 and 5 as well as between router 3 and 7.

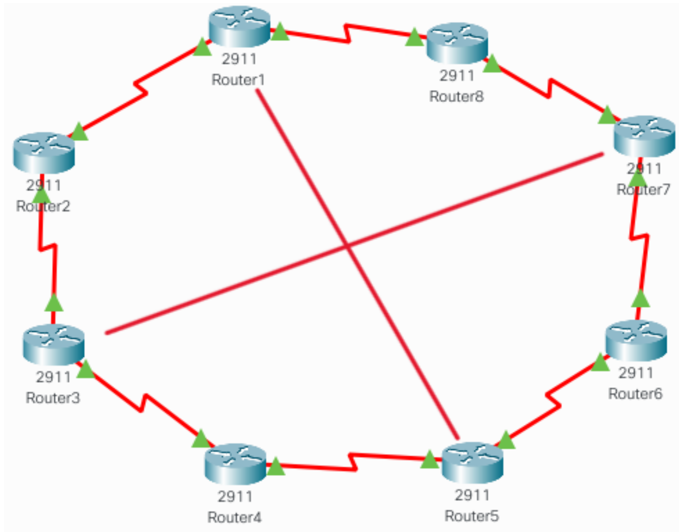

Figure 4: Shows the new improved route

(c)

Destination	Hop-Count	via (Router's name)	Interface
200.88.202.0/25	2	Router 6 and 5	Serial 0/0/2
197.44.117.0/25	3	Router 6, 5 and 1	Serial 0/0/2
199.87.133.0/25	2	Router 6 and 7	Serial 0/2/0
193.84.101.0/25	2	Router 6 and 5	Serial 0/2/1
190.34.131.0/25	1	Router 6	Serial 0/2/1
191.89.181.0/25	0	Local router	GigabitEthernet 0/0
202.43.132.0/25	1	Router 6	Serial 0/2/1
207.31.182.0/25	2	Router 6 and 7	Serial 0/2/1

4 Task 4

```
C:\>ping 191.89.181.11

Pinging 191.89.181.11 with 32 bytes of data:

Reply from 191.89.181.11: bytes=32 time<1ms TTL=128
Reply from 191.89.181.11: bytes=32 time<1ms TTL=128
Reply from 191.89.181.11: bytes=32 time<1ms TTL=128
Reply from 191.89.181.11: bytes=32 time=1ms TTL=128

Ping statistics for 191.89.181.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Figure 5: 'ping' request PC6-1

(a) When pinging the computer, four 32-byte packets are sent by default.

(b) The feedback from the ping request provides us with several pieces of information. The first line confirms that the computer is attempting to ping the target host. The next few lines shows the response from the host pinged. These lines contain four pieces of information: the IP-address of the pinged host, packet size, round trip time and time to live (TTL).

Finally, we get ping statistics, which include the number of lost packets and the approximate average round trip time.

```
C:\>ping 197.44.117.11

Pinging 197.44.117.11 with 32 bytes of data:

Request timed out.
Reply from 197.44.117.11: bytes=32 time=5ms TTL=123
Reply from 197.44.117.11: bytes=32 time=18ms TTL=123
Reply from 197.44.117.11: bytes=32 time=24ms TTL=123

Ping statistics for 197.44.117.11:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 5ms, Maximum = 24ms, Average = 15ms
```

Figure 6: 'ping' PC2-1

(c) There are three main differences. First, we received one less packet, indicating packet loss, this is because after the first packet is lost the timeout is increased. Second we can see that this ping required more hops as the TTL=123 is lesser than the last pings TTL=128. This coincide with the topological view of the network as PC6-1 is further away than PC2-1. Third, the average round trip time is significantly longer. This is also expected as it requires more hops.

5 Task 5

```
C:\>tracert 190.34.131.11

Tracing route to 190.34.131.11 over a maximum of 30 hops:

  1   0 ms      0 ms      0 ms      191.89.181.1
  2   8 ms      0 ms      1 ms      172.16.0.17
  3   *         0 ms      0 ms      190.34.131.11

Trace complete.
```

Figure 7: 'tracert' PC5-1

```
C:\>tracert 199.87.133.12

Tracing route to 199.87.133.12 over a maximum of 30 hops:

  1   0 ms      0 ms      0 ms      191.89.181.1
  2   0 ms      0 ms      0 ms      172.16.0.17
  3   0 ms      2 ms      14 ms     172.16.0.13
  4   0 ms      14 ms     1 ms      172.16.0.9
  5   *         1 ms      15 ms     199.87.133.12

Trace complete.
```

Figure 8: 'tracert' PC3-1

(a)

(b) When executing tracert on PC5-1 we see it takes 3 hops whilst on PC3-1 it takes 5 hops.

(c) Because the route to PC6-2 does not contain a router and only a switch it only needs to hop once.

```
C:\>tracert 191.89.181.11

Tracing route to 191.89.181.11 over a maximum of 30 hops:

  1   0 ms      5 ms      0 ms      191.89.181.11

Trace complete.
```

Figure 9: 'tracert' PC2-2

6 Task 6

(a) ICMP protocol is involved in the operation when run 'tracert' command.

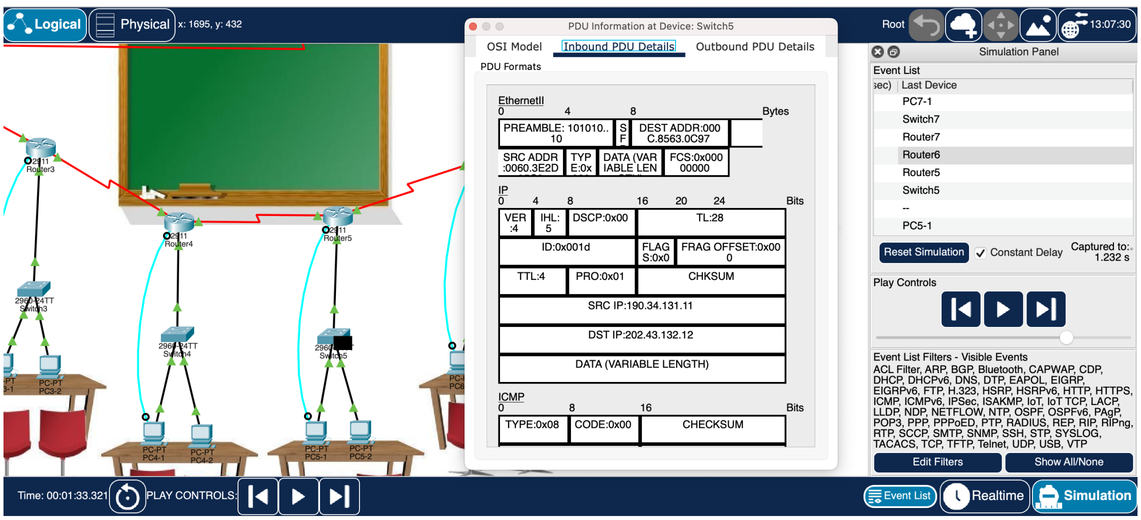

Figure 10: Screenshot with the simulation panel and the PDU Information

(b) Each hop is queried 3 times to better measure the response time.

```
C:\>tracert 202.43.132.12

Tracing route to 202.43.132.12 over a maximum of 30 hops:

  1   4 ms      4 ms      4 ms      190.34.131.1
  2   6 ms      6 ms      6 ms      172.16.0.18
  3   8 ms      8 ms      8 ms      172.16.0.22
  4   12 ms     12 ms     12 ms     202.43.132.12

Trace complete.
```

Figure 11: 'tracert' command

(c) when do a ping to the same destination of tracert. ICMP is used here too and the type is '0x08', which means 'Echo Request'. Although they both uses ICMP, they use TTL(Time to live, usually it is set 128) in different ways. For 'ping' commands, it adopt fixed TTL, when TTL decreases to 0 before it arrives to destination, the packet will be dropped, then it shows in ping that the destination is unreachable. For 'tracert' commands, TTL is set to 1 first and in each tracert round the TTL will be added one, when TTL decreases to 0, the receiver will sends back an ICMP error message, thus duration time can be measured until the request packages arrive to its destination.

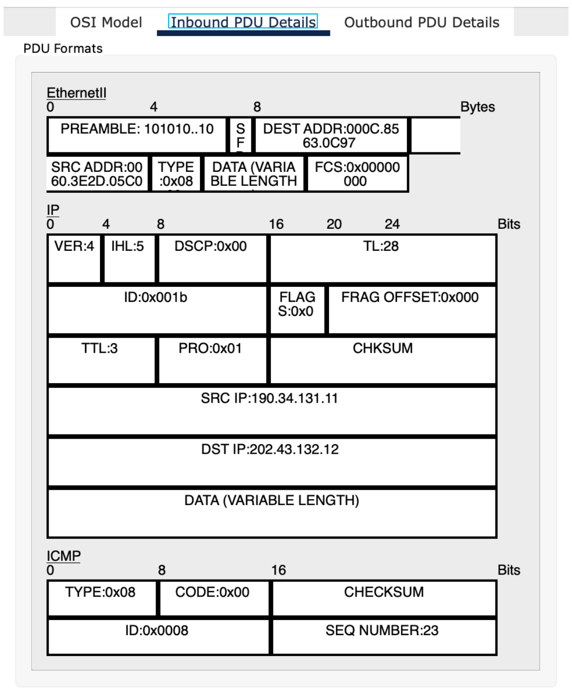

Figure 12: 'tracert' request PDU details

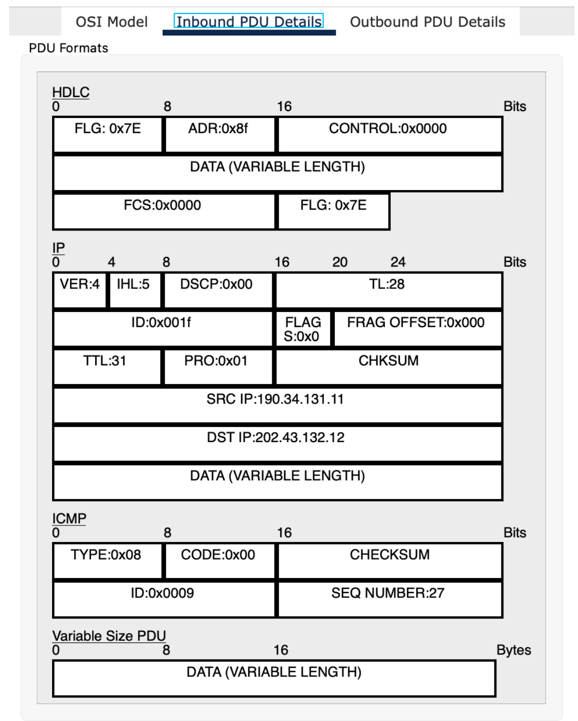

Figure 13: 'ping' request PDU details

7 Task 7

(a) RIP version 2 is used, UDP is used for transport RIP packages and the port number is 520. The source ip address is 190.34.131.1, destination ip address is 224.0.0.9(a multicast address).

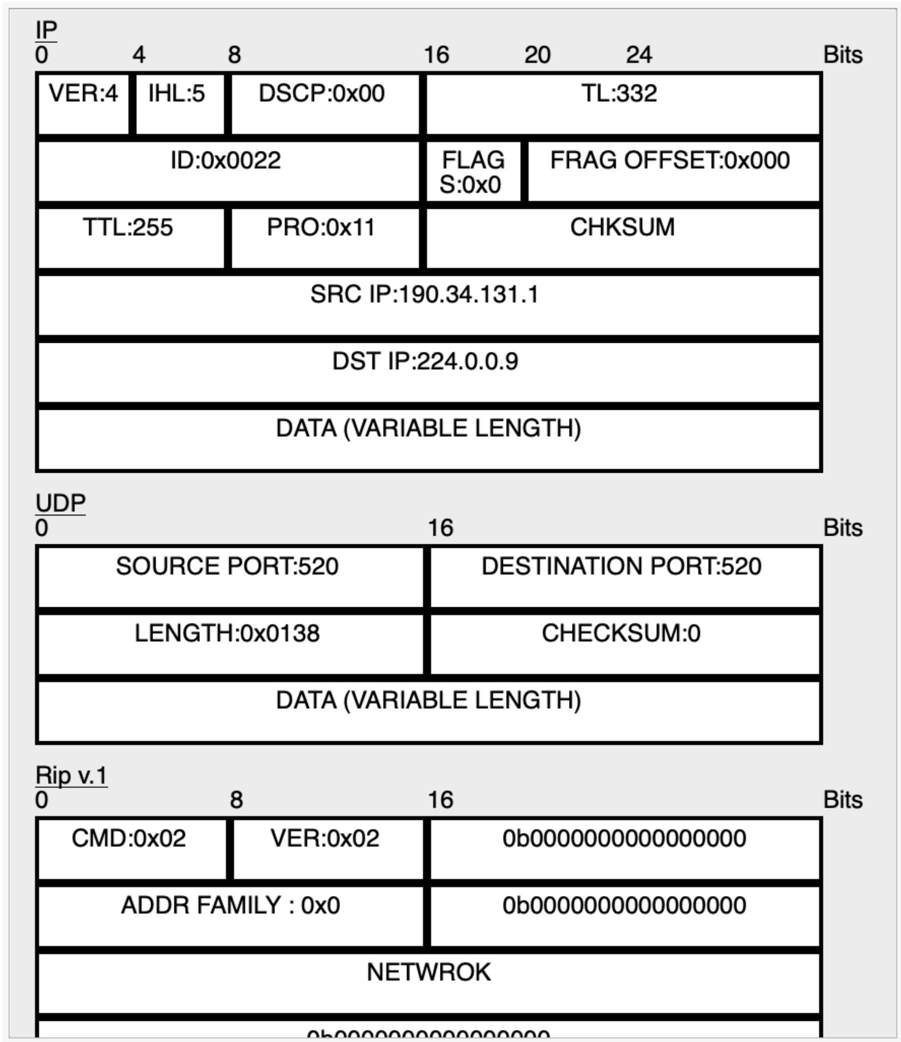

Figure 14: Partial screenshot of RIP packets

(b) A router running RIP sends its routing table to all its neighbours, terminals like PC will directly discard it, only its neighbour routers will take action. If its neighbour router not have a one specific route, it will store the route. However, if its neighbour router already have a route which have the same or smaller hops, it will discard this information.

(c) A RIP message have of a header and multiple 'Rip Route Packet' information. For header, it contains CMD(8 bits, Type of message. 1 means request, 2 means response), Version(8 bits), ADDR FAMILY(16 bits, 2 means IP), ROUTE TAG, NETWROK(32 bits, Destination IP address), SUBNET MASK(32 bits, Destination subnet mask), NEXT HOP(next hop of the destination), METRIC(number of hops of the route). For 'Rip Route Packet' part, it contains all the senders routing table information(except Local route information), and it was constructed similarly as header but deleting the first 32 bits(CMD,Version and plus the reserved 16 bits). Bellman–Ford algorithm and the Ford–Fulkerson algorithm are based on the exchange of such information.

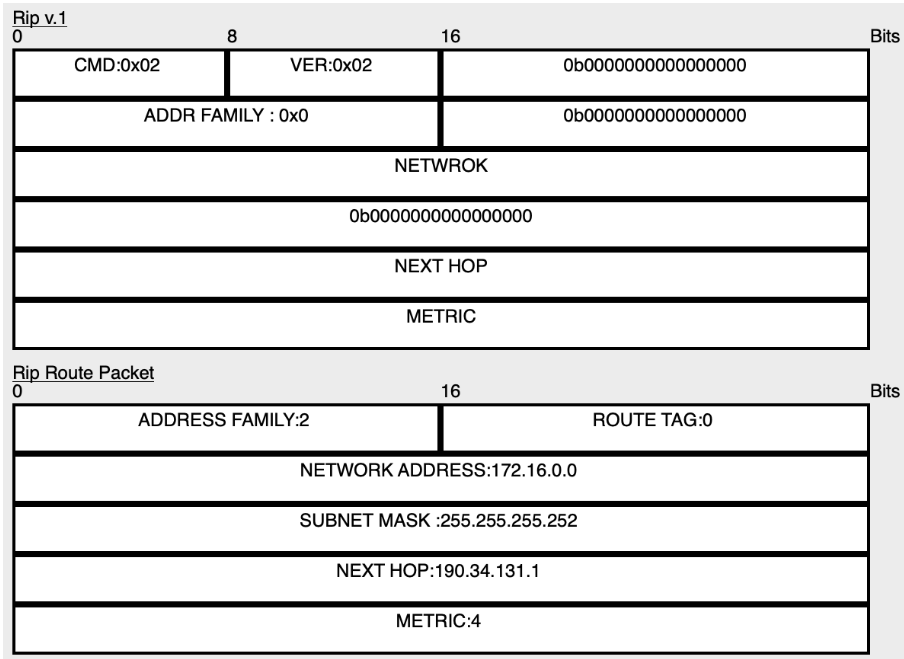

Figure 15: Partial screenshot of RIP packets

(d) As discussed in (b), A router running RIP sends its routing table to all its neighbours, If the receiver router not have a one specific route, it will store the route. However, if the receiver router already have a route which have the same or smaller hops, it will discard this information.