

과제 04 수행보고서

정보통신공학전공

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과제 개요

- 라우팅 프로토콜의 종류인 RIP 프로토콜을 살펴본다.

수행 과제 내용

- 리눅스에서 라우터간 프로토콜 탑재 및 동작 방법 공부
 - 리눅스에 기본으로 탑재되는 라우터간 프로그램은 routed와 zebra임
- Routed를 사용하여 RIP 가동
- RIP 동작 이해 : 제 3의 정적 라우팅을 설정하지 말 것.

RIP

- RIP(Routing Information Protocol)은 기업의 근거리 통신망 또는 랜(LAN)들이 서로 연결된 그룹과 같은 독립적인 네트워크 내에서 라우팅 정보 관리를 위해 광범위하게 사용된 프로토콜.
- 경유하는 라우터의 대수(Hop count)에 따라 최단 경로를 동적으로 결정하는 거리 벡터 알고리즘을 사용한다.
- 현재 버전1 과 버전2가 있음.
 - 버전 1 : 클래스형 라우팅 프로토콜
 - 버전 2 : 클래스리스(CIDR) 라우팅 프로토콜
 - 업데이트 패킷에 서브넷 마스크 필드의 유,무

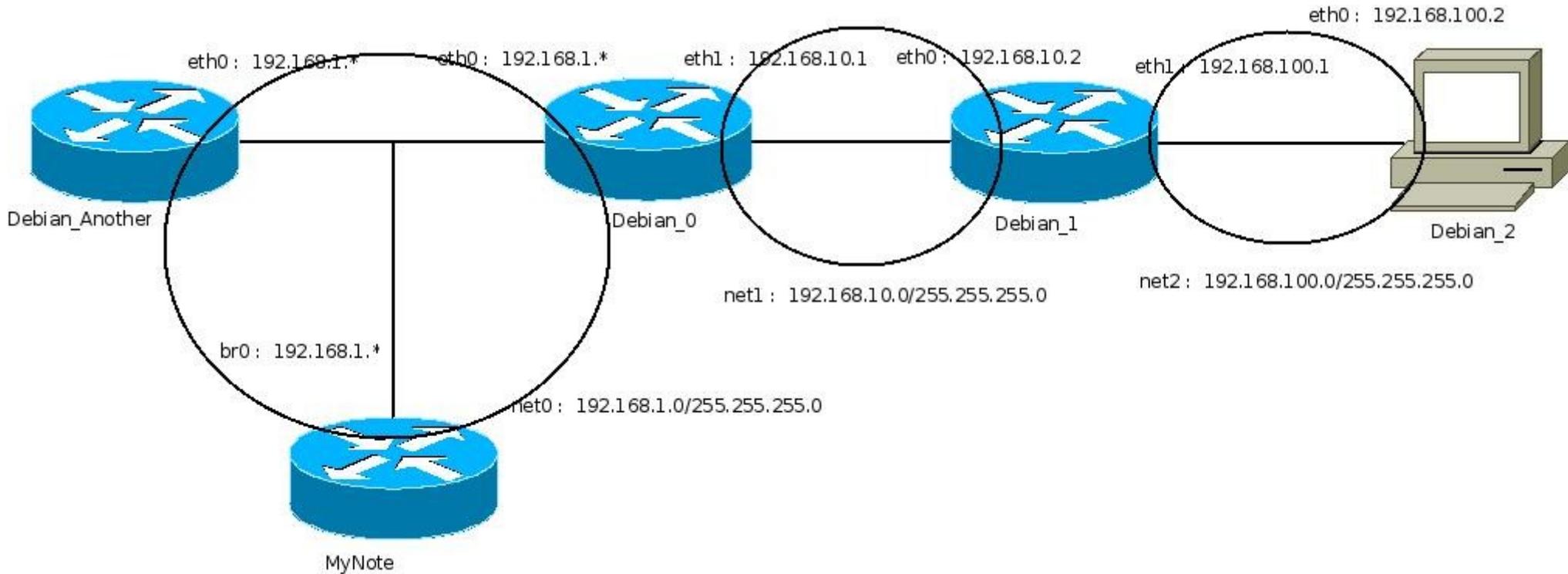
RIP 특징

- (1) 라우팅 프로토콜 분류
 - RIP는 내부 네트워크에서 주로 사용.
 - 경로 지정을 하나 밖에 할 수 없는 단일 경로 라우팅 프로토콜.
 - 알고리즘은 거리 벡터 방식을 사용.
- (2) 서비스하는 네트워크 주소
 - RIP는 다양한 네트워크 주소 중에서도 IP 네트워크만 지원하며,
 - IP 네트워크 주소를 이용한다.
- (3) Metric
 - RIP는 Hop Count (홉수)만으로 경로를 결정하며, 최대 홉수는 15개이다.
- (4) 경로 정보 갱신 주기
 - RIP는 거리 벡터 알고리즘을 사용하므로,
 - 매 30초마다 이웃 네트워크에 대한 정보를 교환한다.
- (5) 갱신 방법
 - 변화된 정보만을 갱신하는 것이 아니라 모든 정보를 동시에 갱신한다.
- (6) 이웃 설정 관계
 - 이웃한 라우터들과 대등한 관계로 정보를 교환하는 Flat 구조방식을 지원한다.
- (7) IP 네트워크 주소 형태
 - RIP는 클래스 형태로만 광고를 하며,
 - 네트워크를 세분할 수 있는 서브넷 단위로는 전송할 수 없다.

RIP 장, 단점

- (1) 장점
 - ① 인터넷 표준 프로토콜로 모든 벤더(Vendor)에서 지원.
 - ② 간단하고 쉬움.
 - ③ 간단하게 구현 및 운영 가능.
 - ④ 전원이나 메모리 등 시스템 자원의 소모가 적음.
 - [출처] RIP 라우팅 프로토콜 |작성자 백장미
- (2) 단점
 - ① 지원하는 최대 Hop Count가 15개로, 16개부터는 전송이 불가능하므로 대규모 네트워크에는 부적합.
 - ② 경로 선택 방법이 Hop Count 뿐이므로 최적의 경로를 선택할 수 없음.
 - ③ 거리 벡터 알고리즘으로 인해 링크 상태에 대한 변화가 느림.
 - ④ 서브넷 정보를 처리하지 못함.

실험 네트워크 구성도



실험 네트워크 환경

- MyNote : 메인 노드(virtual box 설치 노드)
 - br0 (bridge 구성을 위해 eth 를 쓰지 않음) : 192.168.1.103/24
- Debian_0
 - Eth0 : 192.168.1.7/24
 - Eth1 : 192.168.10.1/24
 - Zebra 및 RIP 구성
- Debian_1
 - Eth0 : 192.168.10.2/24
 - Eth1 : 192.168.100.1/24
 - Zebra 및 RIP 구성
- Debian_2
 - Eth0 : 192.168.100.2/24
 - Zebra 및 RIP 구성
- Debian_A
 - Eth0 : 192.168.1.101/24
 - Zebra 및 RIP 구성

라우팅 테이블 변화 - Debian_0

```
permitted by applicable law.
debian-0:~# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use  Iface
192.168.1.0      0.0.0.0         255.255.255.0  U      0      0      0   eth0
192.168.10.0     0.0.0.0         255.255.255.0  U      0      0      0   eth1
0.0.0.0          192.168.1.1    0.0.0.0        UG     0      0      0   eth0
debian-0:~# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use  Iface
192.168.1.0      0.0.0.0         255.255.255.0  U      0      0      0   eth0
192.168.10.0     0.0.0.0         255.255.255.0  U      0      0      0   eth1
0.0.0.0          192.168.1.1    0.0.0.0        UG     0      0      0   eth0
debian-0:~# zebra start &
[1] 1991
debian-0:~# ripd start &
[2] 1992
debian-0:~# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use  Iface
192.168.100.0    192.168.10.2    255.255.255.0  UG     2      0      0   eth1
192.168.1.0      0.0.0.0         255.255.255.0  U      0      0      0   eth0
192.168.10.0     0.0.0.0         255.255.255.0  U      0      0      0   eth1
0.0.0.0          192.168.1.1    0.0.0.0        UG     0      0      0   eth0
debian-0:~# _
```

라우팅 테이블 변화 - Debian_1

```
permitted by applicable law.
debian-1:~# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use Iface
192.168.100.0    0.0.0.0         255.255.255.0   U        0      0      0 eth1
192.168.10.0     0.0.0.0         255.255.255.0   U        0      0      0 eth0
0.0.0.0          192.168.10.1    0.0.0.0         UG       0      0      0 eth0
debian-1:~# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use Iface
192.168.100.0    0.0.0.0         255.255.255.0   U        0      0      0 eth1
192.168.10.0     0.0.0.0         255.255.255.0   U        0      0      0 eth0
0.0.0.0          192.168.10.1    0.0.0.0         UG       0      0      0 eth0
debian-1:~# zebra start &
[1] 1923
debian-1:~# ripd start &
[2] 1924
debian-1:~# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use Iface
192.168.100.0    0.0.0.0         255.255.255.0   U        0      0      0 eth1
192.168.1.0      192.168.10.1    255.255.255.0   UG       2      0      0 eth0
192.168.10.0     0.0.0.0         255.255.255.0   U        0      0      0 eth0
0.0.0.0          192.168.10.1    0.0.0.0         UG       0      0      0 eth0
debian-1:~# _
```

라우팅 테이블 변화 - Debian_2

```
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
debian-2:~# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use Iface
192.168.100.0    0.0.0.0         255.255.255.0   U      0      0      0 eth0
0.0.0.0          192.168.100.1  0.0.0.0         UG     0      0      0 eth0
debian-2:~# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use Iface
192.168.100.0    0.0.0.0         255.255.255.0   U      0      0      0 eth0
0.0.0.0          192.168.100.1  0.0.0.0         UG     0      0      0 eth0
debian-2:~# zebra start &
[1] 1865
debian-2:~# can't open configuration file [/usr/local/etc/zebra.conf]

[1]+  Exit 1                  zebra start
debian-2:~# ripd start &
[1] 1866
debian-2:~# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use Iface
192.168.100.0    0.0.0.0         255.255.255.0   U      0      0      0 eth0
0.0.0.0          192.168.100.1  0.0.0.0         UG     0      0      0 eth0
debian-2:~# _
```

RIP 패킷 분석 - REQ

The image shows a Wireshark network traffic analysis interface. The main display area shows a list of captured packets. Packet 48 is highlighted, showing a RIPv2 Request from source 192.168.1.7 to destination 224.0.0.9. The packet details pane shows the structure of the User Datagram Protocol (UDP) and Routing Information Protocol (RIP) fields. The UDP section shows source and destination ports of 520, a length of 32, and a correct checksum of 0x58d3. The RIP section shows a command of Request (1), version 2, and routing domain 0. The address field is expanded to show an unspecified address with a metric of 16. The packet bytes pane at the bottom shows the raw hex and ASCII data of the packet.

No.	Time	Source	Destination	Protocol	Info
48	20.179344	192.168.1.7	224.0.0.9	RIPv2	Request
49	20.186420	192.168.1.7	224.0.0.22	IGMP	V3 Membership Report / Join group 224.0.0.9 for any sources
50	21.188618	192.168.1.7	224.0.0.9	RIPv2	Response
51	26.704144	192.168.1.7	224.0.0.22	IGMP	V3 Membership Report / Join group 224.0.0.9 for any sources
52	31.264608	192.168.1.7	224.0.0.9	RIPv2	Response
71	37.407330	192.168.1.7	224.0.0.9	RIPv2	Response
72	37.414442	192.168.1.7	224.0.0.9	RIPv2	Response

Frame 48 (66 bytes on wire, 66 bytes captured)
Ethernet II, Src: CadmusCo_8f:91:0a (08:00:27:8f:91:0a), Dst: IPv4mcast_00:00:09 (01:00:5e:00:00:09)
Internet Protocol, Src: 192.168.1.7 (192.168.1.7), Dst: 224.0.0.9 (224.0.0.9)
User Datagram Protocol, Src Port: router (520), Dst Port: router (520)
Source port: router (520)
Destination port: router (520)
Length: 32
Checksum: 0x58d3 [correct]
Routing Information Protocol
Command: Request (1)
Version: RIPv2 (2)
Routing Domain: 0
Address not specified, Metric: 16
Address Family: Unspecified (0)
Route Tag: 0
Netmask: 0.0.0.0 (0.0.0.0)
Next Hop: 0.0.0.0 (0.0.0.0)
Metric: 16

```
0000 01 00 5e 00 00 09 08 00 27 8f 91 0a 08 00 45 00  ..^....'.....E.
0010 00 34 00 00 40 00 01 11 d8 00 c0 a8 01 07 e0 00  .4.@... ..
0020 00 09 02 08 02 08 00 20 58 d3 01 02 00 00 00 00  .....X.....
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
0040 00 10
```

br0: <live capture in progress> File: /tm... Packets: 359 Displayed: 359 Marked: 0 Profile: Default

RIP 패킷 분석 - RES1

The image shows a Wireshark network traffic analysis interface. The top menu bar includes File, Edit, View, Go, Capture, Analyze, Statistics, and Help. Below the menu is a toolbar with various icons for file operations, navigation, and analysis. A filter bar is present with a dropdown menu and buttons for 'Expression...', '비우기(C)', and '적용(A)'. The main display area is divided into two sections: a packet list and a packet details pane.

No.	Time	Source	Destination	Protocol	Info
48	20.179344	192.168.1.7	224.0.0.9	RIPv2	Request
49	20.186420	192.168.1.7	224.0.0.22	IGMP	V3 Membership Report / Join group 224.0.0.9 for any sources
50	21.188618	192.168.1.7	224.0.0.9	RIPv2	Response
51	26.704144	192.168.1.7	224.0.0.22	IGMP	V3 Membership Report / Join group 224.0.0.9 for any sources
52	31.264608	192.168.1.7	224.0.0.9	RIPv2	Response
71	37.407330	192.168.1.7	224.0.0.9	RIPv2	Response
72	37.414442	192.168.1.7	224.0.0.9	RIPv2	Response

The packet details pane shows the following information for the selected packet (No. 50):

- Ethernet II, Src: CadmusCo_8f:91:0a (08:00:27:8f:91:0a), Dst: IPv4mcast_00:00:09 (01:00:5e:00:00:09)
- Internet Protocol, Src: 192.168.1.7 (192.168.1.7), Dst: 224.0.0.9 (224.0.0.9)
- User Datagram Protocol, Src Port: router (520), Dst Port: router (520)
 - Source port: router (520)
 - Destination port: router (520)
 - Length: 32
 - Checksum: 0x8e36 [correct]
- Routing Information Protocol
 - Command: Response (2)
 - Version: RIPv2 (2)
 - Routing Domain: 0
 - IP Address: 192.168.10.0, Metric: 1
 - Address Family: IP (2)
 - Route Tag: 0
 - IP Address: 192.168.10.0 (192.168.10.0)
 - Netmask: 255.255.255.0 (255.255.255.0)
 - Next Hop: 0.0.0.0 (0.0.0.0)
 - Metric: 1

The packet bytes pane shows the raw data in hexadecimal and ASCII:

```
0000 01 00 5e 00 00 09 08 00 27 8f 91 0a 08 00 45 00  ..^.... '.....E.
0010 00 34 00 00 40 00 01 11 d8 00 c0 a8 01 07 e0 00  .4..@... ..
0020 00 09 02 08 02 08 00 20 8e 36 02 02 00 00 00 02  .....6.....
0030 00 00 c0 a8 0a 00 ff ff 00 00 00 00 00 00 00 00  .....
0040 00 01
```

The status bar at the bottom indicates: br0: <live capture in progress> File: /tm... Packets: 408 Displayed: 408 Marked: 0 Profile: Default

RIP 패킷 분석 - RES2

The image shows a Wireshark network traffic analysis interface. The top menu bar includes File, Edit, View, Go, Capture, Analyze, Statistics, and Help. Below the menu is a toolbar with various icons for file operations, navigation, and analysis. A filter bar is present with a dropdown menu and buttons for 'Expression...', '비우기(C)', and '적용(A)'. The main display area is divided into two sections: a packet list and a packet details pane.

No.	Time	Source	Destination	Protocol	Info
48	20.179344	192.168.1.7	224.0.0.9	RIPv2	Request
49	20.186420	192.168.1.7	224.0.0.22	IGMP	V3 Membership Report / Join group 224.0.0.9 for any sources
50	21.188618	192.168.1.7	224.0.0.9	RIPv2	Response
51	26.704144	192.168.1.7	224.0.0.22	IGMP	V3 Membership Report / Join group 224.0.0.9 for any sources
52	31.264608	192.168.1.7	224.0.0.9	RIPv2	Response
71	37.407330	192.168.1.7	224.0.0.9	RIPv2	Response
72	37.414442	192.168.1.7	224.0.0.9	RIPv2	Response
103	55.272564	192.168.1.7	224.0.0.9	RIPv2	Response

The packet details pane for frame 72 shows the following structure:

- Frame 72 (66 bytes on wire, 66 bytes captured)
- Ethernet II, Src: CadmusCo_8f:91:0a (08:00:27:8f:91:0a), Dst: IPv4mcast_00:00:09 (01:00:5e:00:00:09)
- Internet Protocol, Src: 192.168.1.7 (192.168.1.7), Dst: 224.0.0.9 (224.0.0.9)
- User Datagram Protocol, Src Port: router (520), Dst Port: router (520)
 - Source port: router (520)
 - Destination port: router (520)
 - Length: 32
 - Checksum: 0x3435 [correct]
- Routing Information Protocol
 - Command: Response (2)
 - Version: RIPv2 (2)
 - Routing Domain: 0
 - IP Address: 192.168.100.0, Metric: 2
 - Address Family: IP (2)
 - Route Tag: 0
 - IP Address: 192.168.100.0 (192.168.100.0)
 - Netmask: 255.255.255.0 (255.255.255.0)
 - Next Hop: 0.0.0.0 (0.0.0.0)

The packet bytes pane shows the raw data in hexadecimal and ASCII:

```
0000 01 00 5e 00 00 09 08 00 27 8f 91 0a 08 00 45 00  ..^.....'.....E.
0010 00 34 00 00 40 00 01 11 d8 00 c0 a8 01 07 e0 00  .4..@... ..
0020 00 09 02 08 02 08 00 20 34 35 02 02 00 00 00 02  ..... 45.....
0030 00 00 c0 a8 64 00 ff ff 00 00 00 00 00 00 00 00  ....d.. ..
0040 00 02
```

The status bar at the bottom indicates: File: "/tmp/etherXXXXSzMPIV" 333 KB ... Packets: 1075 Displayed: 1075 Marked: 0 Dropped: 0 Profile: Default

Ping

```
debian-2:~# ping yahoo.co.kr
PING yahoo.co.kr (203.212.171.217) 56(84) bytes of data.
64 bytes from rc.vip.kr1.yahoo.com (203.212.171.217): icmp_seq=1 ttl=49 time=9.38 ms
64 bytes from rc.vip.kr1.yahoo.com (203.212.171.217): icmp_seq=2 ttl=49 time=14.4 ms
64 bytes from rc.vip.kr1.yahoo.com (203.212.171.217): icmp_seq=3 ttl=49 time=13.7 ms
64 bytes from rc.vip.kr1.yahoo.com (203.212.171.217): icmp_seq=4 ttl=49 time=14.2 ms
64 bytes from rc.vip.kr1.yahoo.com (203.212.171.217): icmp_seq=5 ttl=49 time=14.4 ms
64 bytes from rc.vip.kr1.yahoo.com (203.212.171.217): icmp_seq=6 ttl=49 time=9.18 ms
64 bytes from rc.vip.kr1.yahoo.com (203.212.171.217): icmp_seq=7 ttl=49 time=10.0 ms
64 bytes from rc.vip.kr1.yahoo.com (203.212.171.217): icmp_seq=8 ttl=49 time=15.5 ms
64 bytes from rc.vip.kr1.yahoo.com (203.212.171.217): icmp_seq=9 ttl=49 time=10.4 ms

--- yahoo.co.kr ping statistics ---
9 packets transmitted, 9 received, 0% packet loss, time 7997ms
rtt min/avg/max/mdev = 9.189/12.384/15.557/2.403 ms
debian-2:~# _
```

Reference

- <http://kldp.org>
- <http://blog.naver.com/rokmc2013/150024628523>
- <http://blog.daum.net/dangsu77/2112394?srchid=BR1http%3>
-