

Cover Page

Name: Wei Lin

Student#: 999595193

ECE461 Lab 4 Preparation

1. Provide the command that configures a Linux PC as an IP router (see Lab 3).

Ans:

```
echo "1" > /proc/sys/net/ipv4/ip_forward
```

2. What are the main differences between a distance vector routing protocol and a link state routing protocol? Give examples for each type of protocol.

Ans:

- i. Distance vector algorithm sends the routing table of each node to its neighbour, so each node has information only about the next hop. Link state algorithm requires each node each node has a consistent view of the network, so it broadcasts the information about the whole network topology to each node. Each node in link state will generate link state advertisement (LSA), maintain a database for receiving LSA and use those information to run shortest path algorithm.
- ii. Distance vector routing makes poor decision if the directions are not completely connected. If parts of directions is incorrect, the routing may be incorrect until the routing algorithm has re-converged. Link state algorithm guarantee to converge and it converges faster than Distance vector.
- iii. Link state are less susceptible to routing loop and count to infinity problem compared to Distance vector.
- iv. The example of Distance vector is RIP and the example of Link state is OSPF.

3. What are the differences between an intradomain routing protocol (also called interior gateway protocol or IGP) and an interdomain routing protocol (also called exterior gateway protocol or EGP)? Give examples for each type of protocol.

Ans:

The routing domain of IGP is one autonomous system (AS) and the routing is done based on metrics on each network connection. The nodes in the same AS share the same routing policies and IGP makes best use of network resources. The example of IGP is RIP and OSPF. The routing domain of EGP is entire network and used to find the path information between different AS, so the routing is based on the connectivity of AS and is done based on policy. The routing policies between different AS could be different in EGP. The example of EGP is BGP.

4. Which routing protocols are supported by the software package Zebra?

Ans:

- i. RIP Version 2 (RFC2453)
- ii. RIPv2 MD5 Authentication (RFC2082)
- iii. RIPng for IPv6 (RFC2080)
- iv. OSPF Version 2 (RFC2328)
- v. OSPF for IPv6 (RFC2740)
- vi. A Border Gateway Protocol 4 (RFC1771)
- vii. Autonomous System Confederations for BGP (RFC1965)
- viii. BGP Communities Attribute (RFC1997)
- ix. RIP Version 2 MIB Extension (RFC1724)
- x. OSPF Version 2 Management Information Base (RFC1850)
- xi. Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing (RFC2545)
- xii. BGP Route Reflection An alternative to full mesh IBGP (RFC2796)
- xiii. Multiprotocol Extensions for BGP-4 (RFC2858)
- xiv. Capabilities Advertisement with BGP-4 (RFC2842)
- xv. SNMP MUX protocol and MIB (RFC1227)
- xvi. Definitions of Managed Objects for the Fourth Version of the Border Gateway Protocol (BGP-4) using SMIv2 (RFC1657)

5. In the Zebra software package, the processes ripd, ospfd, and bgpd deal, respectively, with the routing protocols RIP, OSPF, and BGP. Which role does the process zebra play?

Ans:

The Zebra is an IP routing manager. The process zebra changes the kernel routing table, interface lookup and redistributes routes between different routing protocols. RIPD daemon handles the RIP protocol. OSPFD is a daemon which supports OSPF version BGPD supports the BGP-4 protocol.

6. Describe how a Linux user accesses the processes of Zebra (zebra, ripd, ospfd, bgpd) processes to configure routing algorithm parameters?

Ans:

The command use to access zebra, ripd, ospfd, bgpd are zebra -d, ripd -d, ospfd -d and bgpd -d. TCP uses port number to demultiplex the request depending on the service. For zebra, the port number for ripd, ospfd, bgpd are 2061, 2062, 2064 and 2065 respectively. Therefore, we can use command “telnet host_ip 2602” for RIP and “telnet host_ip 2604” for OSPF (host_ip is the ip address where ripd and ospfd are running).

7. What is the main difference between RIP version 1 (RIPv1) and RIP version 2 (RIPv2)?

Ans:

- i. RIPv1 is a classful routing protocol while RIPv2 supports classless inter-domain routing
- ii. RIPv1's periodic routing updates do not carry subnet information while RIPv2 has the ability to carry subnet information
- iii. RIPv1 does not support variable length subnet masks while RIPv2 supports it.
- iv. RIPv1 has no support for router authentication while RIPv2 supports authentication.
- v. RIPv2 multicasts the entire routing table to all adjacent routers at the address 224.0.0.9, as opposed to RIPv1 which uses broadcast.
- vi. RIPv2 supports triggered updates.
- vii. RIPv2 supports route tags, which allows a distinction between routes learned from the RIP protocol and routes learned from other protocols.

8. Explain what it means to “run RIP in passive mode”.

Ans:

In passive mode, the routing table will be updated while receiving the path information for other nodes, but the updated routing table will not be sent out to network.

9. Explain the meaning of “triggered updates” in RIP.

Ans:

Trigger update allows to send the announcement of the changes of network topology immediately instead of waiting for next periodic announcement, which will improve the convergence time of RIP network.

10. Explain the concept of split-horizon in RIP?

Ans:

Split- horizon is a method used in Distance vector protocol to avoid routing loop or count-to-infinity problem. Split- horizon means routers will not send the information about the routing of a destination to where it receives from. In other words, routers will not advertise the cost to a neighbour if this neighbour is the next hop on the current path.

11. What is an autonomous system (AS)? Which roles do autonomous systems play in the Internet?

Ans:

Autonomous system (AS) is a collection of connected IP routing prefixes under the control of one or more network operators that presents a common, clearly defined routing policy to the Internet. AS were introduced to regulate organizations such as ISPs and each AS is operated as single entity. Each autonomous system is managed independently with respect to BGP.

12. What is the AS number of your institution? Which autonomous system has AS number 1?

Ans:

The AS number of University of Toronto is 239.
AS number 1 is owned by Level 3 Communications, Inc.

13. Explain the terms: Stub AS, Multi-homed AS and Transit AS?

Ans:

A stub Autonomous System refers to an AS that is connected to only one other AS.

A multihomed Autonomous System is an AS that maintains connections to more than one other AS. This allows the AS to remain connected to the Internet in the event of a complete failure of one of their connections. However, this type of AS would not allow traffic from one AS to pass through on its way to another AS.

A transit Autonomous System is an AS that provides connections through itself to other networks. That is, network A can use network B, the transit AS, to connect to network C.