

Assignment 4

CSL 374/672

Due date: March 20, 2013 (Wednesday)

Note: Solve all problems on your own. Approach the instructor for clarifications.

1. AS1 in Figure 1 has the following characteristics.

- All routers run OSPF as the interior gateway protocol (IGP). Recall that OSPF is a link-state routing protocol.
- Only the border routers connecting AS1 to neighbouring ASes run BGP.
- Link weights are static and specified in the diagram.

State any assumptions that you make to solve the problems.

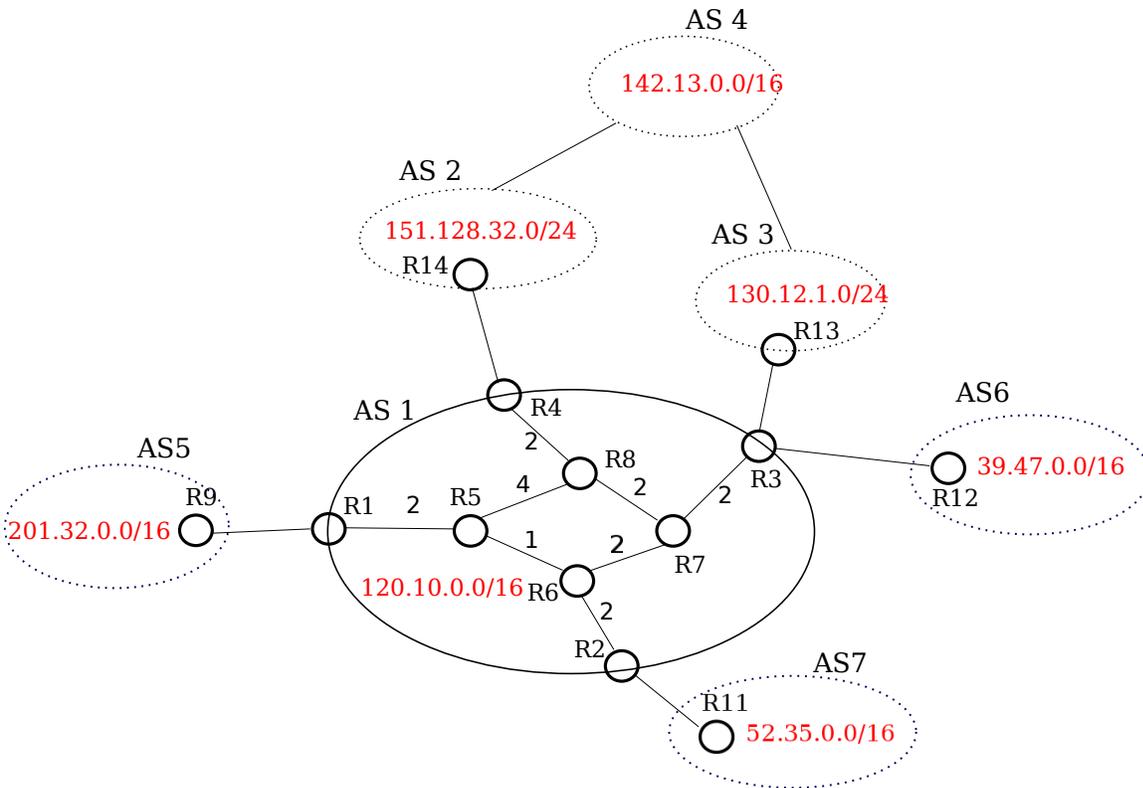


Figure 1: Routing topology

- Using Dijkstra's algorithm determine the shortest path from R1 to all other routers within AS1. Give details of the different stages in creation of the routing tree using diagrams. Similarly determine the shortest path from R2 to all other routers.
- Corresponding to each of the 4 ASes is an IP-prefix as shown. AS2 advertizes the paths [151.128.32.0/24 AS2], [142.13.0.0/16 AS2-AS4] and [130.12.1.0/24 AS2-AS4-AS3] to AS1. AS3 advertizes the paths [130.12.1.0/24 AS3], [142.13.0.0/16 AS3-AS4] and [151.128.32.0/24 AS3-AS4-AS2] to AS1.

Show how AS1 can set the BGP-attributes of these paths so that

- i. it uses R4–R14 to forward packets with destination prefix 151.128.32.0/24,
- ii. it uses R4–R14 to forward packets with destination prefix 130.12.1.0/24,
- iii. it uses “hot-potato” routing to forward packets with destination prefix 142.13.0.0/16.

- (c) Assume that Encapsulation is the solution used by AS1 for BGP-IGP interaction. The BGP routing table at each BGP speaker contains a list of IP prefixes learned using eBGP or iBGP and the corresponding exit routers. Every router in AS1 has an IGP (which is OSPF here) routing table which contains the IP address of all other routers within AS1 and the corresponding next hop on the shortest paths to those routers.

Suppose a packet is forwarded to R1 from AS5 with destination 142.13.5.4. Explain how the routers of AS1 forward this packet toward its destination. Your answer should explain at each router along the path in AS1 the following:

- i. which table(s) the router looks up in order to find the next hop of the packet, and
 - ii. the destination IP address of the packet when it enters and leaves the router.
2. Network address translation (NAT) helps solve the problem of IP address space shortage. Look up any text book or the web to learn about NAT. Briefly explain how NAT works (half a page at most). Does NAT help prevent some security attacks? If so, which ones?