

Homework Problems and Questions

Chapter 5 Review Questions

SECTION 5.1

- R1. What is meant by a control plane that is based on per-router control? In such cases, when we say the network control and data planes are implemented “monolithically,” what do we mean?
- R2. What is meant by a control plane that is based on logically centralized control? In such cases, are the data plane and the control plane implemented within the same device or in separate devices? Explain.

SECTION 5.2

- R3. Compare and contrast the properties of a centralized and a distributed routing algorithm. Give an example of a routing protocol that takes a centralized and a decentralized approach.
- R4. Compare and contrast link-state and distance-vector routing algorithms.
- R5. What is the “count to infinity” problem in distance vector routing?
- R6. Is it necessary that every autonomous system use the same intra-AS routing algorithm? Why or why not?

SECTIONS 5.3–5.4

- R7. Why are different inter-AS and intra-AS protocols used in the Internet?
- R8. True or false: When an OSPF route sends its link state information, it is sent only to those nodes directly attached neighbors. Explain.
- R9. What is meant by an *area* in an OSPF autonomous system? Why was the concept of an area introduced?
- R10. Define and contrast the following terms: *subnet*, *prefix*, and *BGP route*.
- R11. How does BGP use the NEXT-HOP attribute? How does it use the AS-PATH attribute?
- R12. Describe how a network administrator of an upper-tier ISP can implement policy when configuring BGP.
- R13. True or false: When a BGP router receives an advertised path from its neighbor, it must add its own identity to the received path and then send that new path on to all of its neighbors.

Explain.

SECTION 5.5

R14. Describe the main role of the communication layer, the network-wide state-management layer, and the network-control application layer in an SDN controller.

R15. Suppose you wanted to implement a new routing protocol in the SDN control plane. At which layer would you implement that protocol? Explain.

R16. What types of messages flow across an SDN controller's northbound and southbound APIs? Who is the recipient of these messages sent from the controller across the southbound interface, and who sends messages to the controller across the northbound interface?

R17. Describe the purpose of two types of OpenFlow messages (of your choosing) that are sent from a controlled device to the controller. Describe the purpose of two types of Openflow messages (of your choosing) that are send from the controller to a controlled device.

R18. What is the purpose of the service abstraction layer in the OpenDaylight SDN controller?

SECTIONS 5.6–5.7

R19. Names four different types of ICMP messages

R20. What two types of ICMP messages are received at the sending host executing the *Traceroute* program?

R21. Define the following terms in the context of SNMP: managing server, managed device, network management agent and MIB.

R22. What are the purposes of the SNMP *GetRequest* and *SetRequest* messages?

R23. What is the purpose of the SNMP trap message?

Problems

P1. Looking at [Figure 5.3](#) , enumerate the paths from y to u that do not contain any loops.

P2. Repeat Problem P1 for paths from x to z , z to u , and z to w .

P3. Consider the following network. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from x to all network nodes. Show how the algorithm works by computing a table similar to [Table 5.1](#) .



Dijkstra's algorithm: discussion and example