Assignment 03
(Worth 10% - Due date November 25, 2020)

Instructions

This assignment is divide into two parts. Part 1 is short questions; this part is an individual assignment. Part 1 is NOT a group assignment. Part 2 is a design and coding assignment. Part 2 is a group assignment.

For submission - Each student should submit his answers to part 1, using the blackboard assignment submission feature. For part 2, each student should submit one page detailed his role and responsibilities within the group (e.g. which task (design and or coding) completed by him/her). In addition, include in this page a link to a version control repository (e.g. GitHub, BitBucket) contains the design document(s) and the source code of his group.

Short Questions [40 points]

Q1) Compare and contrast IPV4 and IPV6 highlights the similarities and differences between the two protocols?[*4 points*]

Q2)What are the main differences between routing and forwarding? [*2 points*]

Q3) What are software-defined networks, and how they are different from traditional routing [*2 points*]

Q4) What are the most common methods to implement the switch fabric in the routers? [*4 points*]

Q5) When a large datagram is fragmented into multiple smaller datagrams, are these smaller datagrams reassembled into a single larger datagram? [*4 points*]

Q6) What is a private network address? Should a datagram with a private network address ever be present in the larger public Internet? Explain. [*4 points*]

Q7) Suppose there are 35 hosts in a subnet. What should the IP address structure look like?[*4 points*]

Q8) 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 decentralized approach. [*4 points*]

Q9) Compare and contrast static and dynamic routing algorithms. [*4 points*]

Q10) Define and contrast the following terms: subnet, prefix, and BGP route. [*4 points*]

Q11) Names four different types of ICMP messages [*4 points*]

Design and Programming Assignment [60 points]

Based on your proposed network application protocol for Job-Seeker — Job-Creator, extend your network application to enable the network application to assign-execute-report jobs. In this design and implementation assignment, the Job-Creator will create a job and assign it to a Job-Seeker. The Job-Seeker will execute the job and report the results to the Job-Creator. The following is the list of the jobs the creator could assign to the seeker.

One-To-One Jobs

1. Detect if a given IP address or Host Name is online or not. The job creator would like the job seeker to find out if a given IP address is contacted to the network or not. The job description contains at least the target IP
2. Detect the status of a given port at a given IP address. The status of the port could be open—close—filtered. The port could be TCP or UDP. The job description contains at least the target IP and port number.
3. Detect all live IP addresses on a given subnet. The job description contains the target subnet in a.b.c.d/x format
4. Detect the status of all registered TCP—UDP ports on a given IP address or subnet.

One-To-Many Jobs

1. The job creator ask more than one job seeker to execute an ICMP flood attack against a given IP or subnet
2. The job creator ask more than one job seeker to execute a TCP flood attack (any TCP flood attack) against a given port on a given IP
3. The job creator ask more than one job seeker to execute a UDP flood attack against a given port on a given IP

Q1) Select any two jobs from the One-To-One Jobs category, design and implement the create-assign-execute-report. [*25 points*]

Q2) Select any two jobs from the One-To-Many Jobs category design and implement the create-assign-execute-report. [*25 points*]

Q3) Implement test cases to test your implementation [*10 points*]

Resources To complete this assignment you will need to use network packet capturing and crafting library, here is a list of common ones

- Scapy support Python https://scapy.net/
- PCap4J support Java https://www.pcap4j.org/
- PCapPlusPlus support C++ https://pcapplusplus.github.io/

Any other network packet crafting tools are welcomed. Ideally, you need to craft TCP, UDP and ICMP packet. Could you use a third party library or tool or rely on the operating system utilities to avoid crafting your own packets? The answer is NO.