

CS485/ECE440: Homework 5

November 11, 2008

General

- This homework is (mostly) about material covered in Chapter 2 and 3 of the text book.
- The answers to this homework are **due November 18, 2008**.
- Submit via e-mail to `riesen@cs.unm.edu` (Mail it before class on the 30th.) Your subject line must say: “Homework 5 Submission” (and **nothing else**).
- Your answers to the questions below must be in a PDF or plain text file attached as file named `Homework5.pdf` or `Homework5.txt` according to its format. (Not `Hwk5.pdf`, and no Microsoft Word or image files, such as jpeg, please.)
- Keep your answers (and programs) succinct.
- Obey the University rules on plagiarism. In particular, do use libraries and the web to find information you need to answer the questions, but do not copy whole answers or programs. Reference your sources. The work you turn in must be *your* work.

Exercise 1: Path MTU [12 points]

Host A is connected to an Ethernet with an MTU of 1,500 bytes. That is the largest IP datagram, including the IP header, on this network is 1,500 bytes. The IP header consumes 20 bytes which leaves 1,480 for a higher level protocol such as TCP.

On this first network, there is a router connecting to a second network with an MTU of 500 bytes. Host B is on the third network which has an MTU of 380 bytes.

TCP is used to send a 2,840 byte message from host A to host B. TCP adds its own 20-byte header to that message. Show the IP fragments that arrive at host B; i.e. list the size and offset for each fragment. This is similar to the example on pages 240 – 242 in the textbook.

Exercise 2: RIP [12 points]

Answer the following questions about the Routing Information Protocol (RIP):

1. What is the maximum network diameter of a RIP network?
2. Why is there a limit to the network diameter?
3. What would have to change, if we wanted to make the maximum network diameter twice as large?

Exercise 3: ARP [8 points]

ARP queries are sent in a broadcast frame. Why? An ARP response is sent within a frame with a specific destination LAN address. Why

Exercise 4: DHCP [12 points]

Draw a state diagram of a client requesting and receiving an IP address. DHCP uses UDP packets which can get dropped. Make sure your diagram shows how the client reacts to dropped packets. There might be more than one DHCP server on the network, resulting in multiple offers to the client. Your state diagram must take that case into consideration.

Briefly describe your state diagram.

Exercise 5: RIP and OSPF [8 points]

Both RIP and OSPF use advertisements. What is different between these two kinds of advertisements? Describe what is contained in these advertisements.

Exercise 6: Mobile Host [8 points]

If two or more mobile hosts are located on the same foreign network, could they share the same foreign agent? In particular, could these mobile hosts share a care-of address? Explain your answer.

Exercise 7: IPv4 and IPv6 [12 points]

Until all equipment on the Internet is IPv6 capable, it is sometimes necessary to send IPv6 packets along paths that can only handle IPv4 packets. This is possible by creating an IPv4 tunnel.

Describe in detail the process to create such a tunnel and how it is used. What are some of the problems associated with that approach?

Exercise 8: Packet format [8 points]

Draw an IP packet that contains a TCP segment, which in turn contains 50 bytes of data. Show all the fields and sizes in the TCP/IP header.

Exercise 9: CIDR Addressing [4 points]

What does the address 80.0.0.0/1 mean? What would this address be used for in a routing table?

Exercise 10: IPv6 and DHCP [4 points]

IPv6 hosts do not use DHCP. Why?

Exercise 11: BGP [8 points]

A border router uses BGP to learn which networks it can reach. It then uses iBGP to disseminate that information within an AS. Why does it use iBGP and not an IGP?

Exercise 12: Routing and Forwarding [4 points]

What is the difference between routing and forwarding?