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CptS/EE 555
Fall 2001
Exam #1
October 12, 2001

50 Minutes. Open book, open notes, calculators allowed, but closed neighbor. 90 Points total. I suggest reading the whole exam before starting and planning your time carefully.

1. (20 Pts) TTL
    a. Explain the purpose of the TTL field in the IPv4 header.
    b. What is the corresponding field in the IPv6 header?
    c. What happens when the TTL field reaches 0?
    d. Under what two different circumstances might the TTL field reach 0?

2. (20 Pts) Suppose a link has an error rate of 1 bit in 10^4. As we saw in the project's experiment 3 it is very difficult to use such a link efficiently with the SWP. (In this problem your answer should be a single number for each part along with the work justifying it.)
    a. (10 Pts) If 125 byte packets are sent over the link what is the approximate probability that a packet will experience one or more errors?
    b. (10 Pts) If the packets are sent with forward error correction, capable of correcting any single bit error and detecting any greater number of errors, estimate the probability that a received packet will be rejected due to errors, assuming that errors are independent? (Note that after error correction a packet is acceptable as if no error had occurred).

Name:

3. (15 Pts) Fragmentation and encapsulation. Show details of the link level (either Ethernet or AAL) header/trailer fields and IP header fields, including offsets and lengths, illustrating the fragmentation and encapsulation of a 2000-byte data packet
    a. (10 Pts) For an Ethernet – you do NOT need to compute the CRC, but show where it is placed
    b. (5 Pts) For ATM AAL/5 – you do NOT need to compute the CRC, but show where it is placed. Do not break the packet into cells – just show the result at the CS-PDU level, and don't worry about the exact size of the "Pad" field.

4. (10 Pts) When a node on an Ethernet sends an IP broadcast to the net it usually uses the IP broadcast address (`nodeaddress&netmask)|~netmask`. Explain why a host using DHCP to acquire its node configuration information uses the alternate IP broadcast address 255.255.255.255 to send its DHCPDISCOVER message.

Name:

5. (15 Pts) Dijkstra shortest path algorithm: Consider a network represented by the following connectivity matrix:

From Node	Distance to Node				
	A	B	C	D	E
A	0	4	7		2
B	4	0	2		
C	7	2	0	1	
D			1	0	2
E	2			2	0

The number at position (x,y) represents the cost of the direct link from x to y (and y to x) as in the link-state algorithm. Empty cells represent the absence of a direct link. Simulate Dijkstra's shortest path algorithm as it would run at node C. Show the final "confirmed" list in the order that elements are added to it by the algorithm (as in step 7 of Table 4.9 in the text). Each element of the list is a triple: (destination, cost, next hop)

Name:

6. (10 Pts) Write your own question: pick a topic from chapters 1-4 that is relevant to your own interests or research and write a paragraph or two explaining the topic and why it is relevant, in detail. Please write legibly.