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ECE4110, Internetwork Programming, QUIZ 1
Fall 2005

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RULES.

i This quiz is open book and notes (but no old quizzes). Calculators may be used.

ii Answer all questions and show all work to receive full credit. Use back of sheets only if necessary.

iii All sub-questions have the same weight.

iv Please do not ask the proctors any questions during the exam about exam questions. Part of the test is understanding the question, as written, without supplemental information. If you feel additional data is needed to solve the problem, make (and state) an assumption and then work the problem.

v. This is a time-limited test. All papers must be turned in 50 minutes after the start. If you find you are taking more than 10 minutes on a particular problem, move on and come back to that problem after finishing the others. The Georgia Honor Code applies (see last page).

Question 1 –Server coding.

What network function sets up a socket and returns the Socket Descriptor used later?

a. socket()

What three pieces of network information are stored in a "struct sockaddr_in" structure?

b. network "family" AF_INET

c. the IP address (wild card 0 for any local address)

d. the port to listen on (usually a "well-known" port for the type of server

What function ties the above three items to a socket?

e. bind(_)

What function makes the host ready to receive a packet on the designated port number (creates a listening socket)?

f. listen(_)

What function gets a packet (a pointer to the buffer and length of the data) coming to the designated port number and returns the Connection Descriptor of the new active socket?

g. accept()

What function can be used to send data back out the new active socket?

h. write()

What function will terminate the new active socket?

i. close()

A tcp or udp client will use "a" through "d" above. What is the next network function the client uses the create a new active socket?

j. connect()

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Question 2 – Network Conversion Functions

Name a network function (if any) that can be used to do the following:

a. Find the 32-bit integer for a dotted decimal IP address: _____inet_ptoh() _____

b. Find the dotted-decimal IP-address text from a 32-bit integer:_____ inet_htop _____

c. Convert an "unsigned char" (uint8 t) to network order:_____ not needed _____

On an Intel Pentium CPU based host, what is the result (in hex) of the following:

d. htonl(0x1a2b3c4d) = 0x __ 4d3c2b1a_____

e. htonl(0x1a2b) = 0x __ 2b1a0000 _____

f. htons(0x1a2b) = 0x ___ 2b1a _____

On an Sun Sparc or Apple G4 CPU based host, what is the result (in hex) of the following:

g. htonl(0x1a2b3c4d) = 0x ____ 1a2b3c4d _____

Question 3 – C Code

If "pd" is a pointer to a structure of type "date" which has a first element "year",

```
struct date  today, *pd ;
today.year = 2006 ;
pd = & today ;              //   pd = 0x8123abcd  (memory address assigned to "today" by compiler)
```

What is the value of (may be undefined):

pd -> year = _____**2006** _____(a)
(*pd).year = _____**2006** _____(b)
*(pd.year) = _____Not defined ("pd" is not a structure)_____(c)

Add comments to explain what the designated lines of code below are doing.

```
struct item {  // structures of this type will be used to build a __linked list of function names and integer ID's____(d)
  int  id ;       // exact value of identifying integer
  int * func ;     //  a pointer to a function (the name of a function)
  struct item * next  ;    // points to _____next structure in the list_____(e)
}
struct item   * start[ 16 ] ; // _____array of 16 pointers to "item" structures_____(f)
// Code here to fill many "item" structures and array start[] with values.

int  *find_func( int x) //  used to find _____the function associated with the integer "x"_____(g)
{
  struct item   * pi  ;
  pi = start[ x & 0x000f ] ;    //  ___pointer to an "item" structure from "start[]" array, index is hash of "x"___(h)

  while( pi ! NULL ) {
    if( pi->id == x )  return( pi->func ) ; // normally returns ___the function pointer (function name)_____(i)
    pi = pi->next ;
  }
  return( NULL ) ;  //  returns NULL when _____no function is associated with integer "x"_____(j)
}
```

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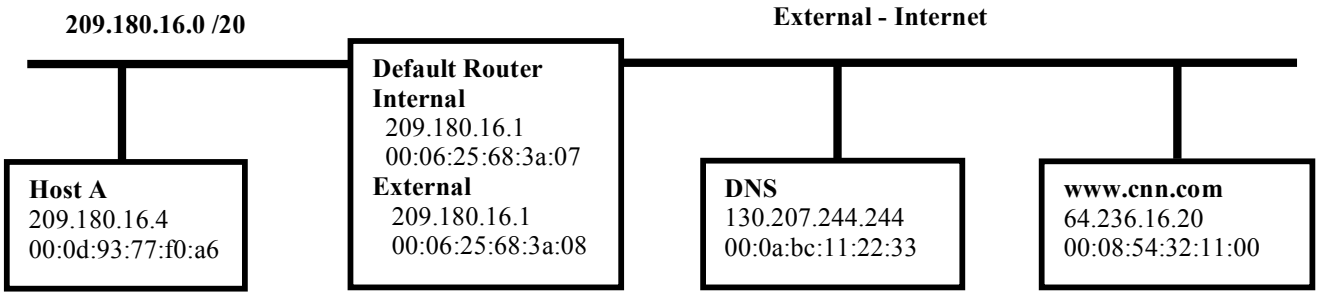
Question 4 – Connection Initiation

Host "A" wants to set up a Web access to www.cnn.com. List below the packets or frames sent and received by Host A until the TCP connection is Active (TCP handshake complete). Indicate under "Request" the information (question or answer) in a requesting or answering packet or frame. Indicate in column five if an IP packet is using TCP or UDP. For TCP packets also indicate the TCP Flag bits that are true (S - Syn, F - Fin, A - Ack, R - Reset)



Show only the last two bytes of the Ethernet address (Host A = f0:a6). If not an IP packet, leave columns 3-5 blank.

Source Ethernet Addr.	Destination Ethernet Addr.	Source IP Address	Destination IP Address	TCP+ Flag(s) or UDP	Request (who is ...) or Response (ans: ...)
f0:a6	**ff:ff***				**who has 209.180.16.1**
3a:07	**f0:a6**				**ans: 3a:07**
f0:a6	**3a:07**	**209.180.16.4**	**130.207.244.244**	UDP	**who is "www.cnn.com"**
3a:07	**f0:a6**	**130.207.244.244**	**209.180.16.4**	UDP	**Ans: 130.207.244.24**
f0:a6	**3a:07**	**209.180.16.4**	**130.207.244.24**	TCP - S	
3a:07	**f0:a6**	**130.207.244.24**	**209.180.16.4**	TCP - SA	
f0:a6	**3a:07**	**209.180.16.4**	**130.207.244.24**	TCP - A	

* Ethernet Broadcast Address is ff:ff:ff:ff:ff:ff

Question 5 – CIDR Routing Table

Host X IP address is 209.180.18.150 on a "209.180.16.0 /20" network. Calculate the following:

a. Host X IP address in hex: 0x **d1 64 12 96**

b. Host X IP address in binary: **1101 0001 1000 000 0000 1101 1001 0110**

c. Host X network mask in hex: 0x **ff ff f0 00**

d. Host X network mask in binary: **1111 1111 1111 1111 1111 0000 0000 0000**

e. Host X IP broadcast address in hex: 0x **d1 64 1**f ff

f. Host X IP broadcast address in binary: **1101 0001 1000 000 0000** 1111 1111 1111

g. On which port (eth0 - eth3) would the router send packets destined to Host X, given the following routing table: **eth2**

Subnet IP Address	Subnet Mask	Port	
209.180.16.0	255.255.240.0	eth0	Match .16.0 - .31.255
209.180.17.0	255.255.252.0	eth1	Match .17.0 - .20.255
209.180.18.0	255.255.255.0	eth2	**Longest Match** .18.0 - .18.255
209.180.18.128	255.255.255.240	eth3	No match .18.128 - 18.143

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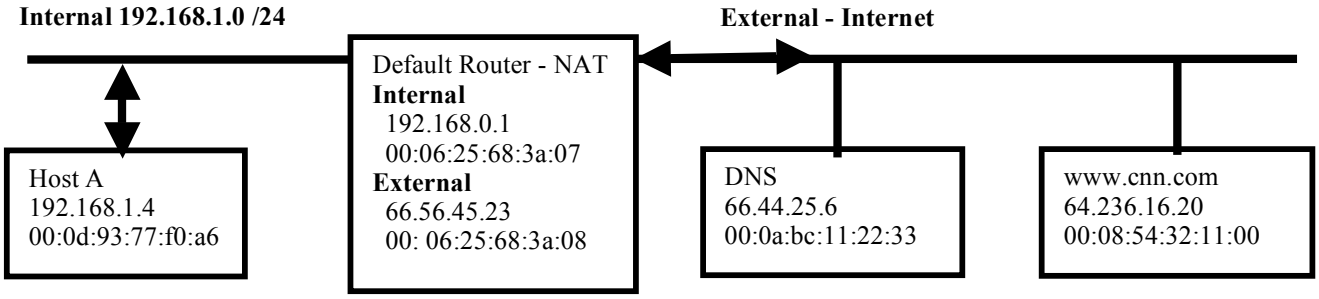
Question 6 – Network Address Translation (NAT)

Host "A" wants to set up a Web access to www.cnn.com. List below **only the TCP packets** sent and received by Host A until the TCP connection is Active (TCP handshake complete) and the first data packets each way are exchanged. Because of the NAT operation, some of the IP addresses will be different when seen on different sides of the NAT Router.



~~Show only the last two bytes of the Ethernet address (Host A = f0:a6). If not an IP packet, leave columns 3-5 blank.~~

Internal Source IP Address	Internal Destination IP Address	External Source IP Address	External Destination IP Address	Flag(s) Syn, Ack,Fin, Reset only	Notes - not part of Quiz
192.168.1.4	64.236.16.20	**66.56.45.23**	64.236.16.23	S	Start of TCP handshake
64.236.16.23	**192.168.1.4**	64.236.16.23	**66.56.45.23**	SA	Positive response
192.168.1.4	64.236.16.23	**66.56.45.23**	64.236.16.23	A	Acknowledge response
192.168.1.4	64.236.16.23	**66.56.45.23**	64.236.16.23	A	(http request)
64.236.16.23	**192.168.1.4**	64.236.16.23	**66.56.45.23**	A	(http reply)

* no points off if order of last two packets is reversed.

Honor Code - I affirm that I have obeyed the rules of the Georgia Tech Honor Code.

Signature _____