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TTM4100
Communication – Services and Networks

Assignment for Chapter 4: "Network Layer"

Deadline of submission: **26.02.2017**

The assignment questions are mostly based on the Problems of Chapter 4 in the textbook: J. F. Kurose and K. W. Ross. *Computer Networking: A Top-Down Approach (International Edition, 6/e)*. Please note that there are modifications to the questions in the textbook, the questions in this document are to be used if there are differences.

The following questions should be answered and the answers should be submitted to the Its Learning System. For these questions, two or more choices are provided for each of their sub-questions, and one of them is correct.

1. Misc.

1.a) What is the 32-bit binary equivalent of the IP address 173.194.41.129?

1.a.1 00001000 01010001 10110010 11101001
1.a.2 10110101 01000011 10010100 10000001
1.a.3 10101101 11000010 00101001 10000001
1.a.4 10000001 10010100 01000011 10110101

1.b) How many times larger is the IPv6 address space than the IPv4 address space?

1.b.1 Four times as large.
1.b.2 96 times as large.
1.b.3 96^2 times as large.
1.b.4 2^96 times as large.

1.c) IP guarantees that:

1.c.1 Packets arrive in the correct sequence.
1.c.2 All packets arrive at the specified destination.
1.c.3 All of the above.
1.c.4 None of the above.

1.d) Suppose there are five routers between a source host and a destination host. Ignoring fragmentation, an IP datagram sent from the source host to the destination host will travel over how many interfaces?

1.d.1 5
1.d.2 7
1.d.3 10
1.d.4 12

1.e) Suppose there are five routers between a source host and a destination host. How many forwarding tables will be indexed to move the datagram from the source to the destination?

1.e.1 1
1.e.2 5
1.e.3 6
1.e.4 7

2. True or False?

2.a) IP is the only network layer protocol.

2.a.1 True
2.a.2 False

2.b) NAT has helped with postponing the running out of IPv4 addresses.

2.b.1 True
2.b.2 False

2.c) Global routing algorithm uses a complete graph of the network, with all the nodes and links.

2.c.1 True
2.c.2 False

2.d) Distance Vector routing algorithms are global routing algorithms.

2.d.1 True
2.d.2 False

3. Consider a datagram network using 32-bit host addresses. Suppose a router has five links, numbered 0 through 4, and packets are to be forwarded to the link interfaces as follows:

Destination Address Range	Link Interface
11000000 10101000 000000000 00000000 through 11000000 10101000 000000000 11111111	0
11000000 10101000 000000001 00000000 through 11000000 10101000 000000001 11111111	1
11000000 10101000 000000010 00000000 through 11000000 10101000 111111111 11111111	2
11000000 10101001 000000000 00000000 through 11000000 10101111 111111111 11111111	3
Otherwise	4

3.a) Provide a forwarding table that has FIVE entries, uses longest prefix matching, and forwards packets to the correct link interfaces.

3.a.1

Prefix Match	Link Interface
11000000 10101000 00000000	0
11000000 10101000 00000001	1
11000000 10101000	2
11000000	3
otherwise	4

3.a.2

Prefix Match	Link Interface
11000000 10101000 00000000	0
11000000 10101000 00000001	1
11000000 10101000	2
11000000 10101	3
otherwise	4

3.a.3

Prefix Match	Link Interface
11000000 10101000 00000000	0
11000000 10101000 00000001	1
11000000 10101000 00000010	2
11000000 10101	3
otherwise	4

3.a.4

Prefix Match	Link Interface
11000000 10101000 00000000	0
11000000 10101000 00000001	1
11000000 10101000 11111111	2
11000000 10101111 11111111	3
otherwise	4

What Link Interface would the forwarding table choose for the IP address?

3.b) 11000000 10101001 00000000 00101010

3.b.1 interface 0
3.b.2 interface 1
3.b.3 interface 2
3.b.4 interface 3
3.b.5 interface 4

3.c) 11000001 10101000 00000000 00101010

3.c.1 interface 0
3.c.2 interface 1
3.c.3 interface 2
3.c.4 interface 3
3.c.5 interface 4

3.d) 11000000 10101000 00000000 00101010

3.d.1 interface 0
3.d.2 interface 1
3.d.3 interface 2
3.d.4 interface 3
3.d.5 interface 4

4. Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 129.241.56/21. Also suppose that Subnet 1 is required to support up to 1000 interfaces, and Subnet 2 and 3 are each required to support up to 500 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints.

4.1	*129.241.56.0/21*	*129.241.60.0/22*	*129.241.62.0/22*
4.2	*129.241.56.0/22*	*129.241.60.0/23*	*129.241.62.0/23*
4.3	*129.241.56.0/21*	*129.241.56.0/22*	*129.241.56.0/23*