Department of Computer Science, Virtual University of Pakistan

CS716: Advanced Computer Networks

Assignment 3 **MS(CS), Spring 2012** **Maximum Points: 100**

Due Date: *Sunday, 22nd July 2012*

Instructions

The purpose of this assignment is to give you hands on practice. It is expected that students will solve the assignments themselves. Following rules will apply during the evaluation of assignment.

- Cheating from any source will result in zero marks in the assignment.
- Any student found cheating in any of the two assignments submitted will be awarded "F" grade in the course.
- No assignment after due date will be accepted

Question No. 1 (10 + 10 + 10 + 20 = 50 Points)

a) Suppose a university has a class C network 200.1.1.0 and wants to form subnets for its four departments, with hosts as follows:

Math department 70 hosts
Computer Science department 70 hosts
Engineering department 70 hosts
Chemistry department 35 hosts

Give a possible arrangement of subnet masks to make this possible. Segmentation of hosts of a department and multi-level subnetting is also allowed to achieve this objective.

b) Consider the network in the following Figure, using link-state routing. Suppose the N–R link fails, and the following then occur in sequence:
(a) Node T is added to the right side with a connection to S.
(b) Node P is added to the left side with a connection to O.
(c) A new link P–M is added.
The failed N–R link is now restored. Describe what link-state packets will flood back and forth. Assume that the initial sequence number at all nodes is 1, and that no packets time out, and that both ends of a link use the same sequence number in their Link State Protocol for that link, greater than any sequence number either used before.

c) Compute a multicast spanning tree for router Q in the following subnet for a group with members at routers O, P, Q, R, S, T, W, and Y.

d) Consider the network shown in the following Figure, in which horizontal lines represent transit providers and numbered vertical lines are interprovider links.
(a) How many routes to P could provider Q's BGP speakers receive?
(b) Suppose Q and P adopt the policy that outbound traffic is routed to the closest link to the destination's provider, thus minimizing their own cost. What paths will traffic from host A to host B and from host B to host A take?
(c) What could Q do to have the B → A traffic use the closer link 1?
(d) What could Q do to have the B → A traffic pass through R?

Question No. 2 (5 x 2 = 10 Points)

Read the attached research paper entitled **"Network Virtualization: State of the Art and Research Challenges"** with this assignment very carefully. Answer the following questions:

1. In context of next-generation networking paradigm which architectural principles are considered in Network Virtualization?
2. Which key issues to be resolved for realization of Network Virtualization Environments?

While evaluating your answer, following rules will apply.

1) Copied answer will result in 0 marks
2) Any student found cheating in any of the two research papers summary submitted will be awarded "F" grade in the course.
3) Avoid using same wording from the research paper.

Useful Web Resources

Some useful resources are available on the Internet that can guide you about: how to read, write, evaluate, and summarize research papers.

1) http://www.ruf.rice.edu/~bioslabs/tools/report/reportform.html
2) http://helios.hampshire.edu/~apmNS/design/RESOURCES/HOW_READ.html
3) http://www.library.dal.ca/how/termpaper.htm
4) http://www.studygs.net/wrtstr8.htm

Question No. 3 (4 x 5 = 20 Points)

Read the attached Lecture Notes by Hari Balakrishnan, "**Interdomain Internet Routing," MIT Lecture Notes** with this assignment very carefully. Answer the following questions:

1. What are the motivation factors in terms of requirements affect the design of BGP.
2. Differentiate between Exporting and Importing Routers discussed in this Lecture.
3. How Pakistan Telecom Authority (PTA) diverted YOUTUBE access and data traffic on February 24, 2008?
4. Differentiate between ***e*BGP** and ***i*BGP** ?
5. Point out the goals that BGP doesn't support properly as discussed in this Lecture.

While evaluating your answer, following rules will apply.

1) Copied answer will result in 0 marks
2) Any student found cheating in any of the two research papers summary submitted will be awarded "F" grade in the course.
3) Avoid using same wording from the research paper.

Question No. 4 (20 Points)

Consider the following topology:

Each link is a duplex link with 10Mb bandwidth and 5msec delay. Node 2 sends UDP data to node 4 with packet size of 500 bytes and 200 packets per second. Node 2 starts sending data at time 1.0 sec. At time 4.0 sec, link from node 3 to 4 goes down and re-establishes at 8.0 sec. Simulation halts at 10.0 seconds. When a link from source to destination fails the network must take alternative path. Create a trace file for the simulation and execute NAM to view the simulation.

Write Tool Command Language (TCL) script for the above simulation scenario in file 'assign3cs716.tcl'.

Useful Web Resources.

1) www.isi.edu/nsnam/ns/
2) www.perform.wpi.edu/NS/
3) http://en.wikipedia.org/wiki/Ns_(simulator)
4) http://www.nsnam.org/