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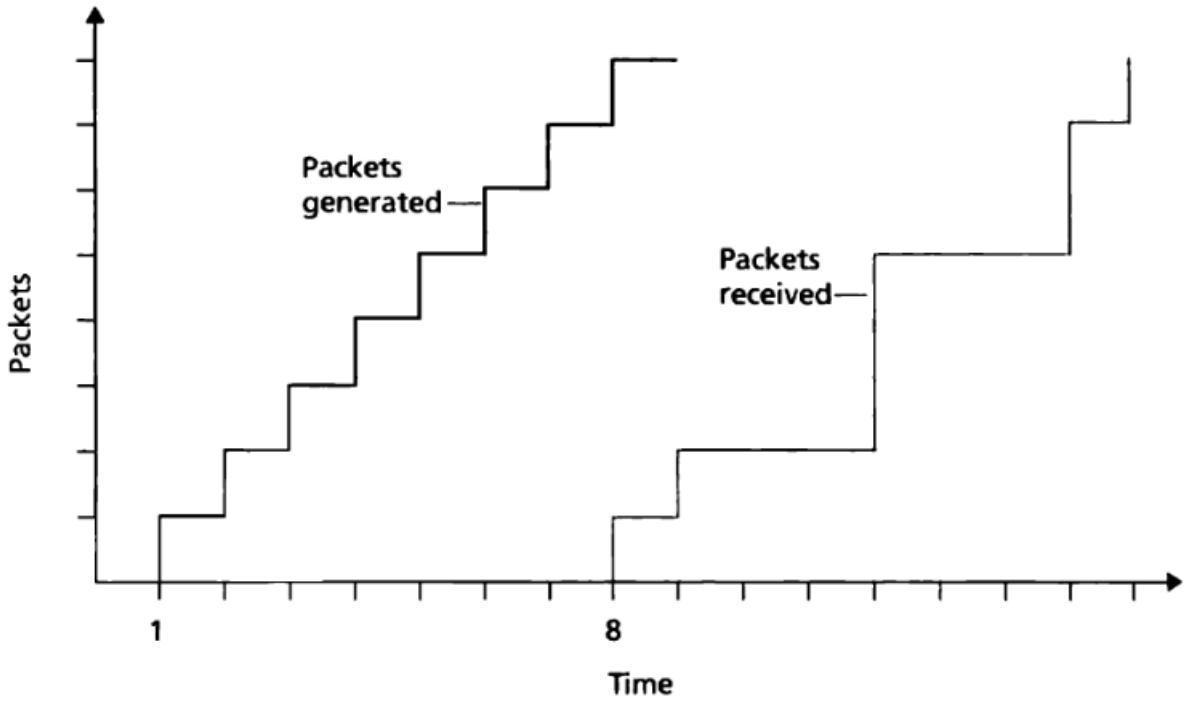
Department of CSIS

Due Date: 13.09.2012

1. Consider the figure below. A sender begins sending packetized audio periodically at t = 1. The first packet arrives at the receiver at t = 8.



   (a) What are the delays (from sender to receiver, ignoring any playout delays) of packets 2 through 8? Note that each vertical and horizontal line segment in the figure has a length of 1, 2, or 3 time units.

   (b) If audio playout begins as soon as the first packet arrives at the receiver at t = 8, which of the first eight packets sent will not arrive in time for playout?

   (c) If audio playout begins at t = 9, which of the first eight packets sent will not arrive in time for playout?

   (d) What is the minimum playout delay at the receiver that results in all of the first eight packets arriving in time for their playout?

2. Consider again the figure given for the previous problem, showing packet audio transmission and reception times.

   (a) Compute the estimated delay for packets 2 through 8 (use the formula for **d** provided in the material given on the Assignments page). Use a value of u = 0.1.

   (b) Compute the estimated deviation of the delay from the estimated average for packets 2 through 8, using the formula for v_i. Use a value of u= 0.1.

3. Abbreviate the following IPv6 addresses:

   (a) 0000:0000:0F53:6382:AB00:67DB:BB27:7332

   (b) 0000:0000:0000:0000:0000:0000:004D:ABCD

   (c) 0000:0000:0000:AF36:7328:0000:87AA:0398

   (d) 2819:00AF:0000:0000:0000:0035:0CB2:B271

   Form the link-local, unique local and node multicast IPv6 addresses for address given in (d).

4. (a) List the ICMPv6 messages types, codes and the ICMP error message text to satisfy the following scenario.

      i. Router drops a packet as the size is too big.

      ii. Router drops a packet because of a prohibiting policy.

      iii. The IPv6 layer of a host receives an IP packet for a non-existing process.

   (b) List the DHCPv6 messages required for the following scenarios. Assume the necessary data.

      i. The client wants to obtain two temporary IP addresses ::8080 and ::8090 from the DHCP server.

      ii. The server wants to reconfigure all the clients with the IPv6 network prefix 2001:30:42::/48.

5. Use the appropriate networking utilities to obtain the answers for the following scenarios.

   (a) Estimation of the round-trip time (RTT) for the host 10.1.1.25.

   (b) Find the network routing path taken to reach the destination 8.8.8.8. Also use the online traceroute tool at http://support.deldsl.net/cgi-bin/trace/chaseroute.pl. Why and where does the traceroute command fail in its path resolution work.

   (c) Do an online trace route on the IP address 49.248.160.149 at the URL - http://www.network-tools.in/nquser.php?formtype=trace. What is the output. What is your conclusion?

   (d) Obtain the name server information for the bits-pilani.ac.in. website.

   (e) Obtain the administrative contact information for apnic.net.

   (f) All the network protocol statistics for your computer.

   (g) All the TCP connections opened to access the website google.com.

6. (a) Write appropriate Wireshark capture filters you need to capture the traffic described below.
    i. Capture HTTP traffic. Does your filter work in the presence of proxy server too? Why (not)?
    ii. Capture DNS traffic going to the name server 10.1.1.61.
    iii. Capture all the packets containing TCP connection setup and release segments.
    iv. Capture all the UDP packets going from 10.2.1.230 to 10.1.1.26.

   (b) Use Wireshark to capture all the traffic coming to the NIC. Write a proper display filter for the following scenarios.
    i. All the RTSP packets.
    ii. All the DHCPv6 packets from the localhost.
    iii. All the packets containing HTTP requests to host www.bits-pilani.ac.in.
    iv. TCP stream between 10.2.1.230 and 10.1.1.26

7. The users of www.flickr.com website can use Google account (gmail account) to login to the flickr website. This is an application of single sign on (SSO). The HTTP headers of the session were captured and made available on the assignments page. Use the trace file to answer this question.

   (a) List all the domain names visited during the session.

   (b) List the domains that set the cookies. How many of these cookies are third party cookies?

   (c) The trace file shows that the user directly logged into to gmail.com without signing in. How is it possible? Clearly illustrate this scenario.

   (d) How does Google indicate the logout status of a user with the help of the cookies?

   (e) What is the purpose of the third-party websites indicated in the trace file?

   (f) List the HTTP response status codes and the sites that use the status codes.

   (Acknowledgements: The SSO trace file was generated using Live HTTP Headers addon of Firefox; for further information, you may check out the addon website at http://livehttpheaders.mozdev.org/. Thanks to Daniel Savard and Nikolas Coukouma for developing a useful Firefox addon)

8. Suppose you are interested in detecting the number of hosts behind a NAT You observe that the IP layer stamps an identification number sequentially on each IP packet. The identification number of the first IP packet generated by a host is a random number, and the identification numbers of the subsequent IP packets are sequentially assigned. Assume all IP packets generated by hosts behind the NAT are sent to the outside world.

   (a) Based on this observation, and assuming you can sniff all packets sent by the NAT to the outside, can you outline a simple technique that detects the number of unique hosts behind a NAT? Justify your answer.

(b) If the identification numbers are not sequentially assigned but randomly assigned, would your technique work? Justify your answer.

9. Write the reviews for the technical papers

   (a) **[NAT and P2P]** Zhou Hu, NAT Traversal Techniques and Peer-to-Peer Applications, HUT T-110.551 Seminar on Internetworking, 2005.

   (b) **[UDP-NAT]** Yuan Wei, Daisuke Yamada, Suguru Yoshida, and Shigeki Goto, A New Method for Symmetric NAT Traversal in UDP and TCP, APAN, 2008.

   The review must include your analysis of the new concepts introduced in the paper, basic assumptions of the paper, limitations of the proposals and possible advantages of the proposals. The review size for each technical paper must be in the range of 1500 to 2000 words.