E 302: 網路概論作業 #4

繳交期限： 2015 十一月 九日, 星期三

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蔡憶佳

不完整作業

Problem 1

Mapping a name to an address is called *name-address resolution*. Assuming that an application program running on a host named **iaic.csie.tku.edu.tw** needs to find the IP address of another host named **mitpress.mit.edu**. Please illustrate the process of *recursive name-address resolution* as well as *iterative resolution*. The example shown in Figure 2.21 of textbook makes use of *both recursive queries and iterative queries*.

Answer Key

請參考課本

Problem 2

Percent-encoding, also known as URL encoding, is a mechanism for encoding information in a Uniform Resource Identifier (URI) under certain circumstances. Please decode the following URIs and explain your results.

A. http://www.google.com/url?sa=t&rct=j&q=iaic&source=web&cd=7&ved=0CFcQFjAG&url=http%3A%2F%2Fiaic.csie.tku.edu.tw%2Fwiki%2Findex.php%2F%25E9%25A6%2596%25E9%25A0%2581&ei=hTLMTrKRCuTPmAWNlZzFDQ&usg=AFQjCNEfnLbDw5aAYiK_T- -LvSM7FYN6Hug

B. http://www.google.com/url?sa=t&rct=j&q=TKU&source=web&cd=1&ved=0CCsQFjAA&url=http%3A%2F%2Fwww.tku.edu.tw%2F&ei=yzLMToPCCIvomAWQ1MGnDQ&usg=AFQjCNFjU- -fs_RkZ9KsShrd8xaciHJ1H7Q

Answer Key

A. http://www.google.com/url? sa=t&rct=j&q=iaic&source=web&cd=7&ved=0CFcQFjAG&
url=http://iaic.csie.tku.edu.tw/wiki/index.php/首頁
&ei=hTLMTrKRCuTPmAWNlZzFDQ&usg=AFQjCNEfnLbDw5aAYiK_T- -LvSM7FYN6Hug

B. http://www.google.com/url?sa=t&rct=j&q=TKU&
source=web&cd=1&ved=0CCsQFjAA&
url=http://www.tku.edu.tw/&ei=yzLMToPCCIvomAWQ1MGnDQ&
usg=AFQjCNFjU- -fs_RkZ9KsShrd8xaciHJ1H7Q

Problem 3

Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that n DNS servers are visited before your host receives the IP address from DNS; the successive visits incur an RTT of $RTT_1, \ldots, RTT_n$. Further suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Let RTT_0 denote the RTT between the local host and the server containing the object. Assuming zero transmission time of the object, how much time elapses from when the client clicks on the link until the client receives the object?

Answer Key

The total amount of time to get the IP address is:

$$RTT_1 + RTT_2 + \cdots + RTT_n \tag{1}$$

Once the IP address is known, RTT_0 elapses to set up the TCP connection and another RTT_0 elapses to request and receive the small object. The total response time is:

$$2RTT_0 + RTT_1 + RTT_2 + \cdots + RTT_n \tag{2}$$

Problem 4

Consider the rdt3.0 protocol. Draw a diagram showing that if the network connection between the sender and receiver can reorder messages (that is, that two messages propagating in the medium between the sender and receiver can be reordered), then the alternating-bit protocol will not work correctly (make sure you clearly identify the sender on the left and the receiver on the right, with the time axis running down the page, showing message (M) and acknowledgment (A) message exchange. Make sure you indicate the sequence number associated with any data or acknowledgment segment.

Answer Key

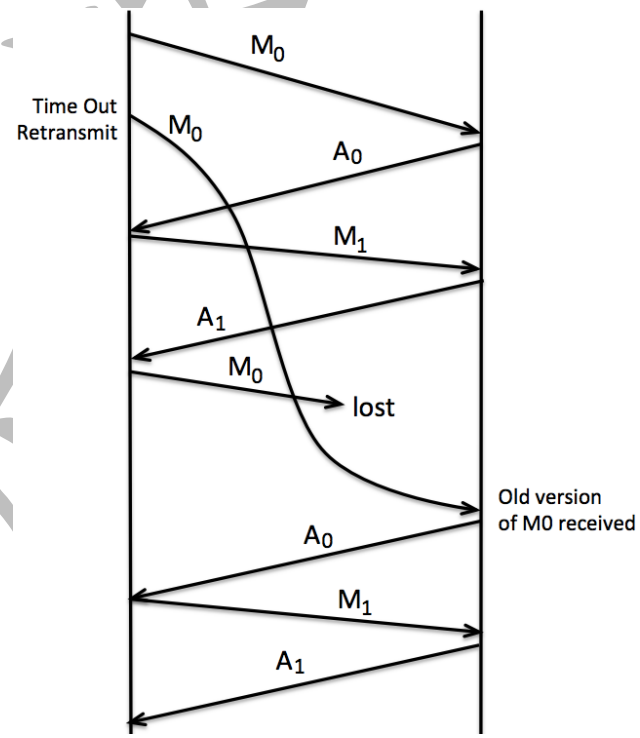

Figure 1: Diagram of alternating-bit protocol will not work correctly

Problem 5

Consider a reliable data transfer protocol that uses only negative acknowledgments (NAKs). Suppose the sender sends data only infrequently. Would a NAK-only protocol be preferable to a protocol that uses ACKs? Why? Now suppose the sender has a lot of data to send and the end-to-end connection experiences few losses. In this second case, would a NAK-only protocol be preferable to a protocol that uses ACKs? Why?

Answer Key

In a NAK only protocol, the loss of packet x is only detected by the receiver when packet $x+1$ is received. That is, the receiver receives $x-1$ and then $x+1$, only when $x+1$ is received does the receiver realize that x was missed. If there is a long delay between the transmission of x and the transmission of $x+1$, then it will be a long time until x can be recovered, under a NAK only protocol.
On the other hand, if data is being sent often, then recovery under a NAK-only scheme could happen quickly. Moreover, if errors are infrequent, then NAKs are only occasionally sent (when needed), and ACK are never sent a significant reduction in feedback in the NAK-only case over the ACK-only case.

Problem 6

Consider the GBN (Go Back N) and SR (Selective Repeat) protocols. Suppose that the sequence number space is of size k. What is the largest allowable sender window that will avoid the occurrence of problems such as the one depicted in the following figure?

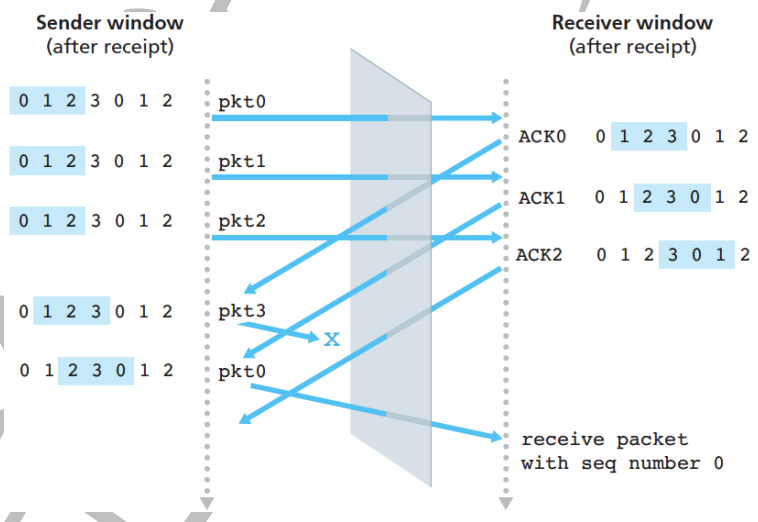

Figure 2: SR receiver dilemma with too-large winodws: a new packet or a retransmission?

Answer Key

In order to avoid the scenario in figure, we want to avoid having the leading edge of the receiver's window (i.e., the one with the highest sequence number) wrap around in the sequence number space and overlap with

the trailing edge (the one with the "lowest" sequence number in the sender's window). That is, the sequence number space must be large enough to fit the entire receiver window and the entire sender window without this overlap condition. Therefore, we need to determine how large a range of sequence numbers can be covered at any given time by the receiver and sender windows.

Suppose that the lowest-sequence number that the receiver is waiting for is packet m. In this case, its window is $[m, m + w - 1]$ and it has received (and ACKed) packet $m - 1$ and the $w - 1$ packets before that, where w is the size of the window. If none of those w ACKs have been yet received by the sender, then ACK messages with values of $[m - w, m - 1]$ may still be propagating back. If no ACKs with these ACK numbers have been received by the sender, then the sender's window would be $[m - w, m - 1]$.

Thus, the lower edge of the sender's window is $m - w$, and the leading edge of the receivers window is $m + w - 1$. In order for the leading edge of the receiver's window to not overlap with the trailing edge of the sender's window, the sequence number space must thus be big enough to accommodate $2w$ sequence numbers. That is, the sequence number space must be at least twice as large as the window size, $k \geq 2w$.

不完整解答