

**C Language Programming: Homework #8**  
**Assigned on 12/30/2014(Tuesday), Due on 01/16/2015(Friday)**

This homework is the extension of homework #7.

The prefix **2001:0db8/32** which is of length 32 can also be represented by

**0010000000000001 0000110110111000 \*\*\*\*\*...\*\*\*(96 \*'s)**

please do the the following:

- (a) write a function *segment(int d)* to divide the prefixes into  $2^d$  groups, where d is the number of bits out of all 128 bit positions and these d bit positions are randomly selected. However, if one of the selected bit is don't care for a prefix, this prefix should be duplicated. For example, assume d=1 and so the routing table will be divided into two groups. If the selected bit is bit 127, then the above prefix will not duplicated. However, if the selected bit position is 0, this prefix will duplicated into both groups.
- (b) Try a number of times to select these d bit positions, let d = 8 and 16.
- (c) printout the number of prefixes in group *i* for  $i = 0$  to  $2^d - 1$ .
- (d) Print out the difference between the max and min groups. Use the smallest difference as your target to do the following:
  1. For each group, you have to use singly linked list to chain the prefixes together.
  2. Therefore, you have to write a function *prefix\_insert()* to insert a prefix in a one-by-one fashion using a insert file **inserted\_prefixes**. The prefixes to be inserted after the segments are built are from a file called **inserted\_prefixes**.
  3. Also, you have to write a function *prefix\_delete()* to delete a prefix. The prefixes to be deleted after inserting all the prefixes from files **routing\_table** and **inserted\_prefixes** are from a file called **deleted\_prefixes**.
  4. you have to write a function *search()* by giving an IP address to report if the search is successful or fails, using a **IP\_file**. Note IP **0010000000000001 0000110110111000 0...0** (96 0's) matches the above prefix but IP **0100000000000001 0000110110111111 0...0** does not.
  5. Finally, you have to report average numbers of search, insert, delete clock cycles , draw three figures as follows.

