York University Dept. of Computer Science and Engineering CSE2031 Homework 3 Due Dec. 8, 2009 5pm

In this lab you will implement a program similar to the internet routing program. It is called the longest matching prefix.

Consider an Internet router that receives packets and some how decides what to do with them based on the IP address of the destination. It has a routing table on the form

Destination Next-hop pairs

The data base might be something like that.

X N1

That means If the incoming packet has a value X in the IP address of the destination field, then send it to node N1

The IP address is on the form x.y.z.w where x,y,z, and w are numbers between 0 and 255 For example, it could be

129.14.7.2 that will be stored in a binary format in 4 bytes (32 bits) as follows 10000001000011100000010

The first (left-most) 8-bit are 10000001 is 129 in binaryThe second 8-bit are00001110 is 14 in binaryThe third 8-bit00000111 is 7 in binaryThe last 8-bit0000010 is 2 in binary

When a packet arrives, the destination field is extracted and compared to the one in the database in order to decide on the next node.

Longest Matching Prefix

The data base does not contain all values of IP addresses (that would require 2^{32} rules too much for any router). So we store partial values for IP addresses on the form 1010110* That matches any IP address that starts with 1010110 Assume that we have two entries in the routing table as follows 1010110* N1 101* N2 Now an arriving packet with destination IP address that starts with 1010110 will match both of these two entries. Which one to choose? The answer is simply **the longest matching prefix** i.e. choose the first entry since it has a matching length of 7 compared to 3 for the second one.

Specifications

Write a C program to perform the longest matching prefix. Inputs The inputs to your program are 2 files

Routing file

Routing file is a text file (../../routing) that contains 2 entries separated by a tab (each pair is on a separate line) such as 128.7.2.0/9 16The meaning of the first entry is as follows: the 128.7.2.0 in binary is 100000000001110000000000000 as we discussed before. Now what about the /9? That basically means consider the right-most 9 bits to be * which means the above address is on the form 100000000001110000001 * * * * * * * 16That matches any address that starts with the first 23 bits of the above address (the matching length is 23) the second entry (16) is the next-hop field, i.e. send the matching packet to node 16

Packet file

The packet file represents the destination address of the incoming pattern. That file is the standard input and contains records such as

92.34.18.93 127.2.1.0 168.17.26.19

and so on.

Your program should read the routing file from the location specified above), and the packet file from the standard input. Perform the matching, find the longest matching prefix and display the next-hop on the standard output as follows (write it as ("%d\n",i)

<mark>Output</mark>

The next hop number one number in a line followed by \n as stated above Example

16 23

1

1

If the input is not on the form x.w.z.w/A where A is less than or equal 32 then display "WRONG IP ADDRESS" followed by \n