CSCI-P 538 Spring 2018 Project 1: Parsing IP Addresses[1]

A Deadline

January 20, 2018 23:59 EDT. Any clarification queries should be posted via the Canvas Discussion board.

B Problem Description

In this mini project, you are asked to convert an IP address between its human-readable format and its internal representation. An IPv4 address is written in the form of $a.b.c.d$ where a, b, c, and d are numbers between 0 and 255 (inclusive). Therefore each number takes one byte (8 bits), and an IP address can be stored in a 4-byte (32-bit) unsigned integer x as follows.

For example, consider the IP address 192.168.0.1 where a=192, b=168, c=0, and d=1. x in its binary form is 11000000 10101000 00000000 00000001. The resultant decimal number is 3232235521 if big-endian is used (a on the most significant byte), or 16820416 if little-endian is used (a on the least significant byte).

You task is to write a program that performs the above conversion. Your program takes three input parameters p_1, p_2, and p_3.

- p_1 is either 0 or 1: 0 instructs your program to convert an IP address from human-readable representation to its internal format; 1 asks your program to perform conversion in the opposite direction.
- p_2 is the IP address to be converted, either in human-readable format (when p_1=0) or in internal decimal format (when p_1=1).
- p_3 is either 0 or 1 indicating the endianness of the internal format: 0 for little-endian and 1 for big-endian.

Your program must output a single line consisting of the conversion result – either the internal representation in decimal (when p_1=0) or the human-readable representation (when p_1=1). If the input data p_2 is invalid, your program must output a single line of "`ERROR`". Below are several input/output examples (assuming the executable is `a.out`).

[1] Created by Feng Qian

Example 1: `./a.out 0 192.168.0.1 1`

`3232235521`

Example 2: `./a.out 0 192.168.0.1 0`

`16820416`

Example 3: `./a.out 1 3232235521 1`

`192.168.0.1`

Example 4: `./a.out 1 16820416 0`

`192.168.0.1`

Example 5: `./a.out 0 256.1.1.1 0`

`ERROR`

Example 6: `./a.out 0 192.168.0 1`

`ERROR`

Example 7: `./a.out 1 -1 0`

`ERROR`

Example 8: `./a.out 1 21474836470 0`

`ERROR`

In Example 5 and 6, `256.1.1.1` and `192.168.0` are not legal IPv4 addresses, so both outputs are `ERROR`. Similarly, in Example 7 and 8, `-1` and `21474836470` are not valid internal representations (they are either negative or more than 32 bits). Therefore the outputs are also `ERROR`. You can assume p_1 and p_3 are always valid, and the input always consists of three parameters corresponding to p_1, p_2, and p_3. The only input that your program need to check is p_2.

C Submit Your Program

You must submit a single C/C++ source code file called `project1.c`, or `project1.cpp`. Do not upload the executable. Your program takes three arguments p_1, p_2, and p_3 as demonstrated in the above examples.

Please ensure that your code compiles and runs as expected on silo . We will be grading your assignments by running the program on silo, and failing to compile will only make grading difficult.

D Test and Grading

We use an automated system to test your program, so you need to make sure your output strictly conforms to the required format (*e.g.,* no additional white spaces, output "ERROR" instead of "Error" or "error"). The output is case-sensitive. In your program, you must write only to standard output (`stdout`), which is the screen by default. Failure to do so will force us to manually test your program, and as a result you will lose half of the points.

We will use 10 test cases to test your program. Each test case is worth 1 point. The total number of points for this project is 10. You have 1 second for each test case.

E Honor Code

Students must follow the IU honor code (`http://studentcode.iu.edu/`). This project is an individual assignment, and no collaboration among students is allowed. In no case may your code be copied from another student or a third-party source on Internet. We will use an anti-plagiarism software to detect code "shared" among students. Any violations of the honor code will be dealt with strictly, including but not limited to receiving no credit for the entire project.