

# 1 Client-Server with TCP/IP Socket version 1

## 1.1 Requirements:

A single serving example of a client-server application using TCP/IP Socket.

- Host name: localhost
- Well-known port number: 7777

### 1.1.1 Algorithm

- Write a C++ program that acts as a TCP/IP server.
  - Open a TCP/IP socket using localhost as the host name and port number 7777
  - Listen to a connection request
  - When a connection is established, read the content from the client.
  - Process the content and reply to the client with an appropriate message.
  - Close the connection.
  - If the terminate signal is FALSE, then `re-listen` again for another incoming connection. Otherwise, exit the program
- Write a C++ program that acts as a TCP/IP client.
  - Open a TCP/IP socket using localhost as the host name and port number 7777
  - Once connected, send a message to the server.
  - If the message is sent successfully, wait for a response from the server.
  - Print out the response from the server
  - Close the connection
  - Exit the program.

### 1.1.2 Content Format

The message exchanges between the client and the server must be formatted this way:

- The entire message/content must be in ASCII printable format.
- The first word will contain the length of the message that follows excluding the first encountered space. For example, the following message indicates 13 characters after the first space (i.e., `13 `):

```
13 Hello, World!
```

- If the message indicates an EXIT (i.e., `4 EXIT`), the server turn on the terminate signal. This will cause the server to exit.
- Both the client and the server must adhere to same content format when a message is sent between them. In other words, the server must follow the same format when responding to the client.

### 1.1.3 How server response

When the server receives a message, it responds by returning a line from one of the two poems in Appendix A. Which line to return? Take the length of the message and divides it by the length of the poem (i.e., the number of lines of the poem). Take the remainder as the line number of the poem and return that line to the client. Remember, to follow the message format appropriately.

## 2 Client-Server with TCP/IP Socket version 2

In the previous exercise (version 1 above), the server serves one client at a time. In this exercise, let's implement a way that we can serve multiple client concurrently. Use Unix `fork` to create a process upon a successful connection with a client. The server should spin off a process/thread to deal with the client that it just recently connected. It then, turn around and wait for a new coming connection.

## 2 Appendix A

- A poem from John Henry Newmann

MAN is permitted much  
To scan and learn  
In Nature's frame;  
Till he well-nigh can tame  
Brute mischiefs, and can touch  
Invisible things, and turn  
All warring ills to purposes of good.  
Thus, as a god below,  
He can control,  
And harmonize, what seems amiss to flow  
As sever'd from the whole  
And dimly understood.  
But o'er the elements  
One Hand alone,  
One Hand has sway.  
What influence day by day  
In straiter belt prevents  
The impious Ocean, thrown  
Alternate o'er the ever-sounding shore?  
Or who has eye to trace  
How the Plague came?  
Forerun the doublings of the Tempest's race?  
Or the Air's weight and flame  
On a set scale explore?  
Thus God has will'd  
That man, when fully skill'd,  
Still gropes in twilight dim;  
Encompass'd all his hours  
By fearfulest powers

Inflexible to him.  
That so he may discern  
His feebleness,  
And e'en for earth's success  
To Him in wisdom turn,  
Who holds for us the keys of either home,  
Earth and the world to come.

- A poem from Shakespeare

Round about the couldron go:  
In the poiones entrails throw.  
Toad,that under cold stone  
Days and nights has thirty-one  
Sweated venom sleeping got,  
Boil thou first in the charmed pot.  
Double,double toil and trouble;  
Fire burn and cauldron bubble.  
Fillet of a fenny snake,  
In the cauldron boil and bake;  
Eye of newt and toe of frog,  
Wool of bat and tongue of dog,  
Adder's fork and blindworm's sting,  
Lizard's leg and howlet's wing.  
For charm of powerful trouble,  
Like a hell-broth boil and bubble.  
Double,double toil and trouble;  
Fire burn and couldron bubble.  
Scale of dragon,tooth of wolf,  
Witch's mummy, maw and gulf  
Of the ravin'd salt-sea shark,  
Root of hemlock digg'd in the dark,  
Liver of blaspheming Jew;

Gall of goat; andslips of yew  
silver'd in the moon's eclipse;  
Nose of Turk, and Tartar's lips;  
Finger of birth-strangled babe  
Ditch-deliver'd by the drab,-  
Make the gruel thick and slab:  
Add thereto a tiger's chaudron,  
For ingrediants of our cauldron.  
Double,double toil and trouble,  
Fire burn and cauldron bubble.