Comp 8005 Asst #2

server performance

By: Peyman
& John Warren

For: Aman Abdulla

Due: March 5, 2017

Design Work

Due:

February 26, 1200 hrs. You may work in groups of two.
(extended to March 5 due to personal matters)

Objective:

To compare the scalability and performance of the select-, multi-threaded-, and epoll- based client-server implementations.

Requirements

Design and implement three separate servers:

1. A multi-threaded, traditional server
2. A select (level-triggered) multiplexed server
3. An epoll (edge-triggered) asynchronous server

all servers must
- handle multiple connections
- transfer specified data to connecgted client

echo client
- send variable length strings
- send configurable quantity of messages
- maintain connection
- **resultant** varying duration

Logging
- track when performance degrades
- track number of connections
- track turnaround time (performance) as load increases
- load vs performance
- maintain stats on both server and client
- multiple instances on multiple machines

Note that you will need to have the client maintain the connection for varying time durations (depending on how much data and iterations). The idea is to keep increasing the load on the server until its performance degrades quite significantly. In other words we want to measure how many (scalability) connections the server can handle, and how fast (performance) it can deliver the data back to the clients.

Restraints

- The server will maintain a list of all connected clients (host names) and store the list together with the number of requests generated by each client and the amount of data transferred to each client.

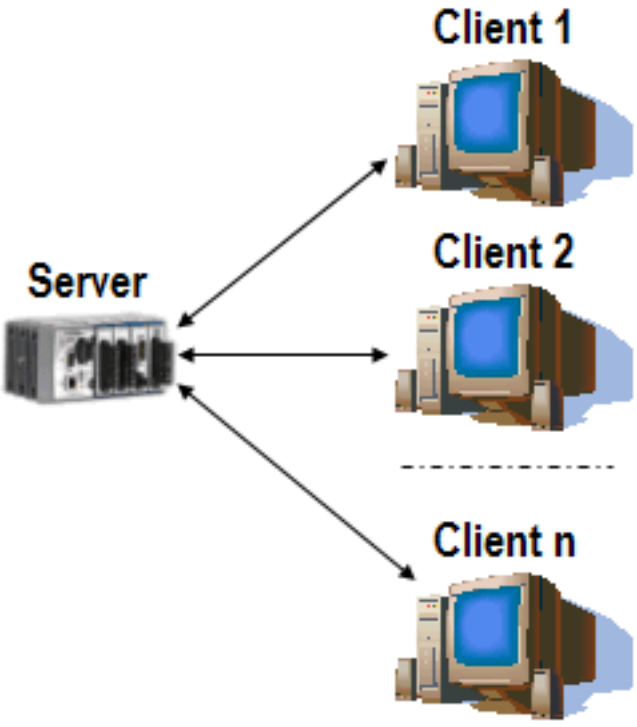
- Each client will also maintain a record of how many requests it made to the server, the amount of data sent to server, and the amount of time it took for the server to respond (i.e., echo the data back).

- You are required to summarize all your data and findings in a properly formatted technical report. Make extensive use of tables and graphs to support your findings and conclusions.

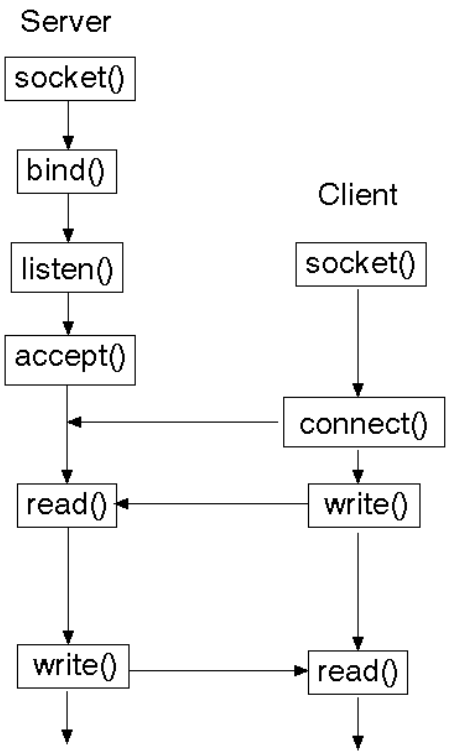
Additional Notes

have threads ready for connections don't make them as connections come in
use netstat to make sure that the connections aren't timed out
richard stevestons v1 chapter6 pool good place to start
nmap for checking network, less intensive than wireshark
strace -e trace=network

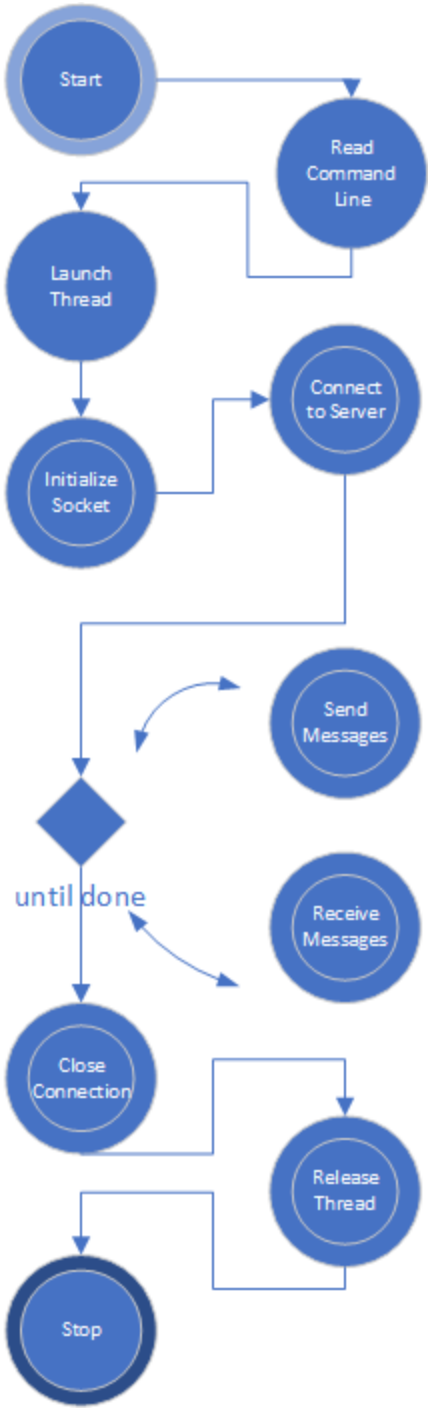
Diagrams



System Diagram

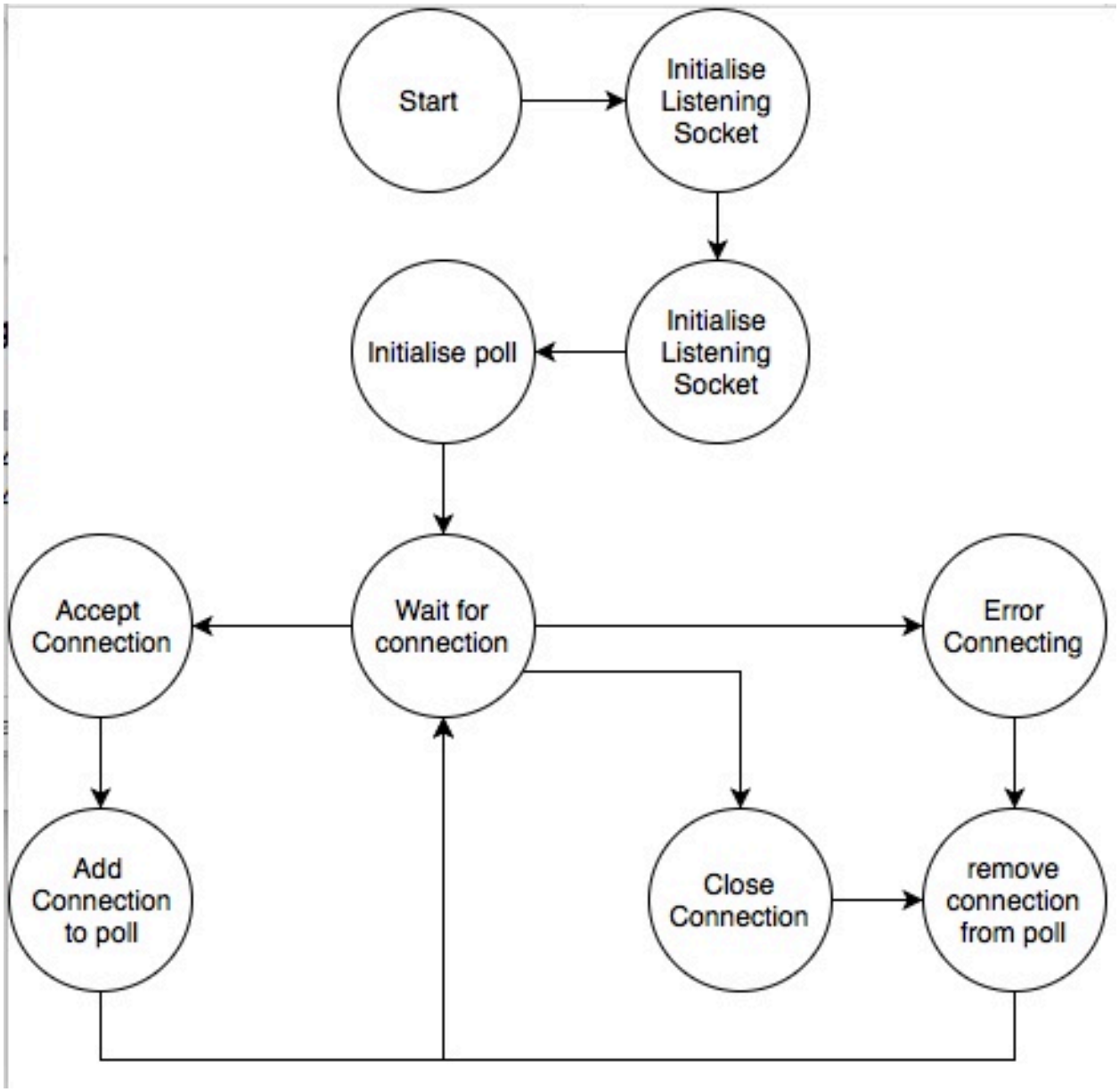


System Calls

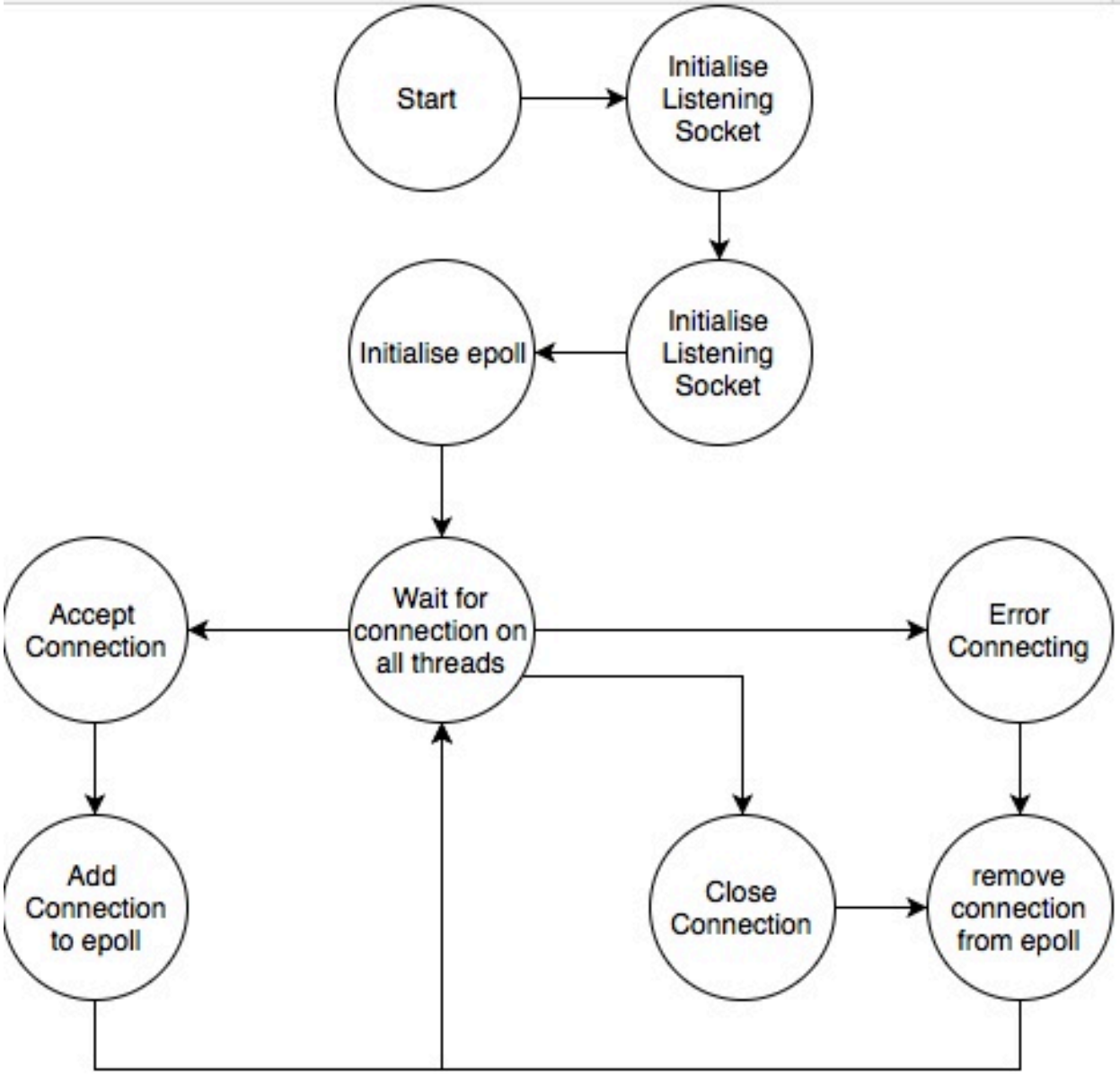


Client

Traditional – Threads


Start
Initialise Listening Socket
Initialise Listening Socket
Initialise poll
Accept Connection
Wait for connection
Error Connecting
Add Connection to poll
Close Connection
remove connection from poll

Select


Start
Initialise Listening Socket
Initialise Listening Socket
Initialise epoll
Wait for connection on all threads
Accept Connection
Error Connecting
Add Connection to epoll
Close Connection
remove connection from epoll

Epoll

Pseudo Code

Client

```
// INPUT: server-ip server-port sequence payload-size duration startup delay
// OUTPUT: client IP, client instance number, requests sent, total data sent, lowest
RTT, highest RTT, avgRTT
Initialize:
    build/define message
for i=1 to n-clients
    start thread
    build and configure socket,
    open connection,
    capture start time, determine end time = start time + duration
    while < end-time
        sendtime=now()
        send packet()
        listen
        receive packet()
        rcvtime=now()
        update times;
            latest = sendtime-rcvtime
            average += latest
            if latest < min then min=latest
            if latest > max then max=latest
        count++
    end while
    capture end time
    avg /= count
    log (client-number, end time - start time, (= total running time), requests-sent,
payload*count (=data-sent), min, max, avg)
    close connection
    close thread
end for
```

Threaded Server

Signal Server

```
create socket for listening for clients
create epoll struct
add socket to epoll

wait for epoll event
if error in event
       remove client from data strctires
if a file discriptor has data to read
       if it's a new connection
              make connection non blocking
              add connection to epoll
       else it's an message
              echo back
if event is we can write echo harder
```

ePoll Server

```
create socket for listening for clients
create epoll struct
add socket to epoll
```

```
on all physical threads
       wait for epoll event
       if error in event
              remove client from data strctires
       if a file discriptor has data to read
              if it's a new connection
                     make connection non blocking
                     add connection to epoll
              else it's an message
                     echo back
       if event is we can write echo harder
```

Test Plan

Results

Traditional / Threaded Server

Statistics

IO

Signal Server

Statistics
Summary created by Wireshark 2.4.4 (v2.4.4)

File:
  Name: /var/tmp/wireshark_any_20180302160504_OdXH6I.pcapng
  Length: 21720439338 bytes
  Format: Wireshark/... - pcapng
  Encapsulation: Linux cooked-mode capture

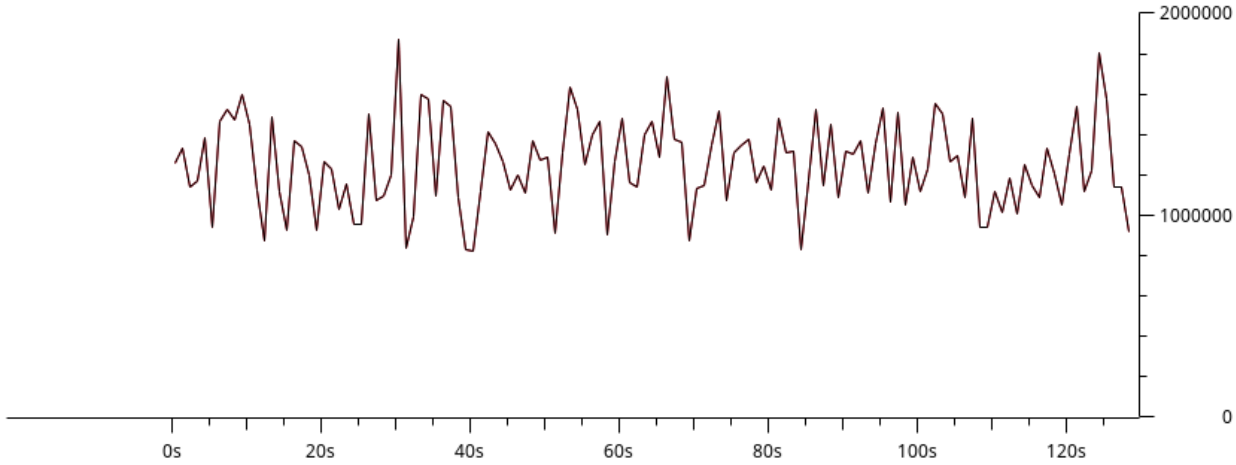
Time:
  First packet: 2018-03-02 16:05:04
  Last packet: 2018-03-02 16:12:18
  Elapsed: 00:07:13

Capture:
  Capture HW: Intel(R) Core(TM) i5-4590 CPU @ 3.30GHz (with SSE4.2)
  OS: Linux 4.15.3-300.fc27.x86_64
  Capture application: Dumpcap (Wireshark) 2.4.4 (v2.4.4)

  any:
    Dropped packets: 54264 (0.482%)
    Capture filter: none
    Link type: Linux cooked-mode capture
    Packet size limit 262144 bytes

Statistics:
  Packets: 11246609
  Between first and last packet:433.326 sec
  Avg. packets/sec: 25954.178
  Avg packet size: 1899.288 bytes
  Bytes: 21360544988
  Avg bytes/sec: 49294448.094
  Avg Mbit/sec: 394.356

IO



Epoll Server

Statistics
Summary created by Wireshark 2.4.4 (v2.4.4)

File:
  Name: /root/Documents/anaconda-ks.cfg2.pcapng
  Length: 247156550 bytes
  Format: Wireshark/... - pcapng
  Encapsulation: Linux cooked-mode capture

Time:
  First packet: 2018-03-02 15:30:32
  Last packet: 2018-03-02 15:46:43
  Elapsed: 00:16:10

Capture:
  Capture HW: Intel(R) Core(TM) i5-4590 CPU @ 3.30GHz (with SSE4.2)
  OS: Linux 4.15.3-300.fc27.x86_64
  Capture application: Dumpcap (Wireshark) 2.4.4 (v2.4.4)

  any:
    Dropped packets: unknown
    Capture filter: none
    Link type: Linux cooked-mode capture
    Packet size limit 262144 bytes

Statistics:
  Packets: 39011

Between first and last packet:970.510 sec
Avg. packets/sec: 40.196
Avg packet size: 6303.553 bytes
Bytes: 245907922
Avg bytes/sec: 253380.206
Avg Mbit/sec: 2.027

IO