

클라이언트의 IP Address와 Port를 출력하는 Iterative echo 서버 작성

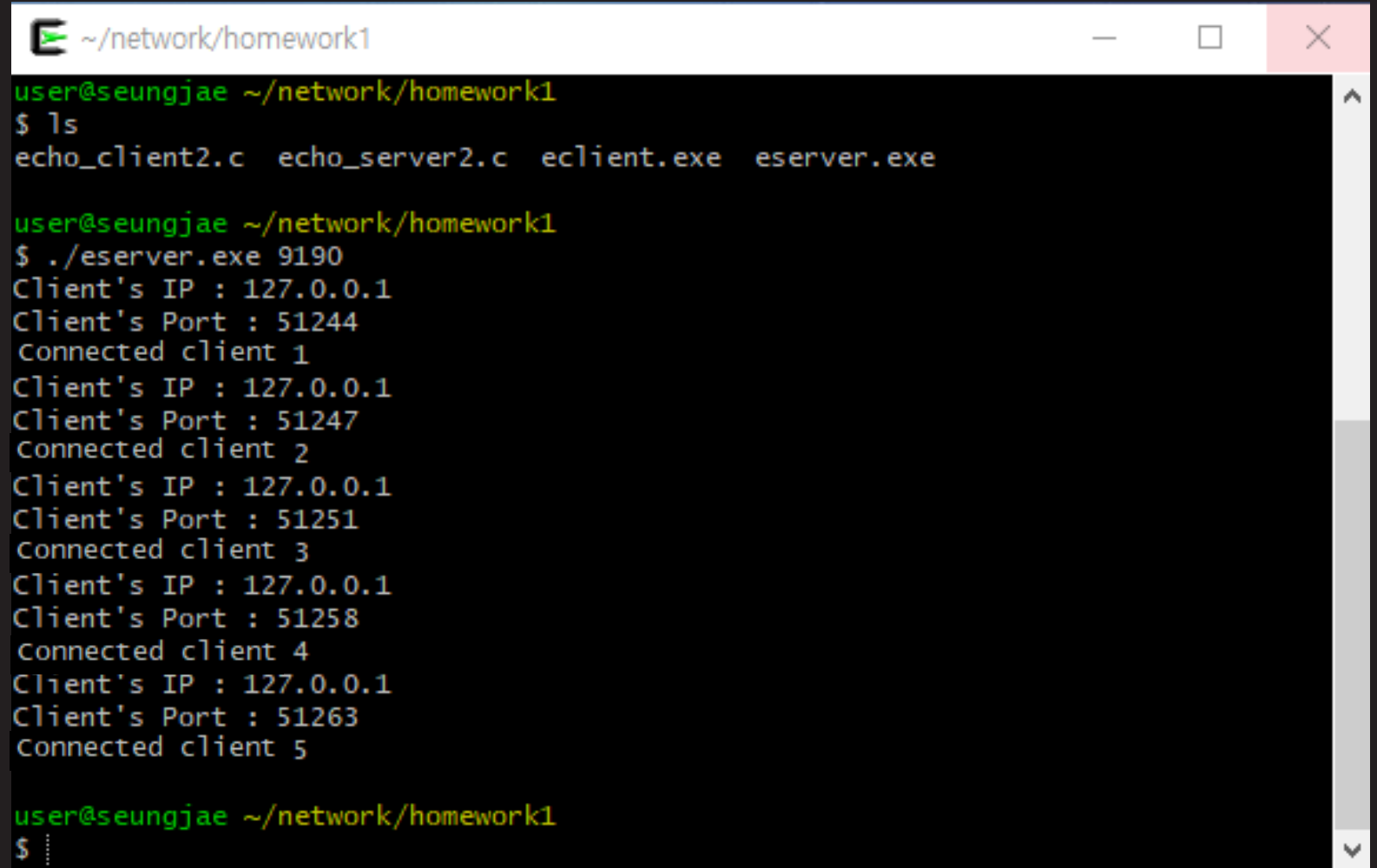
컴퓨터 네트워크

실습교재에 있는 에코 서버와 클라이언트를 이용하여 연결된 Client의 IP Address와 Port를 출력하는 Iterative 에코서버 작성

- 서버의 IP와 port를 출력하는것이 아닌, 서버에 연결된 클라이언트의 IP Address와 Port를 출력
- Iterative 회수는 5회
- echo client.c 파일은 수정하지 않아도 무방

결과 확인 (window - cygwin)

1. 서버 실행결과



```
~/network/homework1
user@seungjae ~/network/homework1
$ ls
echo_client2.c  echo_server2.c  eclient.exe  eserver.exe

user@seungjae ~/network/homework1
$ ./eserver.exe 9190
Client's IP : 127.0.0.1
Client's Port : 51244
Connected client 1
Client's IP : 127.0.0.1
Client's Port : 51247
Connected client 2
Client's IP : 127.0.0.1
Client's Port : 51251
Connected client 3
Client's IP : 127.0.0.1
Client's Port : 51258
Connected client 4
Client's IP : 127.0.0.1
Client's Port : 51263
Connected client 5

user@seungjae ~/network/homework1
$ ..
```

결과 확인 (window - cygwin)

2. 클라이언트의 실행 결과

5번 연결, 각각 Server와 echo message
(편의상 하나의 터미널에서 테스트)

```
~/network/homework1
user@seungjae ~/network/homework1
$ ls
echo_client2.c  echo_server2.c  eclient.exe  eserver.exe

user@seungjae ~/network/homework1
$ ./eclient.exe 127.0.0.1 9190
Connected.....
Input message(Q to quit): 1st Client
Message from server : 1st Client

Input message(Q to quit): Q

user@seungjae ~/network/homework1
$ ./eclient.exe 127.0.0.1 9190
Connected.....
Input message(Q to quit): 2nd Client
Message from server : 2nd Client

Input message(Q to quit): Q

user@seungjae ~/network/homework1
$ ./eclient.exe 127.0.0.1 9190
Connected.....
Input message(Q to quit): 3rd Client
Message from server : 3rd Client

Input message(Q to quit): Q

user@seungjae ~/network/homework1
$ ./eclient.exe 127.0.0.1 9190
Connected.....
Input message(Q to quit): 4th Client
Message from server : 4th Client

Input message(Q to quit): Q

user@seungjae ~/network/homework1
$ ./eclient.exe 127.0.0.1 9190
Connected.....
Input message(Q to quit): 5th Client
Message from server : 5th Client

Input message(Q to quit): Q

user@seungjae ~/network/homework1
$ |
```

결과 확인 (window - cygwin)

3-1. 명령어 netstat -nao | findstr [port] 입력

```
user@seungjae ~  
$ netstat -nao | findstr 9190  
TCP      0.0.0.0:9190      0.0.0.0:0        LISTENING      4572  
TCP      127.0.0.1:9190    127.0.0.1:51244   ESTABLISHED    4572  
TCP      127.0.0.1:51244   127.0.0.1:9190    ESTABLISHED    11792
```

-a : Displays all active TCP connections and the TCP and UDP ports on which the computer is listening.

-e : Displays Ethernet statistics, such as the number of bytes and packets sent and received. This parameter can be combined with **-s**.

-n : Displays active TCP connections, however, addresses and port numbers are expressed numerically and no attempt is made to determine names.

-o : Displays active TCP connections and includes the process ID (PID) for each connection. You can find the application based on the PID on the **Processes** tab in Windows Task Manager. This parameter can be combined with **-a**, **-n**, and **-p**.

findstr을 이용하여 해당 port Number를 포함한 결과만을 찾는다.

결과 확인 (Ubuntu)

3-2. 명령어 netstat -na | grep :[port] 또는 lsof -i :[port]

```
yuseungjae@yuseungjae-VirtualBox: ~/network/homework1
File Edit View Search Terminal Help

yuseungjae@yuseungjae-VirtualBox:~/network/homework1$ ls
echo_client2.c echo_server2.c eclient.exe eserver.exe
yuseungjae@yuseungjae-VirtualBox:~/network/homework1$ gcc echo_server2.c -o es
yuseungjae@yuseungjae-VirtualBox:~/network/homework1$ gcc echo_client2.c -o ec
yuseungjae@yuseungjae-VirtualBox:~/network/homework1$ ls
ec echo_client2.c echo_server2.c eclient.exe es eserver.exe
yuseungjae@yuseungjae-VirtualBox:~/network/homework1$ ./es 9190
Client's IP : 127.0.0.1
Client's Port : 32808
Connected cliend 1

```

```
yuseungjae@yuseungjae-VirtualBox: ~/network/homework1
File Edit View Search Terminal Help

yuseungjae@yuseungjae-VirtualBox:~/network/homework1$ ls
ec echo_client2.c echo_server2.c eclient.exe es eserver.exe
yuseungjae@yuseungjae-VirtualBox:~/network/homework1$ ./ec 127.0.0.1 9190
Connected.....
Input message(Q to quit): 1st Client
Message from server : 1st Client

Input message(Q to quit):

```

```
yuseungjae@yuseungjae-VirtualBox: ~
File Edit View Search Terminal Help

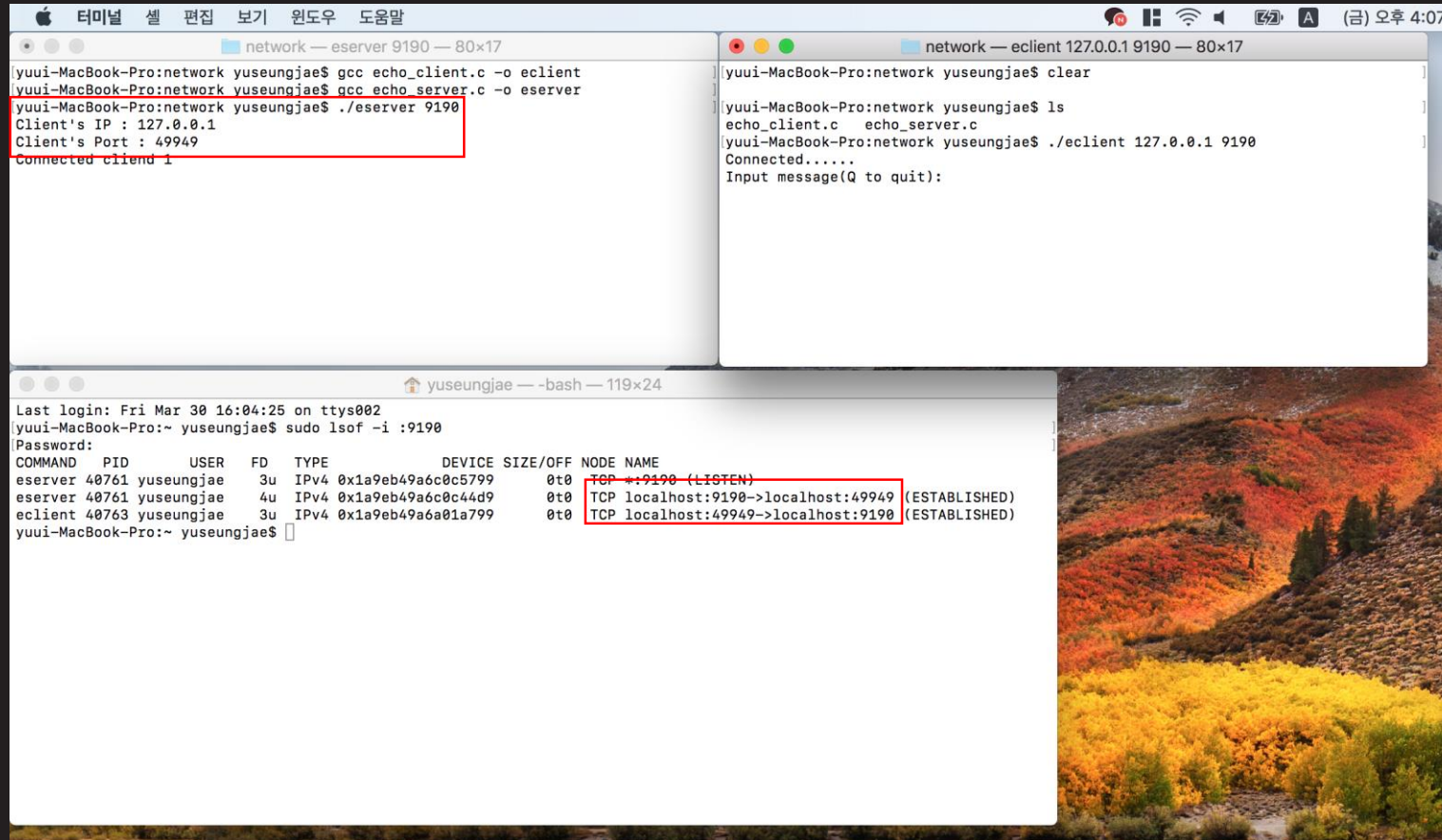
yuseungjae@yuseungjae-VirtualBox:~$ netstat -an | grep :9190
tcp        0      0 0.0.0.0:*          0.0.0.0:*          LISTEN
tcp        0      0 127.0.0.1:9190    127.0.0.1:32808    ESTABLISHED
tcp        0      0 127.0.0.1:32808  127.0.0.1:9190    ESTABLISHED
yuseungjae@yuseungjae-VirtualBox:~$ netstat -na | grep :9190
tcp        0      0 0.0.0.0:*          0.0.0.0:*          LISTEN
tcp        0      0 127.0.0.1:9190    127.0.0.1:32808    ESTABLISHED
tcp        0      0 127.0.0.1:32808  127.0.0.1:9190    ESTABLISHED
yuseungjae@yuseungjae-VirtualBox:~$

```

Grep 을 이용하여 해당 port Number를 포함한 결과만을 찾는다

결과 확인 (Mac)

3-3. 명령어 lsof -i :[port] 입력



The image shows three terminal windows on a Mac. The top-left window shows the compilation of 'echo_client.c' and 'echo_server.c' using 'gcc', and the execution of the server with './eserver 9190'. It displays the client's IP as 127.0.0.1 and port as 49949, and confirms the connection with 'Connected client 1'. The top-right window shows the client being cleared and then executed with './ecient 127.0.0.1 9190', showing 'Connected.....' and 'Input message(Q to quit):'. The bottom window shows the execution of 'sudo lsof -i :9190', displaying a table of network connections. The table has columns: COMMAND, PID, USER, FD, TYPE, DEVICE, SIZE/OFF, NODE, NAME. The connections shown are: 'eserver 40761 yuseungjae 3u IPv4 0x1a9eb49a6c0c5799 0t0 TCP *:9190 (LISTEN)', 'eserver 40761 yuseungjae 4u IPv4 0x1a9eb49a6c0c44d9 0t0 TCP localhost:9190->localhost:49949 (ESTABLISHED)', and 'ecient 40763 yuseungjae 3u IPv4 0x1a9eb49a6a01a799 0t0 TCP localhost:49949->localhost:9190 (ESTABLISHED)'. The 'localhost:9190' and 'localhost:49949' are highlighted with red boxes.

```
network — eserver 9190 — 80x17
[yuui-MacBook-Pro:network yuseungjae$ gcc echo_client.c -o eclient
[yuui-MacBook-Pro:network yuseungjae$ gcc echo_server.c -o eserver
[yuui-MacBook-Pro:network yuseungjae$ ./eserver 9190
Client's IP : 127.0.0.1
Client's Port : 49949
Connected client 1

network — eclient 127.0.0.1 9190 — 80x17
[yuui-MacBook-Pro:network yuseungjae$ clear
[yuui-MacBook-Pro:network yuseungjae$ ls
echo_client.c  echo_server.c
[yuui-MacBook-Pro:network yuseungjae$ ./ecient 127.0.0.1 9190
Connected.....
Input message(Q to quit):

yuseungjae — -bash — 119x24
Last login: Fri Mar 30 16:04:25 on ttys002
yuui-MacBook-Pro:~ yuseungjae$ sudo lsof -i :9190
Password:
COMMAND  PID   USER   FD   TYPE    DEVICE  SIZE/OFF  NODE NAME
eserver  40761 yuseungjae  3u  IPv4  0x1a9eb49a6c0c5799      0t0  TCP *:9190 (LISTEN)
eserver  40761 yuseungjae  4u  IPv4  0x1a9eb49a6c0c44d9      0t0  TCP localhost:9190->localhost:49949 (ESTABLISHED)
ecient   40763 yuseungjae  3u  IPv4  0x1a9eb49a6a01a799      0t0  TCP localhost:49949->localhost:9190 (ESTABLISHED)
yuui-MacBook-Pro:~ yuseungjae$
```

lsof -i :[port]

결과 확인 예시 (window 환경)

```
user@seungjae ~/network/homework1
$ ./eserver.exe 9190
Client's IP : 127.0.0.1
Client's Port : 51244
Connected client 1
Client's IP : 127.0.0.1
Client's Port : 51247
Connected client 2
Client's IP : 127.0.0.1
Client's Port : 51251
Connected client 3
Client's IP : 127.0.0.1
Client's Port : 51258
Connected client 4
Client's IP : 127.0.0.1
Client's Port : 51263
Connected client 5
```

프로토콜

로컬주소

외부주소

상태

PID

```
user@seungjae ~
$ netstat -nao | findstr 9190
TCP 0.0.0.0:9190 0.0.0.0:0 LISTENING 4572
TCP 127.0.0.1:9190 127.0.0.1:51244 ESTABLISHED 4572
TCP 127.0.0.1:51244 127.0.0.1:9190 ESTABLISHED 11792
```

```
user@seungjae ~
$ netstat -nao | findstr 9190
TCP 0.0.0.0:9190 0.0.0.0:0 LISTENING 4572
TCP 127.0.0.1:9190 127.0.0.1:51247 ESTABLISHED 4572
TCP 127.0.0.1:51244 127.0.0.1:9190 TIME_WAIT 0
TCP 127.0.0.1:51247 127.0.0.1:9190 ESTABLISHED 2800
```

```
user@seungjae ~
$ netstat -nao | findstr 9190
TCP 0.0.0.0:9190 0.0.0.0:0 LISTENING 4572
TCP 127.0.0.1:9190 127.0.0.1:51251 ESTABLISHED 4572
TCP 127.0.0.1:51244 127.0.0.1:9190 TIME_WAIT 0
TCP 127.0.0.1:51247 127.0.0.1:9190 TIME_WAIT 0
TCP 127.0.0.1:51251 127.0.0.1:9190 ESTABLISHED 4356
```

```
user@seungjae ~
$ netstat -nao | findstr 9190
TCP 0.0.0.0:9190 0.0.0.0:0 LISTENING 4572
TCP 127.0.0.1:9190 127.0.0.1:51258 ESTABLISHED 4572
TCP 127.0.0.1:51244 127.0.0.1:9190 TIME_WAIT 0
TCP 127.0.0.1:51247 127.0.0.1:9190 TIME_WAIT 0
TCP 127.0.0.1:51251 127.0.0.1:9190 TIME_WAIT 0
TCP 127.0.0.1:51258 127.0.0.1:9190 ESTABLISHED 1928
```

```
user@seungjae ~
$ netstat -nao | findstr 9190
TCP 0.0.0.0:9190 0.0.0.0:0 LISTENING 4572
TCP 127.0.0.1:9190 127.0.0.1:51263 ESTABLISHED 4572
TCP 127.0.0.1:51247 127.0.0.1:9190 TIME_WAIT 0
TCP 127.0.0.1:51251 127.0.0.1:9190 TIME_WAIT 0
TCP 127.0.0.1:51258 127.0.0.1:9190 TIME_WAIT 0
TCP 127.0.0.1:51263 127.0.0.1:9190 ESTABLISHED 10508
```

```
user@seungjae ~
$
```


제출 관련

[반드시 포함해야할 것]

1. 클라이언트의 IP주소와 Port를 출력하는 Iterative 에코 서버코드
2. 서버의 실행결과 캡처사진
3. 클라이언트의 실행결과 캡처 사진 (5개의 클라이언트 연결)
4. 서버가 출력하는 Port와 프로세스 확인 명령어를 이용한 결과 일치 사진 (5회 연결)

반드시 압축하여 제출 파일이름 :
[학번]_[이름].zip