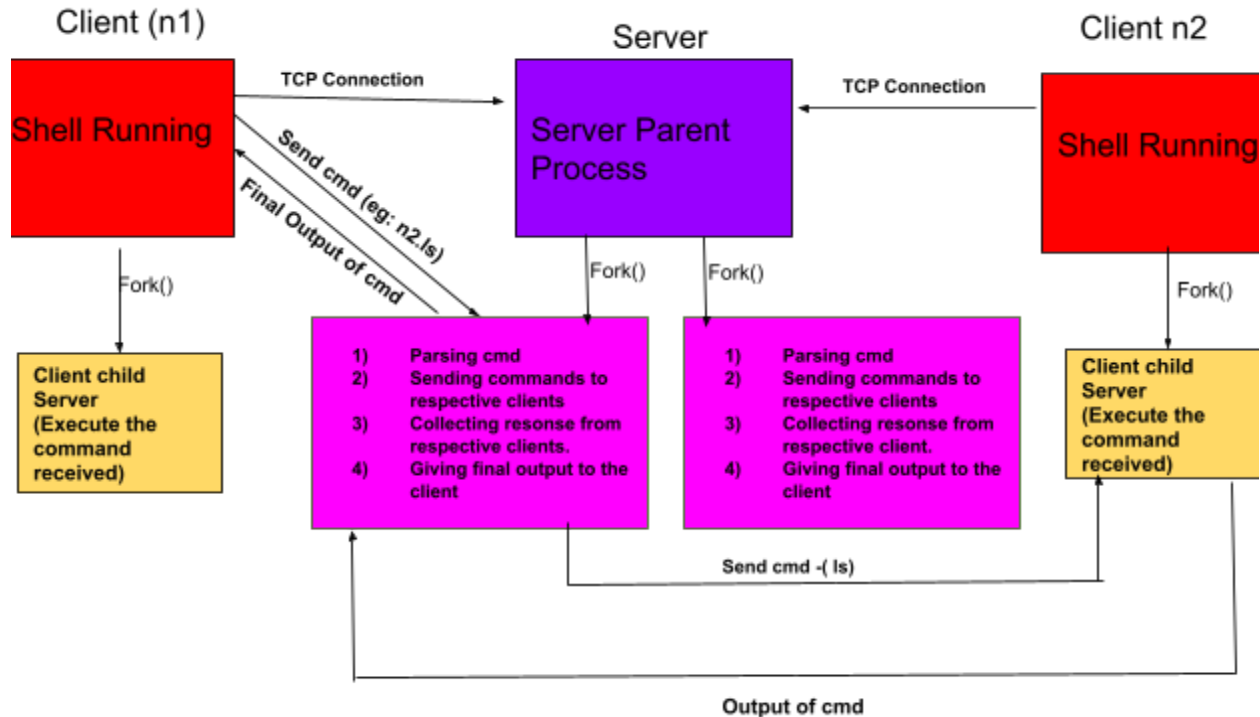# P2) Cluster Shell

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Design

In this project a shell feature is extended to a cluster of machines.

The design architecture of the system is illustrated in the following figure.

Server started : When the server is started, it creates a socket and start listening for TCP connections from clients. It works in a concurrent manner. A new tcp connection is assigned to a new child of the server process.

Client started: When a client is started, it establishes a TCP connection with the server. The server checks if the client is authorised or not. If not authenticated, the connection is closed.If authenticated, the shell is run.

Client also create a child process, which act as a client server to execute commands receiving from server child process.

Step by step working

Suppose in client n1 shell, following command is run: n2.ls

1) Shell of client n1 sends the command to server (n2.ls). After which the shell waits for the server to send a reply.

2) Server parses the commands which it receives from the client shell, with pipe(|) as a breaking point.

3) After parsing, the sub commands are sent to the individual client child server, with help of node name,ip mapping present in config file.

4) The client child server receives the command to be executed from the server. It executes the command with help of popen command and returns the output to the server.

5) The server combines the output as required and return the final result to client

6) The client receives the final output from the server, and prints it in the shell.

7) The shell is ready for the next command.

(Additional)

1)Also implemented double pipe (||) and triple pipe(|||) feature.

Eg n1.ls || n2.wc,n1.wc

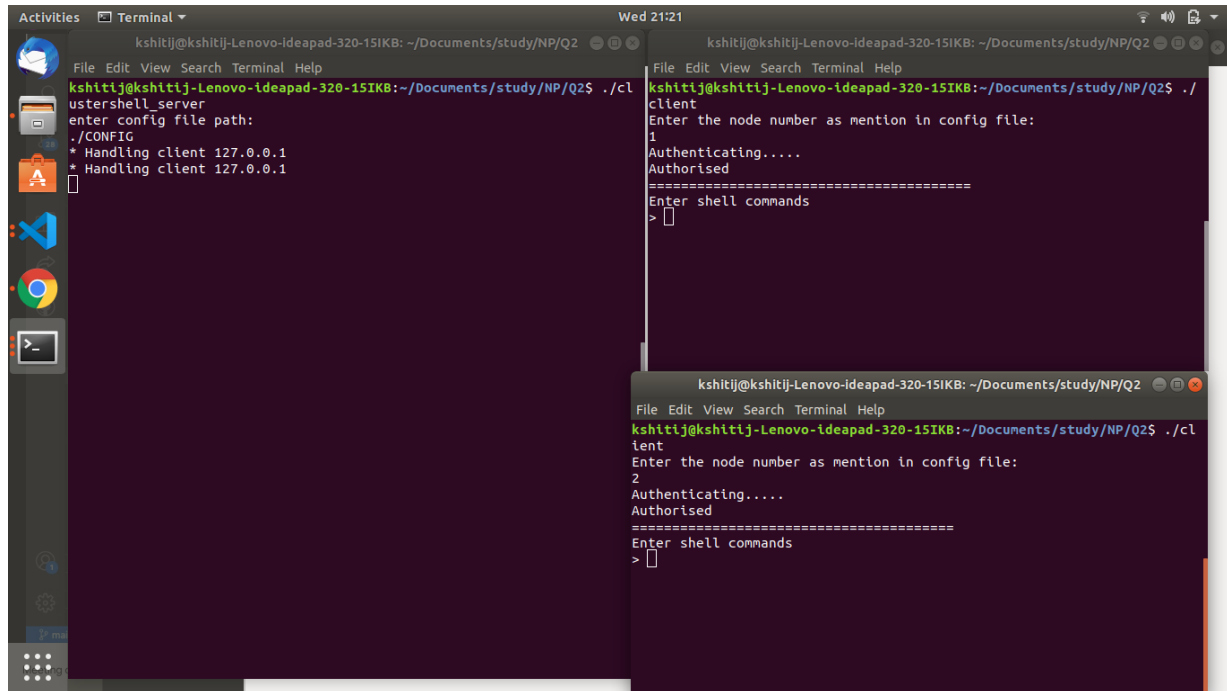2) Handled all the errors, if command is wrong or the node which is requested is not active.

3)For client to exit, please type "exit" or use Ctrl+c.

How to run

1. Use the Makefile to compile the server and client programs. Use the command → make
2. Open a new terminal and execute the server program using command → ./server
3. Open a new terminal for every new child and execute the child process using the command → ./child

Screenshots

1) Server started. Node 1 authorised and connected with server.
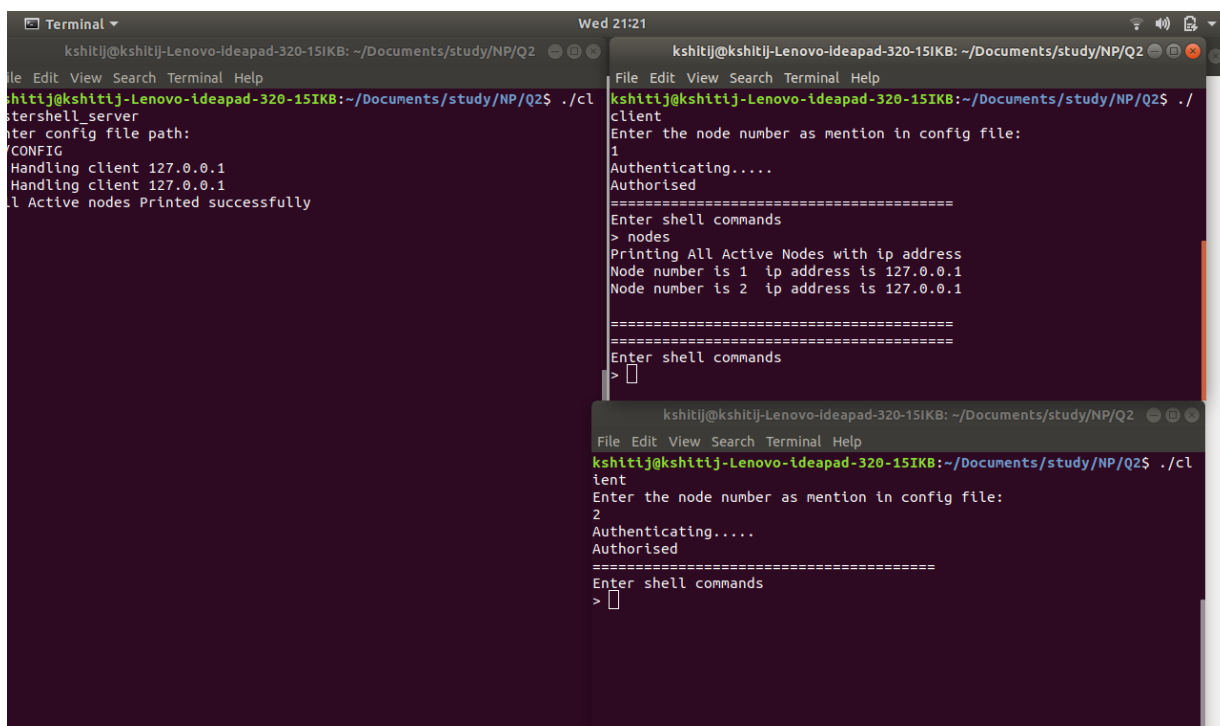
2) Node 2 connected with server.

"nodes" command executed on node 1

3) "n1.ls|n2.wc" command executed on node 1

   "ls" command executed on node 1

4) "ls" command executed on node 2.
   "n*.ls" command executed on node 1.

Top-left terminal:

kshitij@kshitij-Lenovo-ideapad-320-15IKB: ~/Documents/study/NP/Q2

File Edit View Search Terminal Help

```
kshitij@kshitij-Lenovo-ideapad-320-15IKB:~/Documents/study/NP/Q2$ ./cl
ustershell_server
enter config file path:
./CONFIG
* Handling client 127.0.0.1
* Handling client 127.0.0.1
All Active nodes Printed successfully
```

Top-right terminal:

kshitij@kshitij-Lenovo-ideapad-320-15IKB: ~/Documents/study/NP/Q2

File Edit View Search Terminal Help

```
Enter shell commands
> n1.ls|n2.wc
       9        9       95

========================================
========================================
Enter shell commands
> n*.ls
a1.txt
client
client.c
clustershell_server
clustershell_server.c
CONFIG
sample
server
server.c
a1.txt
client
client.c
clustershell_server
clustershell_server.c
CONFIG
sample
server
server.c

========================================
Enter shell commands
> n*.cd sample/
Directory changed successfully
Directory changed successfully

========================================
Enter shell commands
>
```

Middle terminal (top group):

kshitij@kshitij-Lenovo-ideapad-320-15IKB: ~/Documents/study/NP/Q2

File Edit View Search Terminal Help

```
========================================
Enter shell commands
> ls
a1.txt
client
client.c
clustershell_server
clustershell_server.c
CONFIG
sample
server
server.c

========================================
========================================
Enter shell commands
>
```

Bottom-left terminal:

kshitij@kshitij-Lenovo-ideapad-320-15IKB: ~/Documents/study/NP/Q2

File Edit View Search Terminal Help

```
kshitij@kshitij-Lenovo-ideapad-320-15IKB:~/Documents/study/NP/Q2$ ./cl
ustershell_server
enter config file path:
./CONFIG
* Handling client 127.0.0.1
* Handling client 127.0.0.1
All Active nodes Printed successfully
```

Bottom-right terminal:

kshitij@kshitij-Lenovo-ideapad-320-15IKB: ~/Documents/study/NP/Q2

File Edit View Search Terminal Help

```
> n*.ls
a1.txt
client
client.c
clustershell_server
clustershell_server.c
CONFIG
sample
server
server.c
a1.txt
client
client.c
clustershell_server
clustershell_server.c
CONFIG
sample
server
server.c

========================================
Enter shell commands
> n*.cd sample/
Directory changed successfully
Directory changed successfully

========================================
Enter shell commands
> n*.ls
b.txt
b.txt

========================================
Enter shell commands
>
```

Bottom-middle terminal (bottom group):

kshitij@kshitij-Lenovo-ideapad-320-15IKB: ~/Documents/study/NP/Q2

File Edit View Search Terminal Help

```
========================================
Enter shell commands
> ls
a1.txt
client
client.c
clustershell_server
clustershell_server.c
CONFIG
sample
server
server.c

========================================
Enter shell commands
>
```

kshitij@kshitij-Lenovo-ideapad-320-15IKB: ~/Documents/study/NP/Q2

File Edit View Search Terminal Help

```
kshitij@kshitij-Lenovo-ideapad-320-15IKB:~/Documents/study/NP/Q2$ ./cl
ustershell_server
enter config file path:
./CONFIG
* Handling client 127.0.0.1
* Handling client 127.0.0.1
All Active nodes Printed successfully
```

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File Edit View Search Terminal Help

```
clustershell_server
clustershell_server.c
CONFIG
sample
server
server.c

=====================================
=====================================
Enter shell commands
> n1.cd ..
Directory changed successfully

=====================================
Enter shell commands
>
```

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File Edit View Search Terminal Help

```
CONFIG
sample
server
server.c

=====================================
Enter shell commands
> n*.cd sample/
Directory changed successfully
Directory changed successfully

=====================================
Enter shell commands
> n*.ls
b.txt
b.txt

=====================================
Enter shell commands
> n1.cat a1.txt|n2.sort|n2.uniq
a clean fire licking at the evening
and hope...
are beeswax candles
burning with no smoke
its own melody that leads us
on the hour. The ritual is
 our voices small flames quivering.
The songs string us like beads
The songs we join in
where we have gone before

=====================================
Enter shell commands
>
```

kshitij@kshitij-Lenovo-ideapad-320-15IKB: ~/Documents/study/NP/Q2

File Edit View Search Terminal Help

```
kshitij@kshitij-Lenovo-ideapad-320-15IKB:~/Documents/study/NP/Q2$ ./cl
ustershell_server
enter config file path:
./CONFIG
* Handling client 127.0.0.1
* Handling client 127.0.0.1
All Active nodes Printed successfully
client setup doneclosing connection from server
```

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File Edit View Search Terminal Help

```
clustershell_server
clustershell_server.c
CONFIG
sample
server
server.c

=====================================
Enter shell commands
> n1.cd ..
Directory changed successfully

=====================================
Enter shell commands
>
```

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File Edit View Search Terminal Help

```
=====================================
Enter shell commands
> n*.cd sample/
Directory changed successfully
Directory changed successfully

=====================================
Enter shell commands
> n*.ls
b.txt
b.txt

=====================================
Enter shell commands
> n1.cat a1.txt|n2.sort|n2.uniq
a clean fire licking at the evening
and hope...
are beeswax candles
burning with no smoke
its own melody that leads us
on the hour. The ritual is
 our voices small flames quivering.
The songs string us like beads
The songs we join in
where we have gone before

=====================================
Enter shell commands
> exit
CLOSING node
=====================================
closing conectionkshitij@kshitij-Lenovo-ideapad-320-15IKB:~/Document
s/study/NP/Q2$
```