CMSI 3510 - Operating Systems
Dr. Johnson

Freeport

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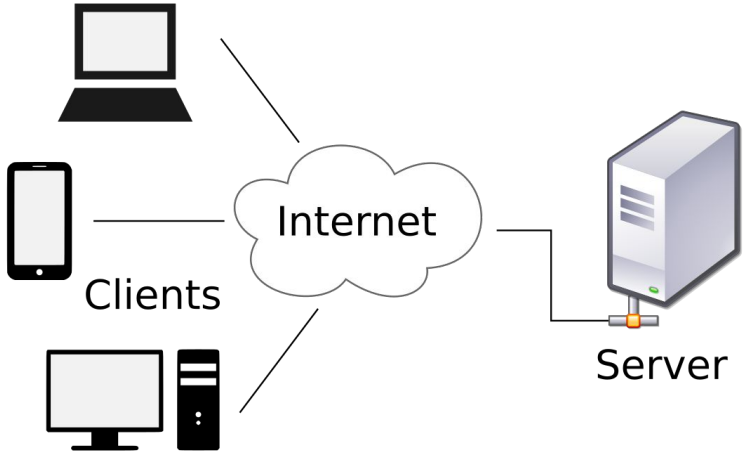
DESCRIPTION

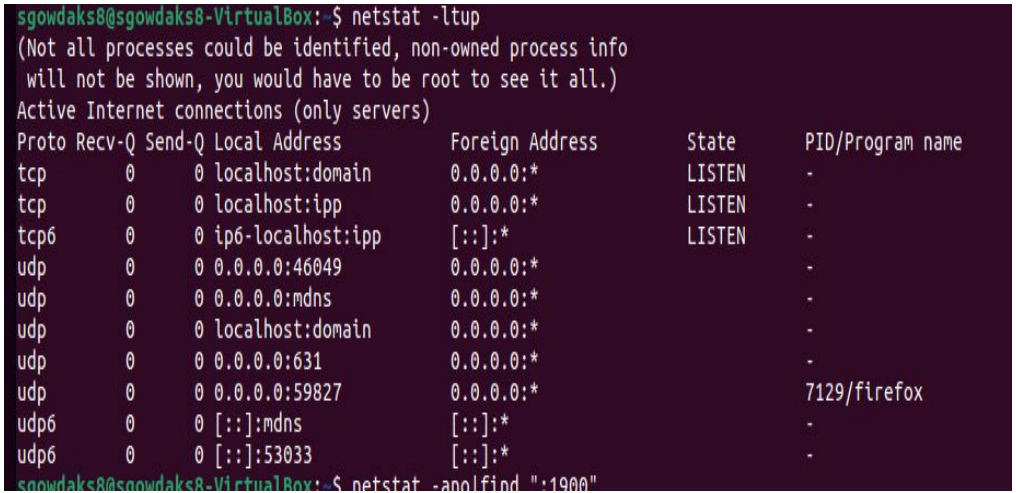
Free ports are needed for inter process communication. An example of this is client-server architecture where both client and server communicate with each other over a port.



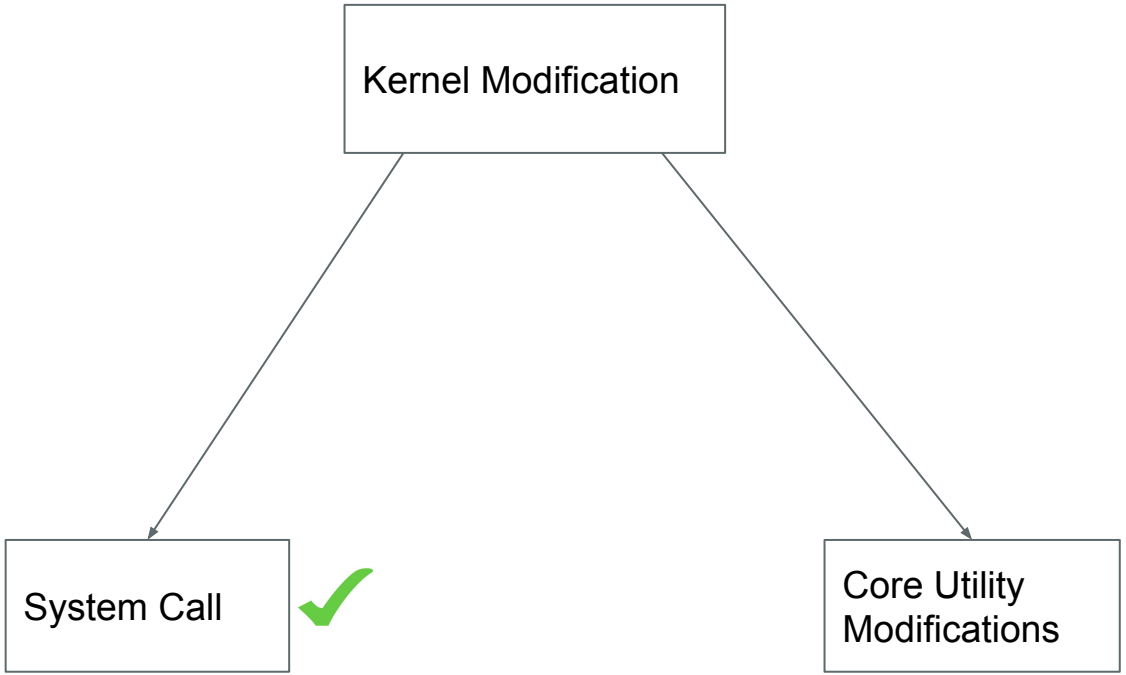
Background

Netstat commands usually provides all the ports that are occupied, but freeport gives one specific port that is available.

The freeport command will be helpful for users when launching web servers by letting the user know an exact port that is available.

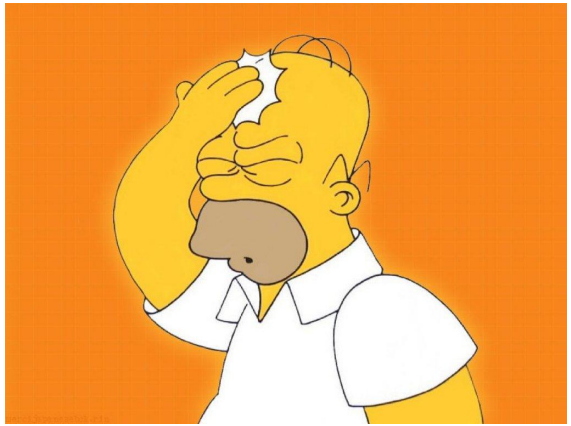


Approach


Kernel Modification
System Call
Core Utility Modifications

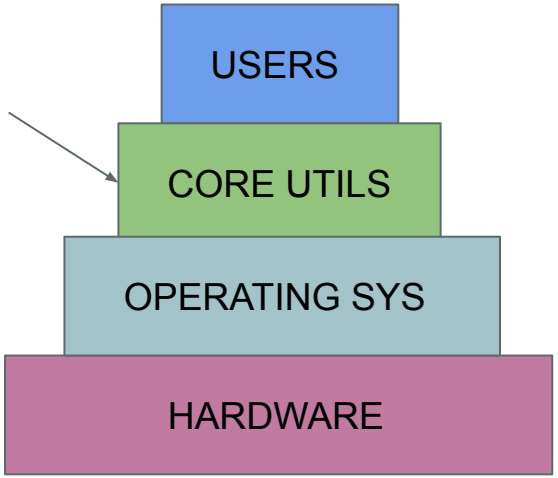
System Call

We came up with an idea to add a system call named freeport, and we also added a xyzzy system call which worked fine, but later that we realized that C libraries cannot be used inside a system call. We Wanted <sys/socket.h> library.



Core Utilities

- We decided to modify whoami command from coreutils.
- Simple and no side effects after modification.
-
```
(base) sg@sks:~$ whoami
sg
(base) sg@sks:~$
```



High level diagram

After modifying whoami.....


```
root@sgowdaks8-VirtualBox:/#
root@sgowdaks8-VirtualBox:/# /root/coreutils/bin/whoami
root
Opened fd 3
port number 35951
root@sgowdaks8-VirtualBox:/#
```

- The whoami command displayed the name and the free port that is not occupied.
- Idea behind the freeport: Trying to bind to port 0 makes the kernel allocate a free port.
- Demonstration and code review.

Problems faced

- After compiling the Kernel, when we tried to restart we just got back blank screen. We tried solving it but no use, So we decided to repeat the whole procedure again.
- Missing a semicolon or any line of code was disaster.
- While using -j3 (3 processors), somehow it was getting stuck in the middle and when we tried to run it again there were many files that were incomplete so we had to delete those files one by one.
- Some of the error messages were above the head and some of the error messages were solved automatically just with restart.

Useful Resources

- Dr. Johnson's build notes
- Stackoverflow, Stackexchange,
- Blogs from medium.com
- GNU organization https://www.gnu.org/
- Github coreutils scourcecode https://github.com/coreutils/coreutils

More?

Shell one-liner:

```
PORT=$(python -c 'import socket; s=socket.socket(); s.bind(("", 0)); print(s.getsockname()[1]); s.close()')
echo $PORT
```

Python

```python
import socket

s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
s.bind(('', 0))
addr = s.getsockname()
print(addr[1])
s.close()
```

Thank You!

Any questions?