Process and network management in Linux

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PROCESS MANAGEMENT

Introduction

Process = a running program

Each process has the following information:

- Process id (pid)
- Parent process id (ppid)
- Owner (uid) and group (gid)
- Command
- Standard input (stdin), standard output (stdout), standard error (stderr)
- CPU time and priority
- Current working directory of the process
- Reference table to used files

Processes are organised to share CPU using

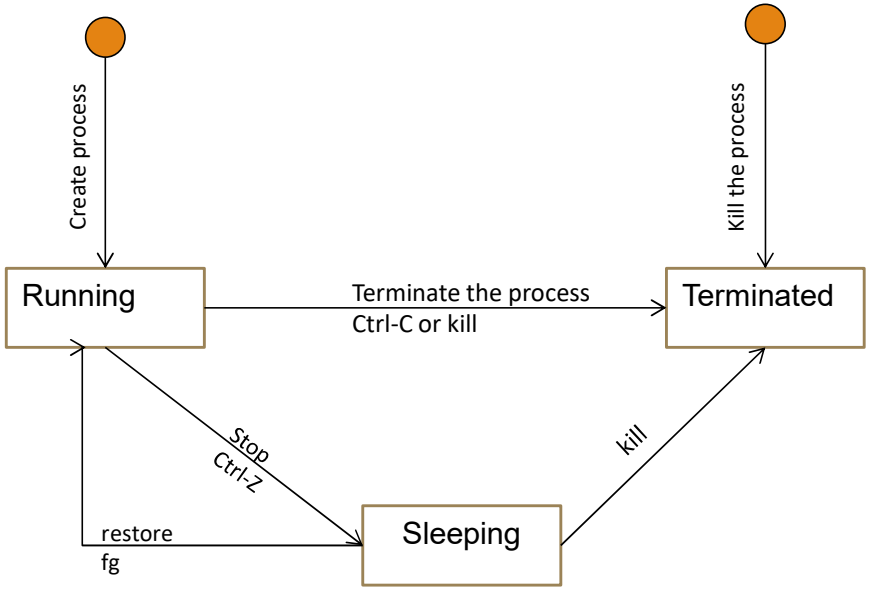
States of a process

S: Sleeping

R: Running

T: Terminted

Z: undefined



Process type (1)

System process

- Usually belongs to root
- No interactive interface
- Usually daemon one
- Purpose: general tasks, providing for everyone
- Example:
  - **lpsched**: manage printing service
  - **cron**: schedule command/ program.
  - **inetd**: manage networking service.

Process type(2)

User process

- Perform tasks of a specific user
  - Need to login before executing any tasks.
  - Is performed through a shell or GUI
- Usually being executed, managed by a terminal
- Example:
  - cp
  - vi
  - man
  - …

Command ps

Show the processes

- By default, only show the process belongs to the current user of the terminal.
- Use option aux to show all current running processes

```
$ ps
 PID TTY          TIME CMD
2803 pts/1    00:00:00 bash
2965 pts/1    00:00:00 ps
$ ps aux
USER   PID  %CPU  %MEM  VSZ   RSS  TTY   STAT START TIME COMMAND
root     1   0.1   0.1  1104  460   ?     S   15:26 0:03 init[3]
...
ttanh  951   0.0   0.3  1728  996  pts/0 S   16:09 0:00 bash
ttanh  953   0.0   1.9  6860 4916  pts/0 S   16:09 0:00 emacs
ttanh  966   0.0   0.3  2704 1000  pts/0 R   16:23 0:00 ps aux
...
```

Command kill

Send a signal to a process (ID of the process is one of parameters).

- By default, signal 15 will be sent (SIGTERM – terminate the process)
- Option -9: send the signal 9 (SIGKILL – kill the process)
- Option –l: list all available signals

Command killall: use to kill all processes by providing the name of a command.

Permission to terminate a process belongs to the owner of the process

Priority of a process

All processes have a default priority of zero (**0)**

Priority of a process ranges from -19 to +19

- Only root (or users with root privilege) can reduce the value of process priority
- Normal users can only increase the value of process priority (reduce the priority of a process)

Command **nice** allows to change/modify the priority of a process in execution of a program/process.

- $ nice [-n Value] [Command [Arguments ...]]

Command **renice** allows to change the priority of a process **after** starting a process.

Command top

Display and update the following information of current processes:

- CPU usage
- Memory usage including virtual memory
- Other information such as PID, PR, USER, TIME,…

$ top [–d] delay

- Option –d allows to determine the delay time between screen updates (seconds).

Command top also allows users to interact and manage processes (modify priority, send signals,…)

Foreground and background (1)

Foreground type: a process will be started as followed:

- « fork » is used to duplicate the parent process (it would be shell process if you enter a command)
- « wait » is run to put the parent process to sleep state
- « exec » is used to execute the child process.
- After finishing the child process, a « wake-up » signal is sent to the parent process.
- So, users cannot interact with the parent process while executing the child process.

Foreground and background (2)

If you want to interact with the parent process while running the child process, the child process need to be run as background type.

Example: $ emacs&

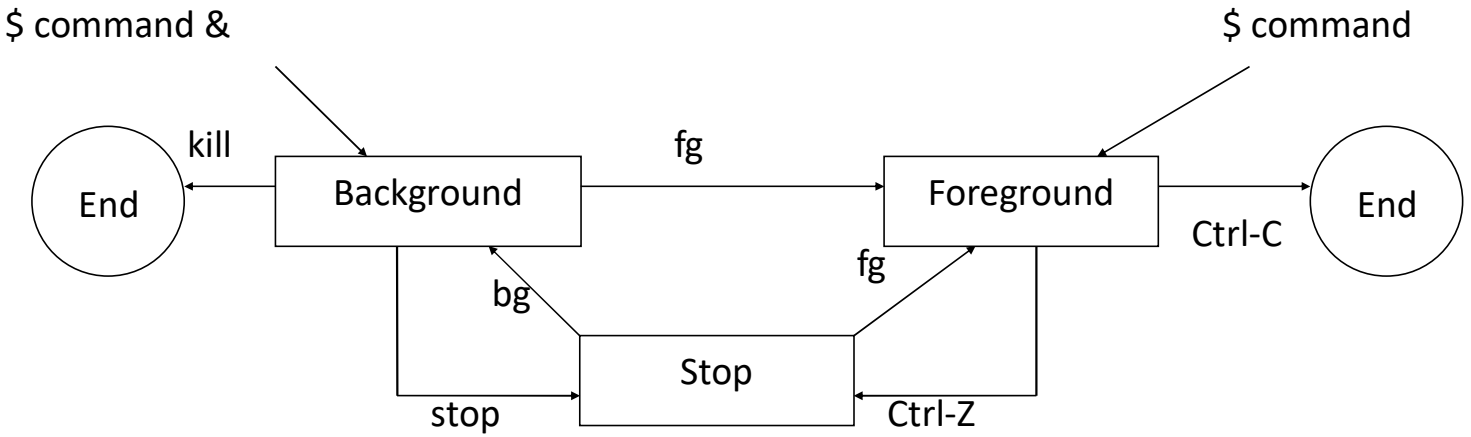
- After entering this command, emacs will run as a background process. Users can use the terminal to enter other commands.

Manage jobs/tasks

A job/task = exécution of a command. A job can relate to a group of process (one parent process and many child processes)

Can not have more than 1 foreground job

Can have multiple background tasks/jobs



Examples

```
$ emacs &
[1] 756
$ stop 756
# or $ stop %1
$ bg 756
# or $ bg %1
$ kill -9 756
# or $ kill %1
```

Run multiple commands

cmd1;cmd2

cmd1 && cmd2

cmd1 | cmd2

Execution types

Execute independent commands

- Use the character ";" to execute many consecutive and independent commands.
- `$cp public/* perso; rm -r public`

Execute dependent commands

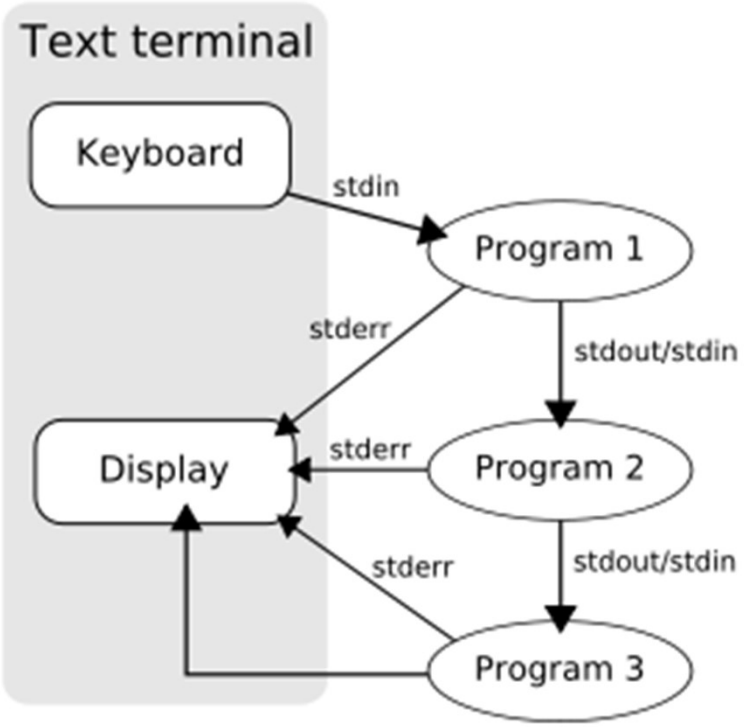
- Use the character **&&** to execute many consecutive and independent commands. The next command can only be executed after the previous command is finished without any errors.
- `$cp public/* perso && rm -r public`
- Use the character **||** to execute many consecutive and independent commands. The next command can only be executed after the previous command is finished without any errors.
- `$cp public/* perso || rm -r public`

Pipepline mechanism

Pipeline allows the output of the first command becoming the input of the second one

Pipeline can be established by using the character "|"

- $ cmd1 | cmd2



Change the standard input/output/error

Each process has :

- A standard input (default one is keyboard)
- A standard output (default one is terminal)
- A standard error (default one is terminal)

Change the standard input **(<)**

```
$ tee < test.txt
```

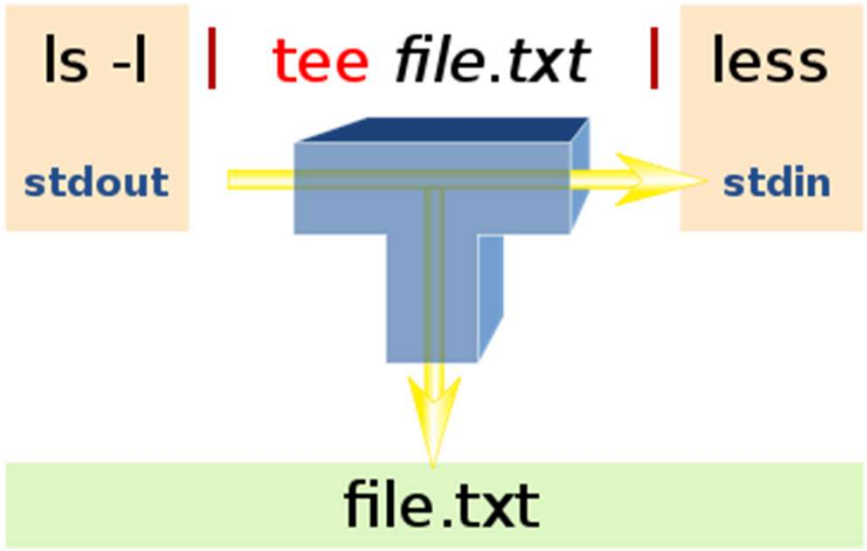
Change the standard output **(>, >>)**

```
$ ls > /dev/lp
$ ls >> test.txt
```

Change the standard error

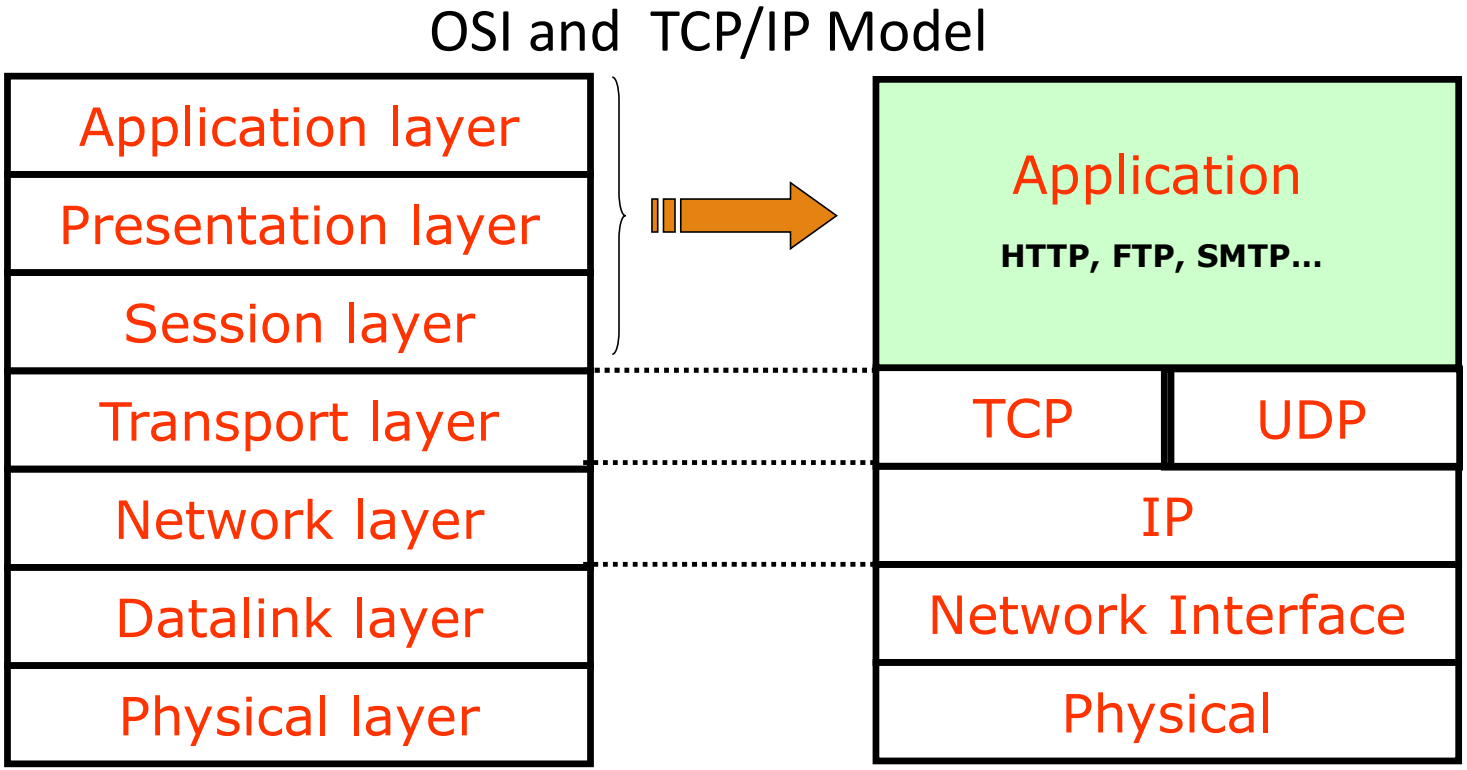
```
$ rm prog.c 2> /dev/null
$ gcc prog.c 2>> erreur.txt
```

tee command

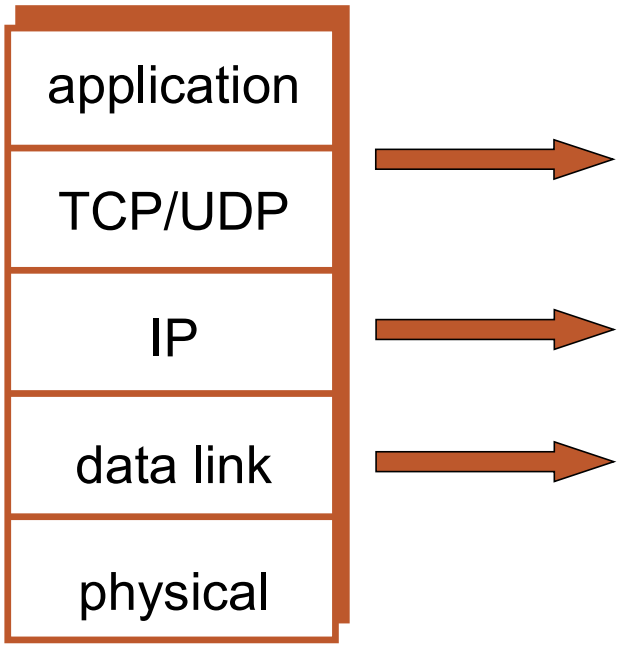


NETWORK MANAGEMENT

Remind the network knowledge



Remind the network knowledge



Port Number, e.g. Port 80

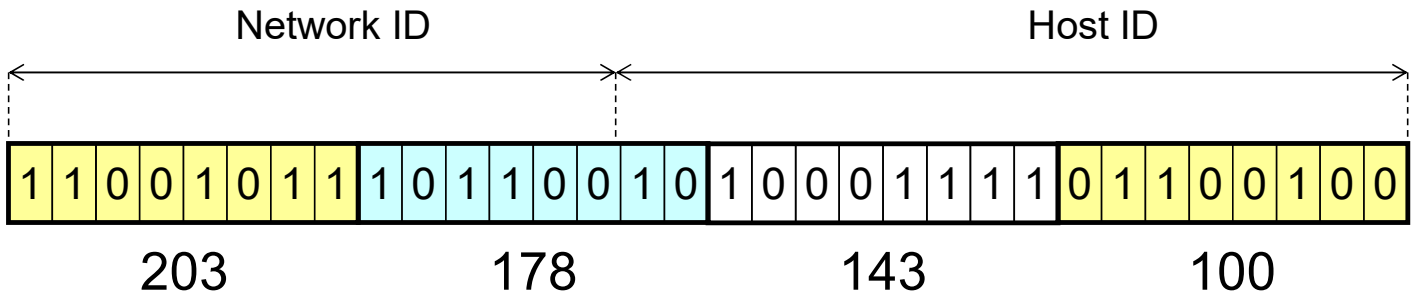
IP address, e.g. 203.12.15.165

Physical address / MAC address
e.g. 00:11:24:79:8e:82

Network ID (subnet) và Host ID (phần host)

IP Address has two parts

- Host ID
- Network ID



- How to distinguish Network ID and Host ID
  - Classes (A,B,C,D,E)
  - Netmask and subnet

Domain names

- The computer understands the number
- On the other hand, human can remember name easier than number

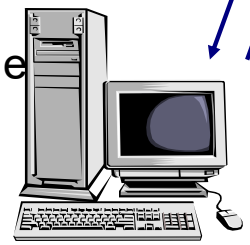
Necessity of name resolution

User

I want to see the website www.soict.hust.edu.vn

Please access to the server 202.47.142.40

Name server



WEB server
202.47.142.40

You can input the IP address instead of domain name

Network information

Configure network connection

- NIC: Network Interface Card.
- IP Address/Netmask
- Gateway

Configure domain names

- NIS, DNS, host

Check problems

Configuration files

Tên [illegible] NNT1	Ý nghĩa
/etc/init.d/network	Turn on/off/restart network service
/etc/network	Configure network service
/etc/sysconfig/network-script	Configure NIC
/etc/resolve.conf	Configure DNS
/etc/hosts	Reference host and name-ip
/etc/nsswitch	Configure which services are to be used to determine information such as hostnames, password files, and group files

NNT1 Kiểm tra lại với Ubuntu và CentOS mới, dịch vụ đã thay đổi

Nguyen Ngoc Tran, 20/10/2020

/etc/resolv.conf

Show DNS servers used to translate domain names

search *name-of-domain.com* - ***Name of your domain or ISP's domain if using their name server***

nameserver *XXX.XXX.XXX.XXX* - ***IP address of primary name server***

nameserver *XXX.XXX.XXX.XXX* - ***IP address of secondary name server***

/etc/hosts

contains a mapping of IP addresses to URLs

override the IP-address-to-URL mapping returned by a DNS server

127.0.0.1 *your-node-name.your-domain.com* localhost.localdomain localhost

XXX.XXX.XXX.XXX node-name

Check network configurations

Operation	Meaning
ping host-ip	NIC OK?
ping GW	Local network OK?
ping live public IP	Network configuration OK
ping live domain name	DNS configuration OK
telnet	Check remote services
Operation	**Information**
traceroute	Check the path of IP datagrams
ifconfig	Configure NIC
route	Routing tables
cat /etc/resolve.conf	DNS
hostname	Host names

Configure by using commands

Operation	Command
Set up IP address	ifconfig NIC-name IP netmask MASK
	Immediate change
Set up GW	route add default GW IP
	Immediate change
Turn off NIC	ifconfig en0sp3 down / ifdown en0sp3
Turn on NIC	ifconfig en0sp3 up / ifup en0sp3
Set up host name	hostname