The Wonderful World of Services

VINCE

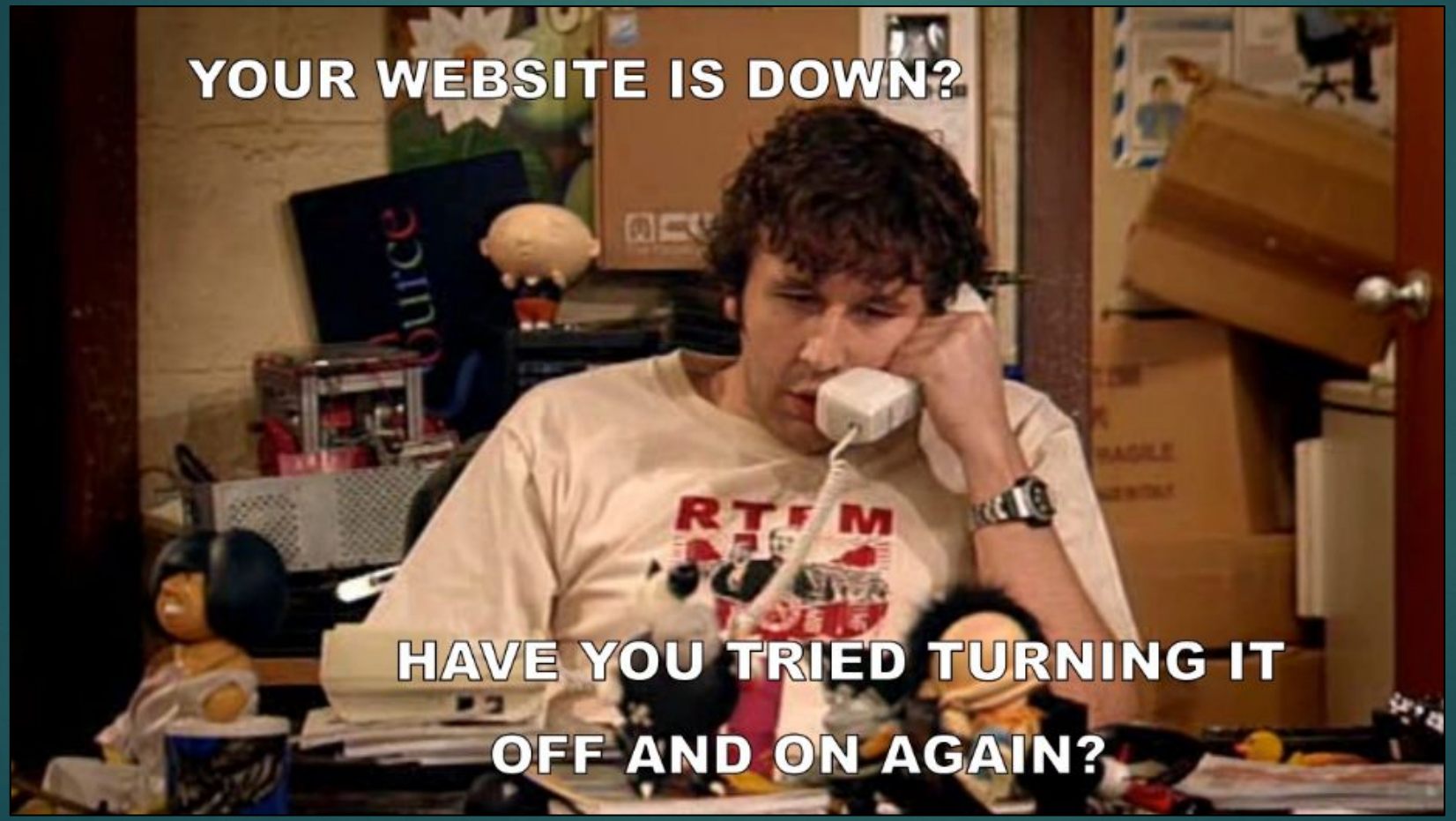
Agenda

- definitions
- services for Windows and Linux
- breaks?
- auditing Linux + I guess… Windows
- useful tools

Goals

- develop a better understanding of Linux and Windows
- services
- minor networking
- useful commands
- pick up some useful tools!

Services


YOUR WEBSITE IS DOWN?
HAVE YOU TRIED TURNING IT
OFF AND ON AGAIN?

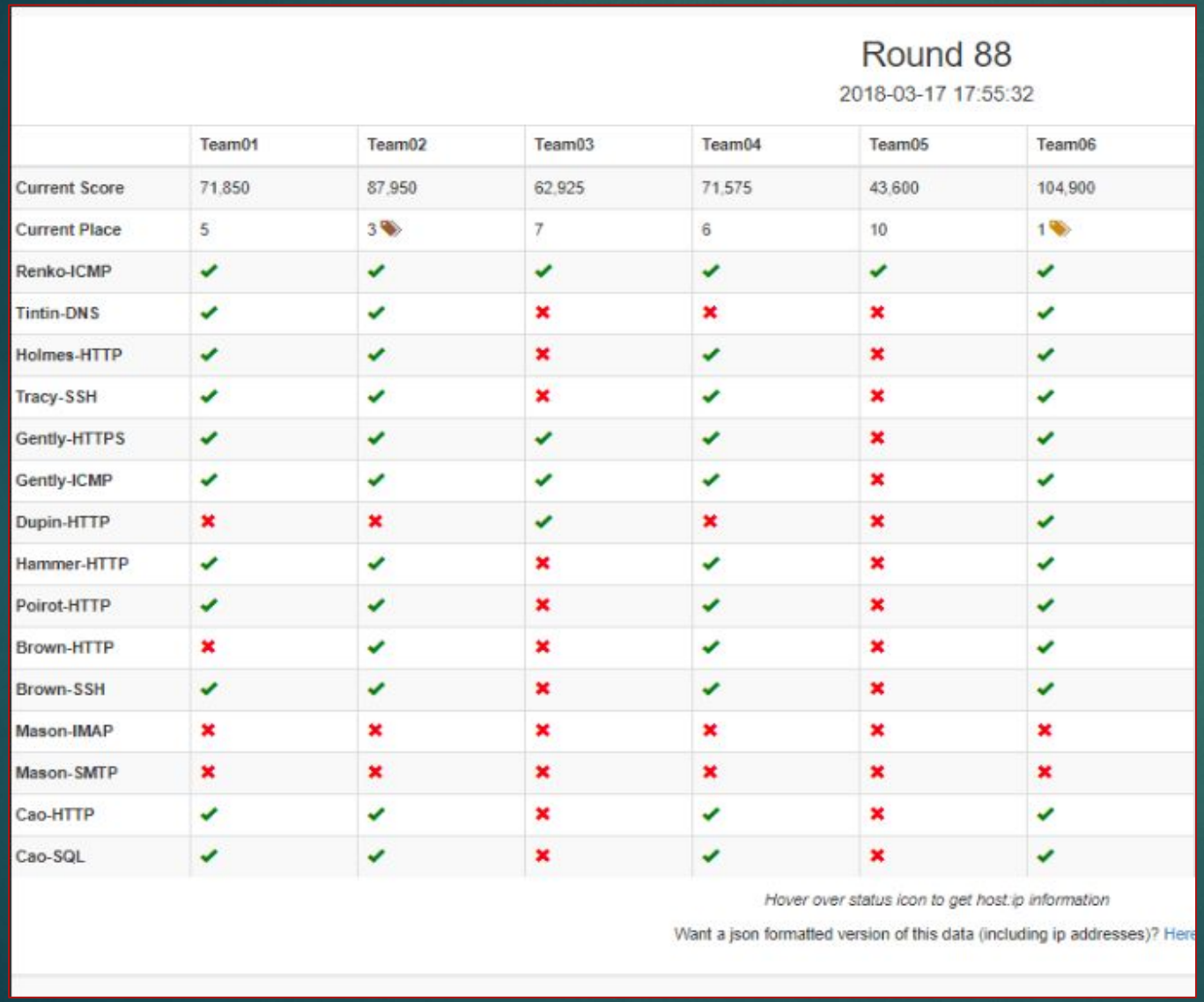
What is a service?

- an application (or set of applications) that runs in the background (usually)
- this application can enable your box to do a certain task, or carry out essential tasks
  - such as running a web server

Some common services

- **D**omain **N**ame **S**ystem (DNS)
- **S**ecure **S**hell (SSH)
- Databases – MySQL, MongoDB (Graylog uses this!)
- APACHE – cross-platform web server
- **FTP** – File Transfer Protocol

NECCDC 2018 Services



Round 88

2018-03-17 17:55:32

	Team01	Team02	Team03	Team04	Team05	Team06
Current Score	71,850	87,950	62,925	71,575	43,600	104,900
Current Place	5	3	7	6	10	1
Renko-ICMP	✔	✔	✔	✔	✔	✔
Tintin-DNS	✔	✔	✖	✖	✖	✔
Holmes-HTTP	✔	✔	✖	✔	✖	✔
Tracy-SSH	✔	✔	✖	✔	✖	✔
Gently-HTTPS	✔	✔	✔	✔	✖	✔
Gently-ICMP	✔	✔	✔	✔	✖	✔
Dupin-HTTP	✖	✖	✔	✖	✖	✔
Hammer-HTTP	✔	✔	✖	✔	✖	✔
Poirot-HTTP	✔	✔	✖	✔	✖	✔
Brown-HTTP	✖	✔	✖	✔	✖	✔
Brown-SSH	✔	✔	✖	✔	✖	✔
Mason-IMAP	✖	✖	✖	✖	✖	✖
Mason-SMTP	✖	✖	✖	✖	✖	✖
Cao-HTTP	✔	✔	✖	✔	✖	✔
Cao-SQL	✔	✔	✖	✔	✖	✔

Hover over status icon to get host:ip information

Want a json formatted version of this data (including ip addresses)? Here

Services operate over ports

Internet Applications

Use this table as a review tool to help you remember each Internet application:

Application	TCP/UDP	Port	Notes
HTTP	TCP	80	The Web
HTTPS	TCP	443	The Web, securely
Telnet	TCP	23	Terminal emulation
SSH	TCP	22	Secure terminal emulation
SMTP	TCP	25	Sending e-mail
POP3	TCP	110	E-mail delivery
IMAP4	TCP	143	E-mail delivery
FTP	TCP	20/21 (active), 21 (passive)	File transfer
TFTP	UDP	69	File transfer

We can use **nmap** to check ports and services!

- We know a lot about **nmap** around these parts…

```
os-class@vince:~$ nmap reddit.com

Starting Nmap 7.01 ( https://nmap.org ) at 2018-
03-25 00:43 EDT
Nmap scan report for reddit.com (151.101.65.140)
Host is up (0.034s latency).
Other addresses for reddit.com (not scanned): 15
1.101.129.140 151.101.1.140 151.101.193.140
Not shown: 995 filtered ports
PORT     STATE SERVICE
21/tcp   open  ftp
80/tcp   open  http
443/tcp  open  https
554/tcp  open  rtsp
7070/tcp open  realserver

Nmap done: 1 IP address (1 host up) scanned in 4
.55 seconds
os-class@vince:~$
```

Switch	Example	Description
-sV	nmap 192.168.1.1 -sV	Attempts to determine the version of the service running on port

SOURCE: https://www.stationx.net/nmap-cheat-sheet/

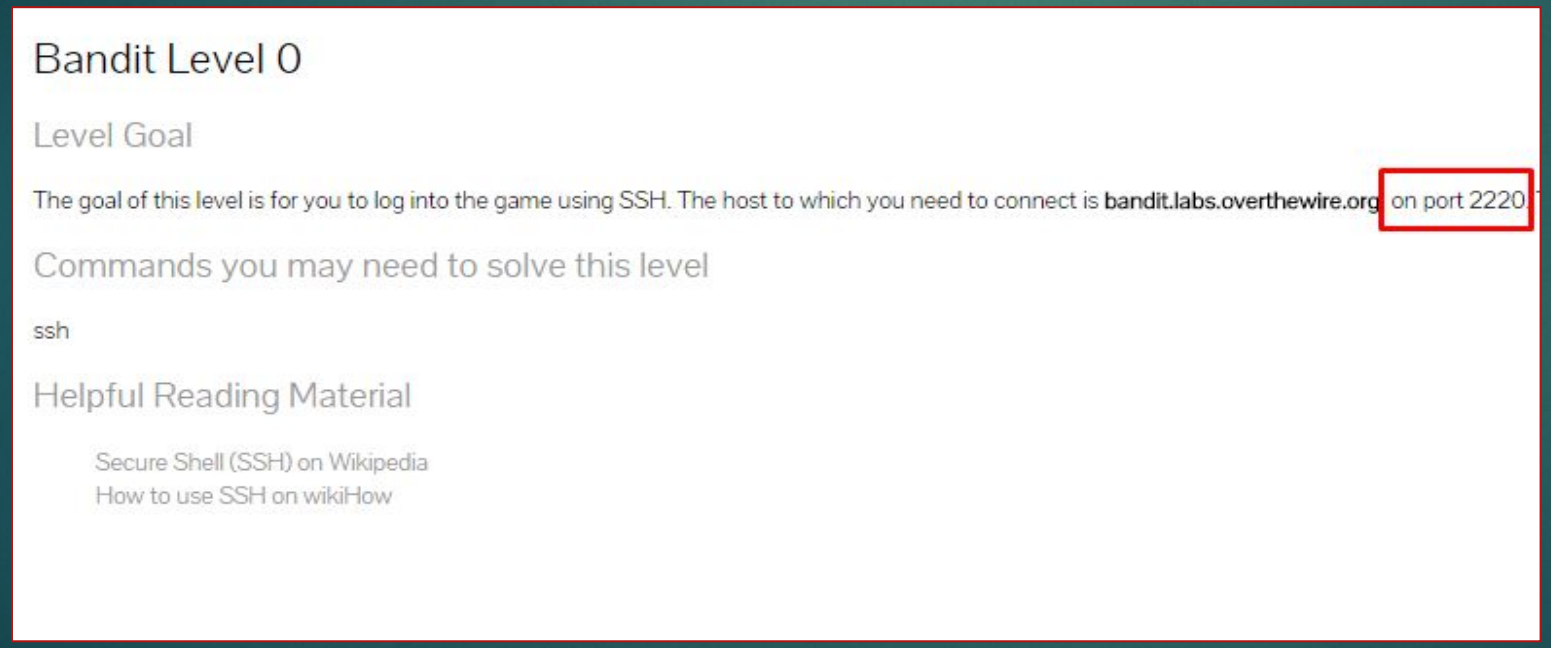
```
os-class@vince:~$ nmap -sV 10.0.1.51

Starting Nmap 7.01 ( https://nmap.org ) at 2018-03-25 00:58 EDT
Nmap scan report for 10.0.1.51
Host is up (0.0018s latency).
Not shown: 978 closed ports
PORT     STATE SERVICE     VERSION
21/tcp   open  ftp         vsftpd 2.3.4
22/tcp   open  ssh         OpenSSH 4.7p1 Debian 8ubuntu1 (protocol 2.0)
23/tcp   open  telnet      Linux telnetd
25/tcp   open  smtp        Postfix smtpd
80/tcp   open  http        Apache httpd 2.2.8 ((Ubuntu) DAV/2)
111/tcp  open  rpcbind     2 (RPC #100000)
139/tcp  open  netbios-ssn Samba smbd 3.X (workgroup: WORKGROUP)
445/tcp  open  netbios-ssn Samba smbd 3.X (workgroup: WORKGROUP)
512/tcp  open  exec        netkit-rsh rexecd
513/tcp  open  login?
514/tcp  open  tcpwrapped
1099/tcp open  rmiregistry GNU Classpath grmiregistry
1524/tcp open  shell       Metasploitable root shell
2049/tcp open  nfs         2-4 (RPC #100003)
2121/tcp open  ftp         ProFTPD 1.3.1
3306/tcp open  mysql       MySQL 5.0.51a-3ubuntu5
5432/tcp open  postgresql  PostgreSQL DB 8.3.0 - 8.3.7
5900/tcp open  vnc         VNC (protocol 3.3)
6000/tcp open  X11         (access denied)
6667/tcp open  irc         Unreal ircd
8009/tcp open  ajp13       Apache Jserv (Protocol v1.3)
8180/tcp open  http        Apache Tomcat/Coyote JSP engine 1.1
Service Info: Hosts:  metasploitable.localdomain, localhost, irc.Metasploitable.LAN; OSs: Unix, L

Service detection performed. Please report any incorrect results at https://nmap.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 14.79 seconds
os-class@vince:~$
```

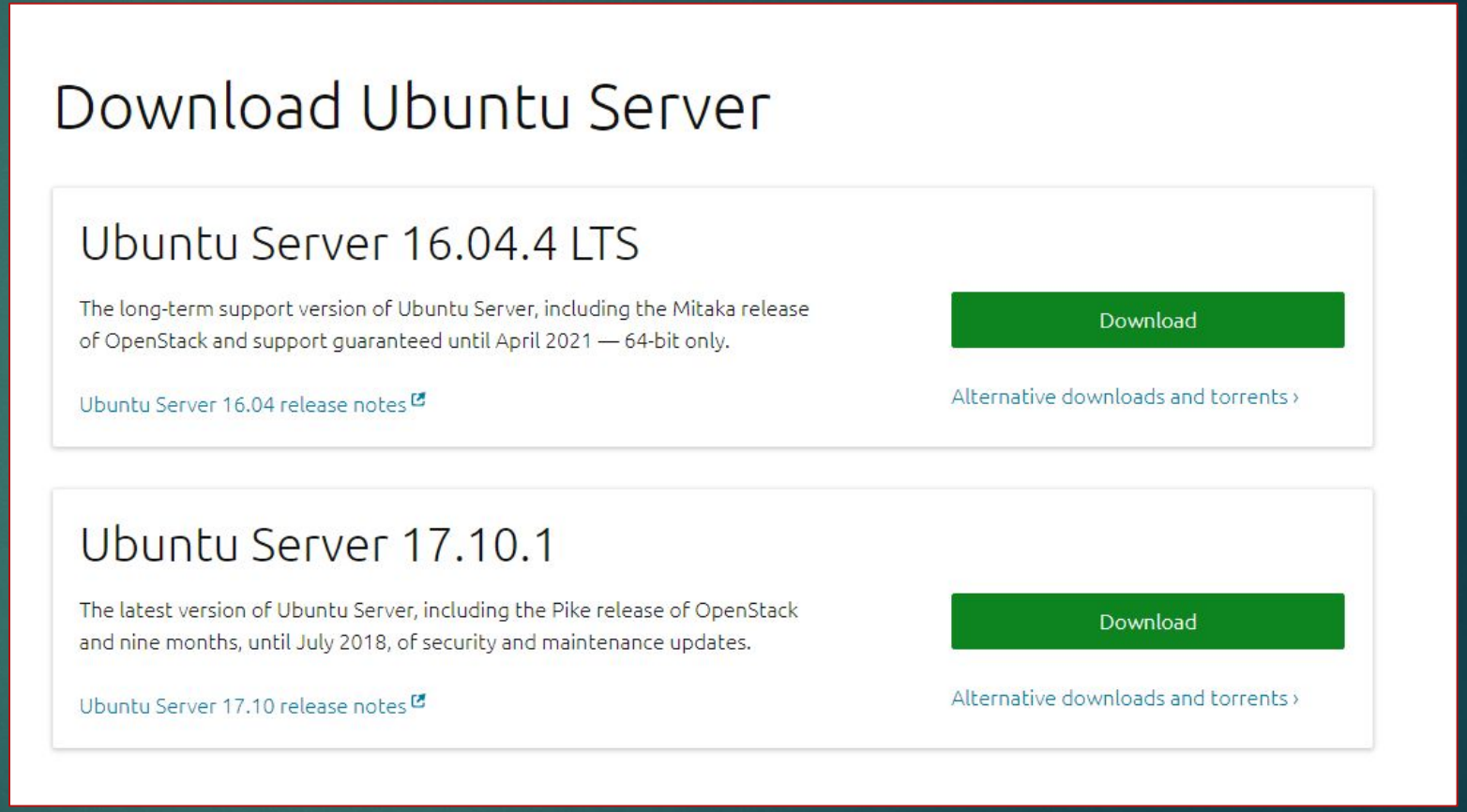
Why do we need to know ports?

- if you are setting up your Firewall, it's important to make sure you allow traffic over that port
- you can always change the port (config files)
- for example OverTheWire runs SSH over a different port



Services and Operating Systems

- server-oriented operating systems are good for services
- as you guys know there is Windows Server 20XX, you can use this… but no one likes Windows so, why?



What service(s) are on my box?

Managing Services	Ubuntu Version >= 15.04
	`systemctl {start|stop|...} {service_name}.service`
	
	Ubuntu Version < 15.04
	`service {service_name} {start|stop|....}`

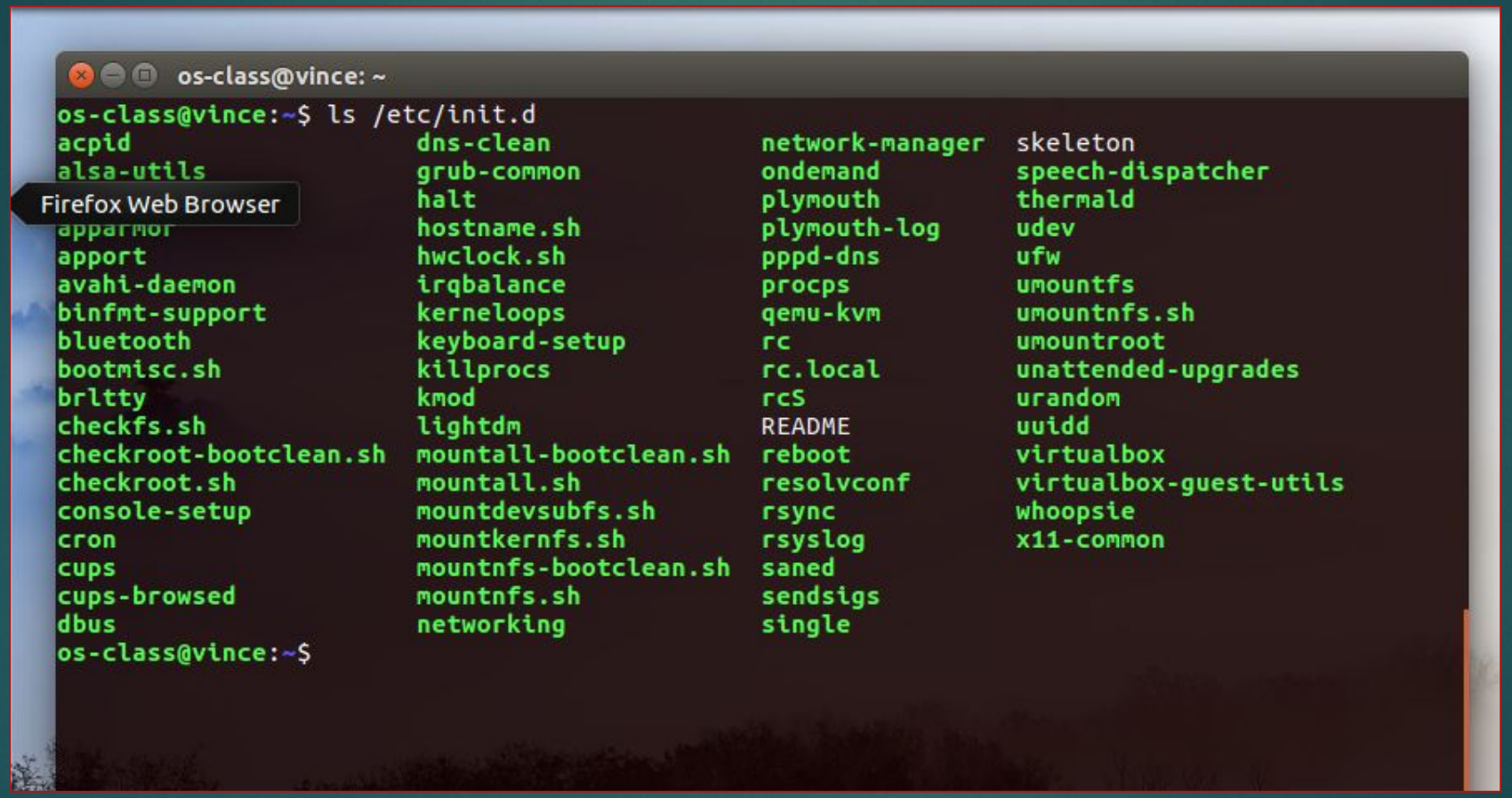
Older Architectures(S)

- **`service [SERVICE_NAME] [start | stop | restart | reload | status]`**

Newer Architectures(S)

- **`systemctl [start | stop | restart | reload | status] [SERVICE_NAME]`**

ls /etc/init.d


os-class@vince: ~
os-class@vince:~$ ls /etc/init.d
acpid
alsa-utils
Firefox Web Browser
apparmor
apport
avahi-daemon
binfmt-support
bluetooth
bootmisc.sh
brltty
checkfs.sh
checkroot-bootclean.sh
checkroot.sh
console-setup
cron
cups
cups-browsed
dbus
dns-clean
grub-common
halt
hostname.sh
hwclock.sh
irqbalance
kerneloops
keyboard-setup
killprocs
kmod
lightdm
mountall-bootclean.sh
mountall.sh
mountdevsubfs.sh
mountkernfs.sh
mountnfs-bootclean.sh
mountnfs.sh
networking
network-manager
ondemand
plymouth
plymouth-log
pppd-dns
procps
qemu-kvm
rc
rc.local
rcS
README
reboot
resolvconf
rsync
rsyslog
saned
sendsigs
single
skeleton
speech-dispatcher
thermald
udev
ufw
umountfs
umountnfs.sh
umountroot
unattended-upgrades
urandom
uuidd
virtualbox
virtualbox-guest-utils
whoopsie
x11-common
os-class@vince:~$

service --status-all

```
os-class@vince:~$ service --status-all
 [ + ]  acpid
 [ + ]  alsa-utils
 [ - ]  anacron
 [ + ]  apparmor
 [ + ]  apport
 [ + ]  avahi-daemon
 [ + ]  binfmt-support
 [ - ]  bluetooth
 [ - ]  bootmisc.sh
 [ - ]  brltty
 [ - ]  checkfs.sh
 [ - ]  checkroot-bootclean.sh
 [ - ]  checkroot.sh
 [ + ]  console-setup
 [ + ]  cron
 [ + ]  cups
 [ + ]  cups-browsed
 [ + ]  dbus
 [ - ]  dns-clean
 [ + ]  grub-common
 [ - ]  hostname.sh
 [ - ]  hwclock.sh
 [ + ]  irqbalance
 [ - ]  kerneloops
 [ + ]  keyboard-setup
 [ - ]  killprocs
 [ + ]  kmod
 [ + ]  lightdm
 [ - ]  mountall-bootclean.sh
 [ - ]  mountall.sh
 [ - ]  mountdevsubfs.sh
 [ - ]  mountkernfs.sh
 [ - ]  mountnfs-bootclean.sh
 [ - ]  mountnfs.sh
 [ + ]  network-manager
 [ + ]  networking
 [ + ]  ondemand
 [ - ]  plymouth
 [ - ]  plymouth-log
 [ - ]  pppd-dns
 [ + ]  procps
 [ + ]  qemu-kvm
 [ + ]  rc.local
 [ + ]  resolvconf
 [ - ]  rsync
 [ + ]  rsyslog
```

service --status-all | grep “[+]”

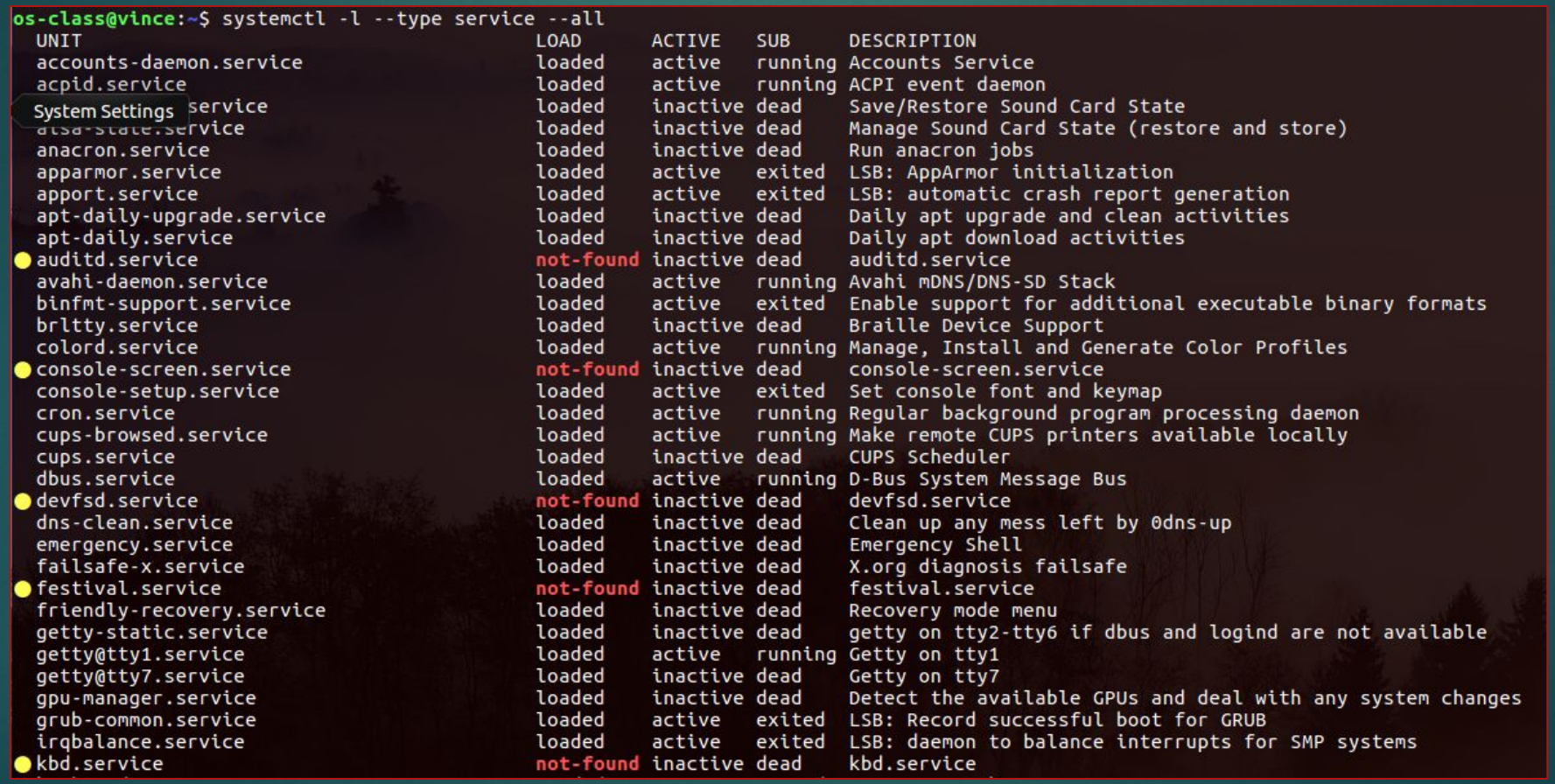
```
os-class@vince:~$ service --status-all | grep "[+]"
 [ + ]  acpid
 [ + ]  alsa-utils
 [ + ]  apparmor
 [ + ]  apport
 [ + ]  avahi-daemon
 [ + ]  binfmt-support
 [ + ]  console-setup
 [ + ]  cron
 [ + ]  cups
 [ + ]  cups-browsed
 [ + ]  dbus
 [ + ]  grub-common
 [ + ]  irqbalance
 [ + ]  keyboard-setup
 [ + ]  kmod
 [ + ]  lightdm
 [ + ]  network-manager
 [ + ]  networking
 [ + ]  ondemand
 [ + ]  procps
 [ + ]  qemu-kvm
 [ + ]  rc.local
 [ + ]  resolvconf
 [ + ]  rsyslog
 [ + ]  speech-dispatcher
 [ + ]  udev
 [ + ]  ufw
 [ + ]  unattended-upgrades
 [ + ]  urandom
 [ + ]  virtualbox
 [ + ]  virtualbox-guest-utils
 [ + ]  whoopsie
os-class@vince:~$
```

What about what is not running?

`service --status-all | grep -v "[+]"`

```
os-class@vince:~$ service --status-all | grep -v "[+]"
 [ - ]  anacron
 [ - ]  bluetooth
 [ - ]  bootmisc.sh
 [ - ]  brltty
 [ - ]  checkfs.sh
 [ - ]  checkroot-bootclean.sh
 [ - ]  checkroot.sh
 [ - ]  cups
 [ - ]  dns-clean
 [ - ]  hostname.sh
 [ - ]  hwclock.sh
 [ - ]  kerneloops
 [ - ]  killprocs
 [ - ]  mountall-bootclean.sh
 [ - ]  mountall.sh
 [ - ]  mountdevsubfs.sh
 [ - ]  mountkernfs.sh
 [ - ]  mountnfs-bootclean.sh
 [ - ]  mountnfs.sh
 [ - ]  plymouth
 [ - ]  plymouth-log
 [ - ]  pppd-dns
 [ - ]  rsync
 [ - ]  saned
 [ - ]  sendsigs
 [ - ]  thermald
 [ - ]  umountfs
 [ - ]  umountnfs.sh
 [ - ]  umountroot
 [ - ]  uuidd
 [ - ]  x11-common
os-class@vince:~$
```

systemctl -l --type service --all



You can also run the previous command as root!

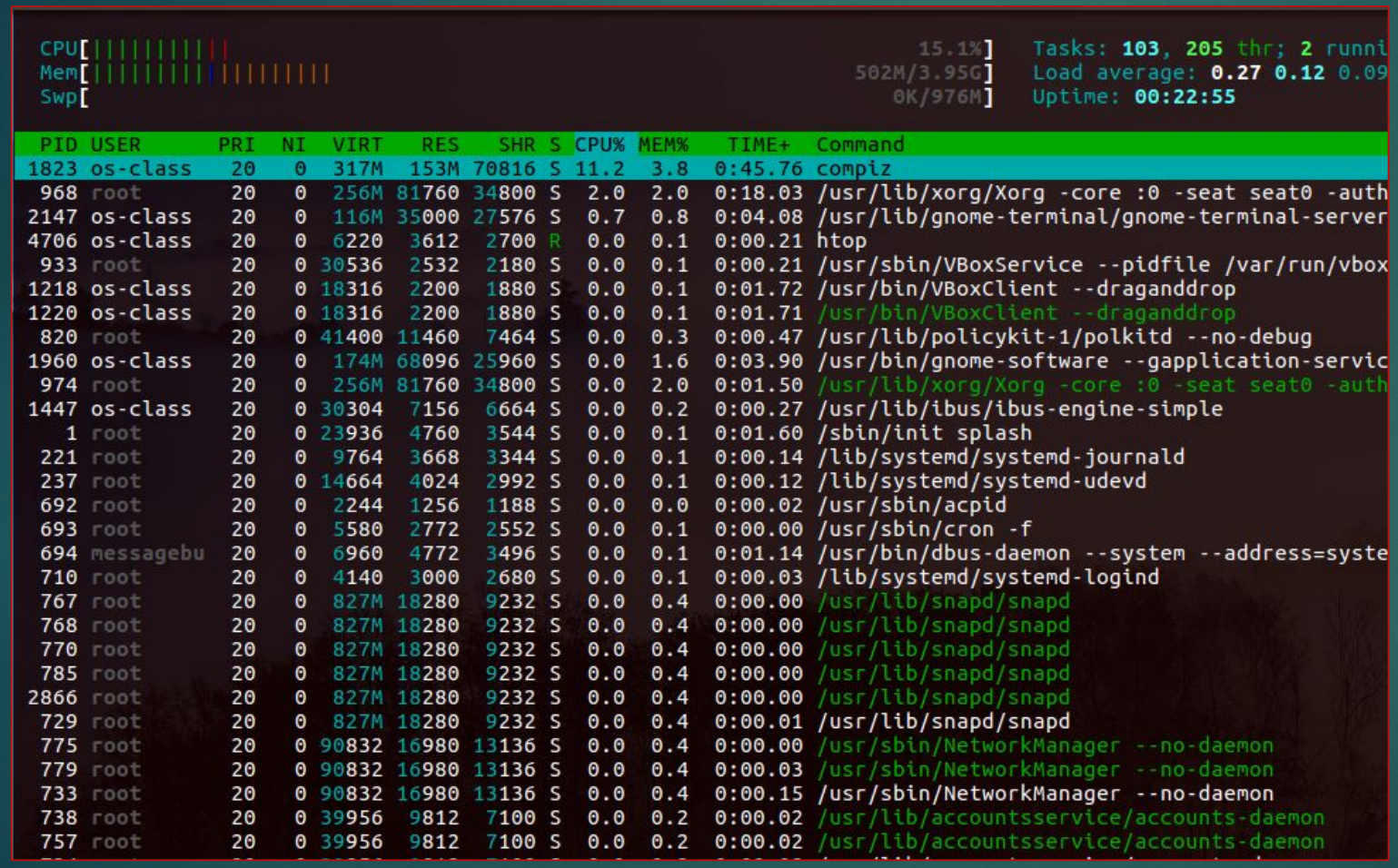
```
os-class@vince:~$ sudo systemctl -r --type service --all
  UNIT                                LOAD      ACTIVE   SUB     DESCRIPTION
  accounts-daemon.service             loaded    active   running Accounts Service
  acpid.service                       loaded    active   running ACPI event daemon
  alsa-restore.service                loaded    inactive dead    Save/Restore Sound Card State
  alsa-state.service                  loaded    inactive dead    Manage Sound Card State (restore and store)
  anacron.service                     loaded    inactive dead    Run anacron jobs
  apparmor.service                    loaded    active   exited  LSB: AppArmor initialization
  apport.service                      loaded    active   exited  LSB: automatic crash report generation
  apt-daily-upgrade.service           loaded    inactive dead    Daily apt upgrade and clean activities
  apt-daily.service                   loaded    inactive dead    Daily apt download activities
● auditd.service                      not-found inactive dead    auditd.service
  avahi-daemon.service                loaded    active   running Avahi mDNS/DNS-SD Stack
  binfmt-support.service              loaded    active   exited  Enable support for additional executable binary formats
  brltty.service                      loaded    inactive dead    Braille Device Support
  colord.service                      loaded    active   running Manage, Install and Generate Color Profiles
● console-screen.service              not-found inactive dead    console-screen.service
  console-setup.service               loaded    active   exited  Set console font and keymap
  cron.service                        loaded    active   running Regular background program processing daemon
  cups-browsed.service                loaded    active   running Make remote CUPS printers available locally
  cups.service                        loaded    inactive dead    CUPS Scheduler
  dbus.service                        loaded    active   running D-Bus System Message Bus
● devfsd.service                      not-found inactive dead    devfsd.service
  dns-clean.service                   loaded    inactive dead    Clean up any mess left by 0dns-up
  emergency.service                   loaded    inactive dead    Emergency Shell
```


I AM ROOT
I AM ROOOOT

You can also look into your process manager to see services.

```
os-class@vince:~$ ps -aux
USER         PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root           1  0.1  0.1  23936  4760 ?        Ss   23:38   0:01 /sbin/init splas
root           2  0.0  0.0      0     0 ?        S    23:38   0:00 [kthreadd]
root           4  0.0  0.0      0     0 ?        S<   23:38   0:00 [kworker/0:0H]
root           6  0.0  0.0      0     0 ?        S    23:38   0:00 [ksoftirqd/0]
root           7  0.0  0.0      0     0 ?        S    23:38   0:00 [rcu_sched]
root           8  0.0  0.0      0     0 ?        S    23:38   0:00 [rcu_bh]
root           9  0.0  0.0      0     0 ?        S    23:38   0:00 [migration/0]
root          10  0.0  0.0      0     0 ?        S<   23:38   0:00 [lru-add-drain]
root          11  0.0  0.0      0     0 ?        S    23:38   0:00 [watchdog/0]
root          12  0.0  0.0      0     0 ?        S    23:38   0:00 [cpuhp/0]
root          13  0.0  0.0      0     0 ?        S    23:38   0:00 [kdevtmpfs]
root          14  0.0  0.0      0     0 ?        S<   23:38   0:00 [netns]
root          15  0.0  0.0      0     0 ?        S    23:38   0:00 [khungtaskd]
root          16  0.0  0.0      0     0 ?        S    23:38   0:00 [oom_reaper]
root          17  0.0  0.0      0     0 ?        S<   23:38   0:00 [writeback]
root          18  0.0  0.0      0     0 ?        S    23:38   0:00 [kcompactd0]
root          19  0.0  0.0      0     0 ?        SN   23:38   0:00 [ksmd]
root          20  0.0  0.0      0     0 ?        SN   23:38   0:00 [khugepaged]
root          21  0.0  0.0      0     0 ?        S<   23:38   0:00 [crypto]
root          22  0.0  0.0      0     0 ?        S<   23:38   0:00 [kintegrityd]
root          23  0.0  0.0      0     0 ?        S<   23:38   0:00 [bioset]
root          24  0.0  0.0      0     0 ?        S<   23:38   0:00 [kblockd]
root          25  0.0  0.0      0     0 ?        S<   23:38   0:00 [ata_sff]
root          26  0.0  0.0      0     0 ?        S<   23:38   0:00 [md]
```

htop

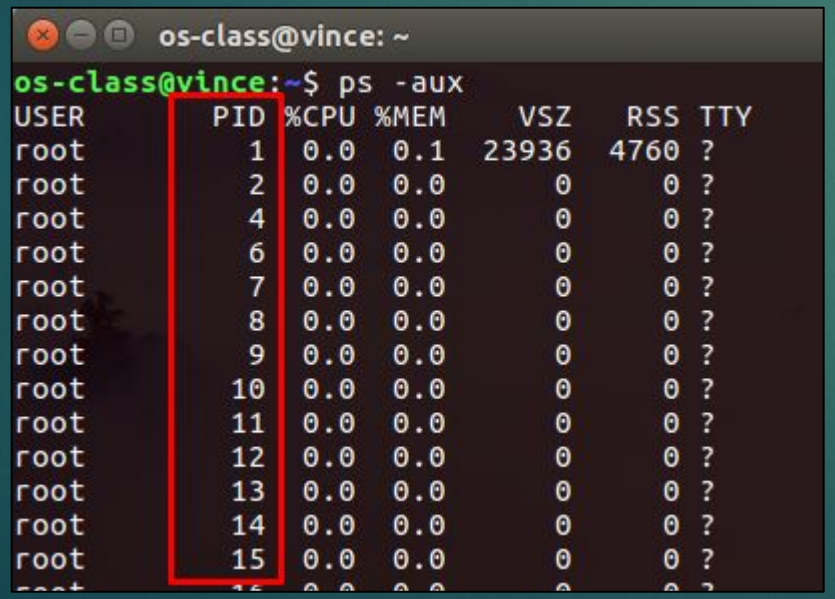


- htop is not always there
- **sudo apt-get install htop**

The **`kill`** command

Some Explanation

- the command is used to end a process without having to log out or reboot
- a process is also referred to as a *task* that is in a running state
- these processes are given *process identification numbers (PID) – we need this as reference!*



`kill [PID]`

- this works… but no guarantee the process will end
- this by default sends signal 15, sometimes services will ignore this

`kill -9 [PID]`

- this command is a little misleading, it doesn't actually *kill the process rather it send a signal to that process*
- *what that process does with that signal is up to the process itself*
- *processes have signal handlers, these define what it does with a signal*
- *our command from before "kill [PID]" has no signal supplied, therefore it defaults to 15*
- ***`kill -9 [PID]`*** *is stronger, this signal is* ***SIGKILL***

kill -l

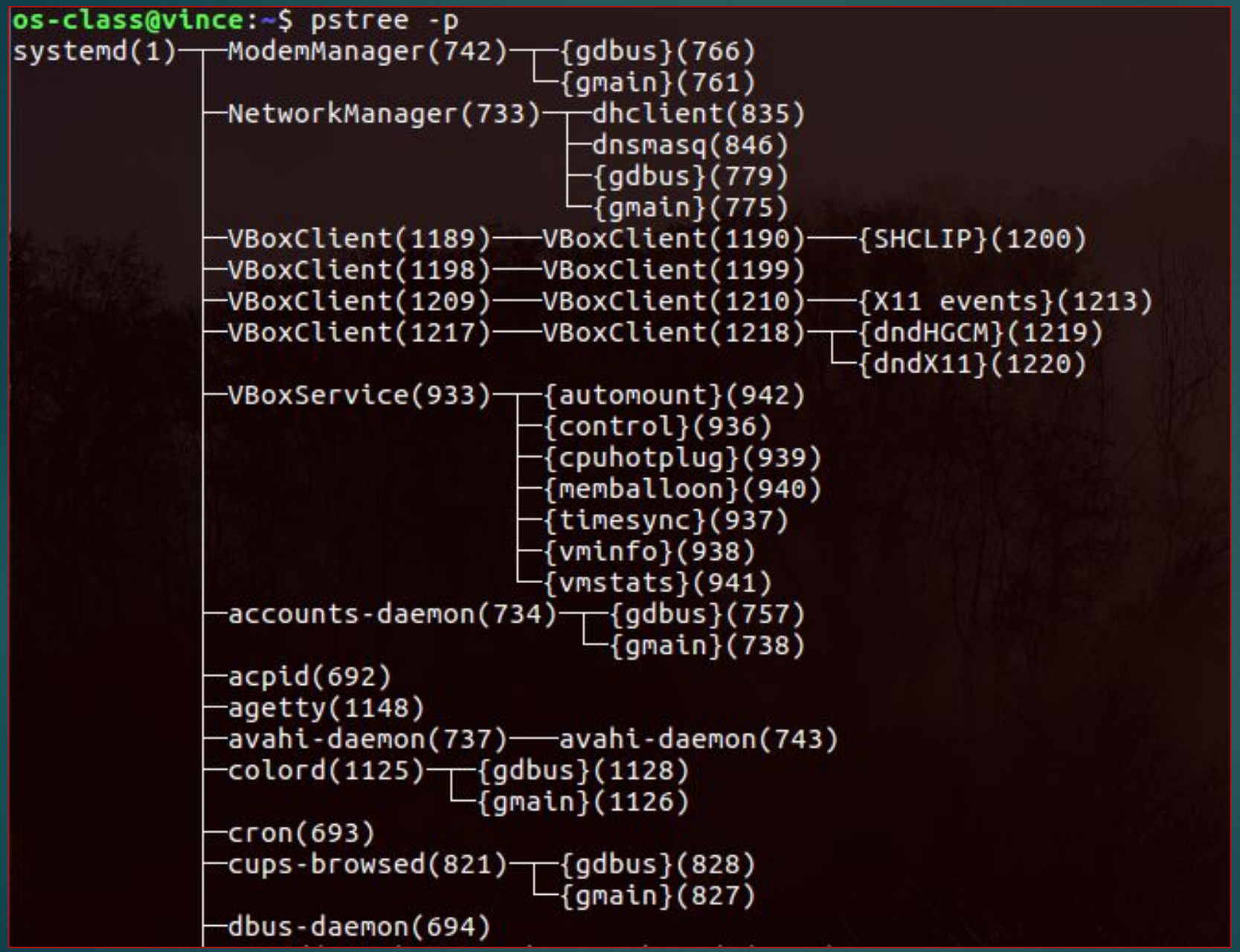
```
os-class@vince:~$ kill -l
 1) SIGHUP       2) SIGINT       3) SIGQUIT      4) SIGILL       5) SIGTRAP
 6) SIGABRT      7) SIGBUS       8) SIGFPE       9) SIGKILL     10) SIGUSR1
11) SIGSEGV     12) SIGUSR2     13) SIGPIPE     14) SIGALRM     15) SIGTERM
16) SIGSTKFLT   17) SIGCHLD     18) SIGCONT     19) SIGSTOP     20) SIGTSTP
21) SIGTTIN     22) SIGTTOU     23) SIGURG      24) SIGXCPU     25) SIGXFSZ
26) SIGVTALRM   27) SIGPROF     28) SIGWINCH    29) SIGIO       30) SIGPWR
31) SIGSYS      34) SIGRTMIN    35) SIGRTMIN+1  36) SIGRTMIN+2  37) SIGRTMIN+3
38) SIGRTMIN+4  39) SIGRTMIN+5  40) SIGRTMIN+6  41) SIGRTMIN+7  42) SIGRTMIN+8
43) SIGRTMIN+9  44) SIGRTMIN+10 45) SIGRTMIN+11 46) SIGRTMIN+12 47) SIGRTMIN+13
48) SIGRTMIN+14 49) SIGRTMIN+15 50) SIGRTMAX-14 51) SIGRTMAX-13 52) SIGRTMAX-12
53) SIGRTMAX-11 54) SIGRTMAX-10 55) SIGRTMAX-9  56) SIGRTMAX-8  57) SIGRTMAX-7
58) SIGRTMAX-6  59) SIGRTMAX-5  60) SIGRTMAX-4  61) SIGRTMAX-3  62) SIGRTMAX-2
63) SIGRTMAX-1  64) SIGRTMAX
os-class@vince:~$
```

- we can use this to see the signal handlers

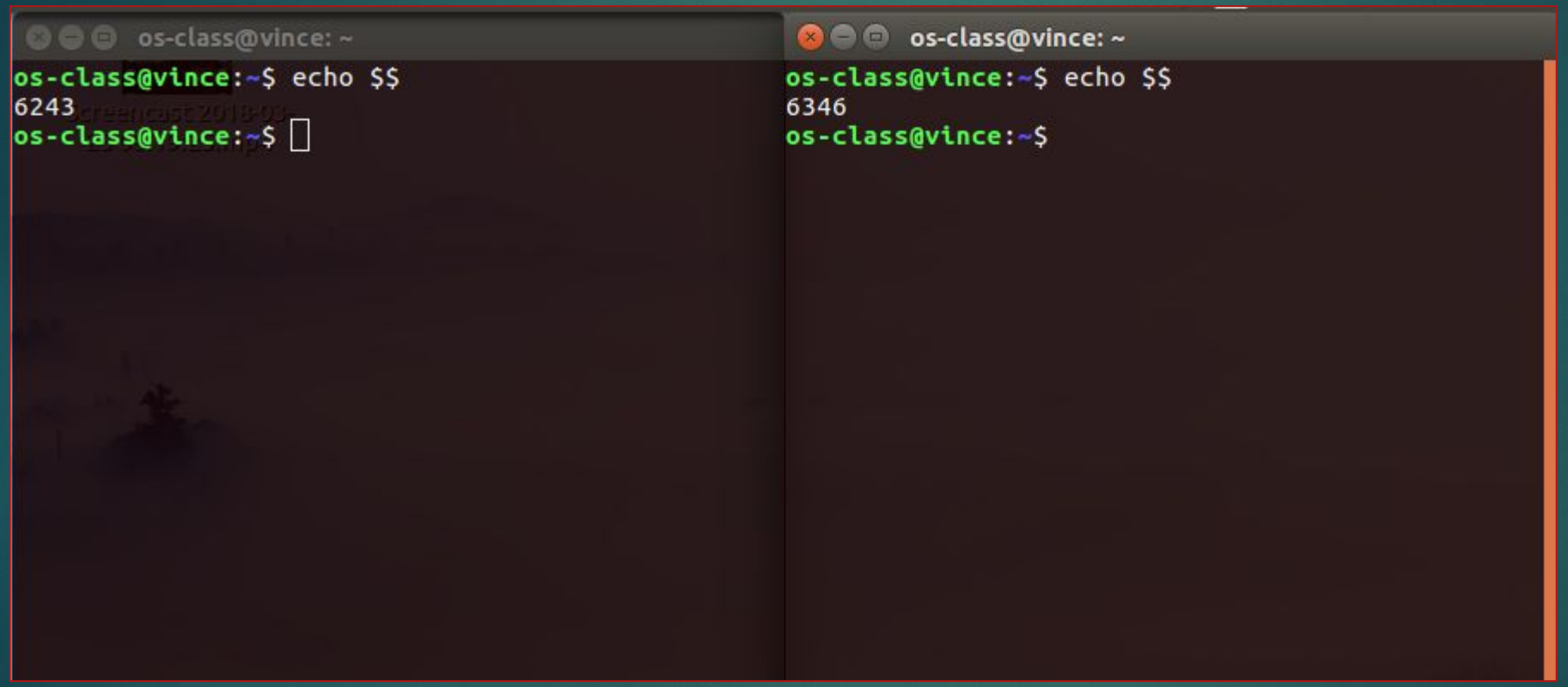
SOURCE: http://www.linfo.org/kill.html

pstree -p

- this command is interesting…
- we can actually use this to see the parent/ child relationship of processes, and by killing the parent process this will kill the child processes
- this makes it much easier to end processes, versus manually finding each PID


os-class@vince:~$ pstree -p
systemd(1)
ModemManager(742)
{gdbus}(766)
{gmain}(761)
NetworkManager(733)
dhclient(835)
dnsmasq(846)
{gdbus}(779)
{gmain}(775)
VBoxClient(1189)
VBoxClient(1190)
{SHCLIP}(1200)
VBoxClient(1198)
VBoxClient(1199)
VBoxClient(1209)
VBoxClient(1210)
{X11 events}(1213)
VBoxClient(1217)
VBoxClient(1218)
{dndHGCM}(1219)
{dndX11}(1220)
VBoxService(933)
{automount}(942)
{control}(936)
{cpuhotplug}(939)
{memballoon}(940)
{timesync}(937)
{vminfo}(938)
{vmstats}(941)
accounts-daemon(734)
{gdbus}(757)
{gmain}(738)
acpid(692)
agetty(1148)
avahi-daemon(737)
avahi-daemon(743)
colord(1125)
{gdbus}(1128)
{gmain}(1126)
cron(693)
cups-browsed(821)
{gdbus}(828)
{gmain}(827)
dbus-daemon(694)

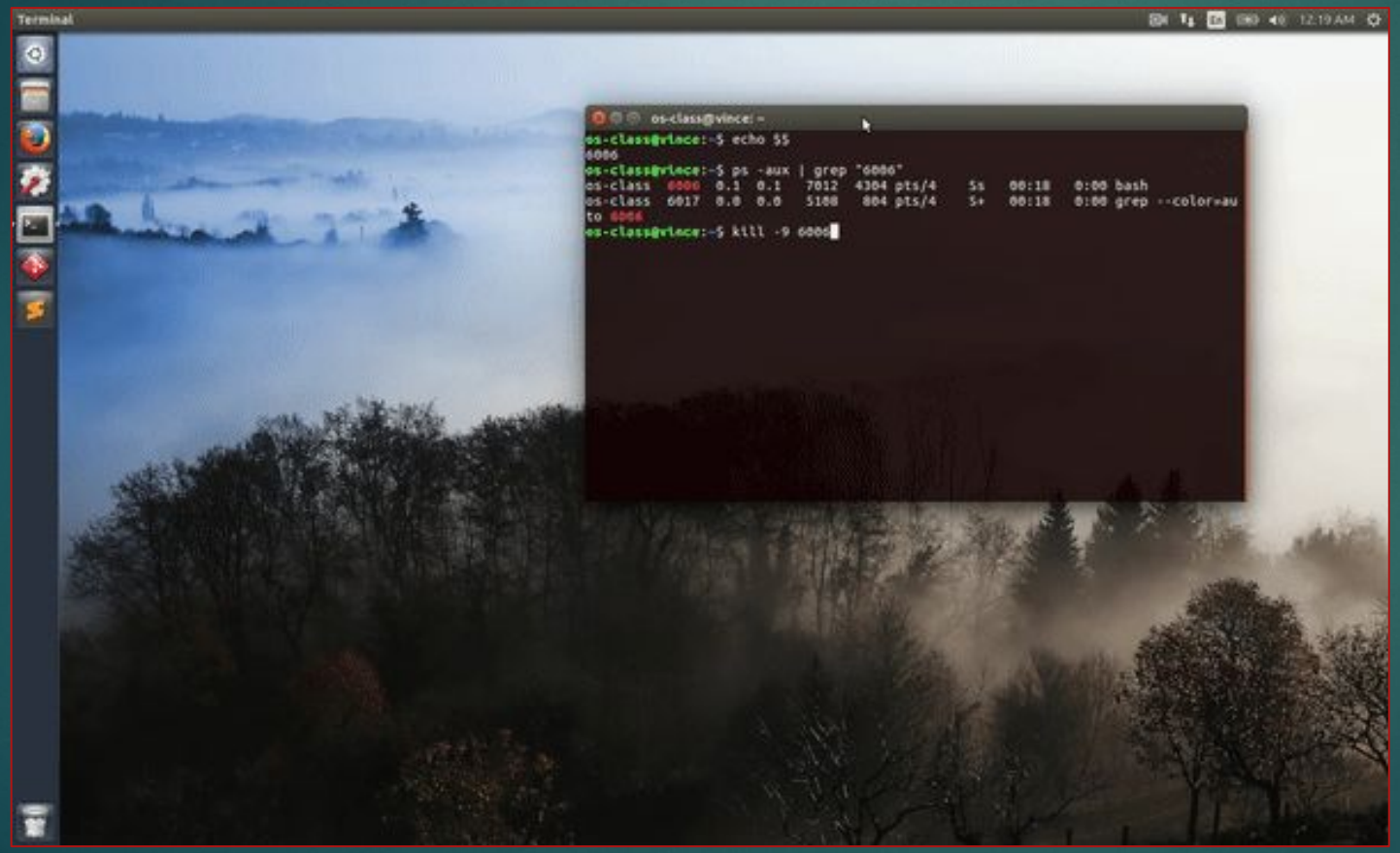
Ross likes to kill bash sessions…



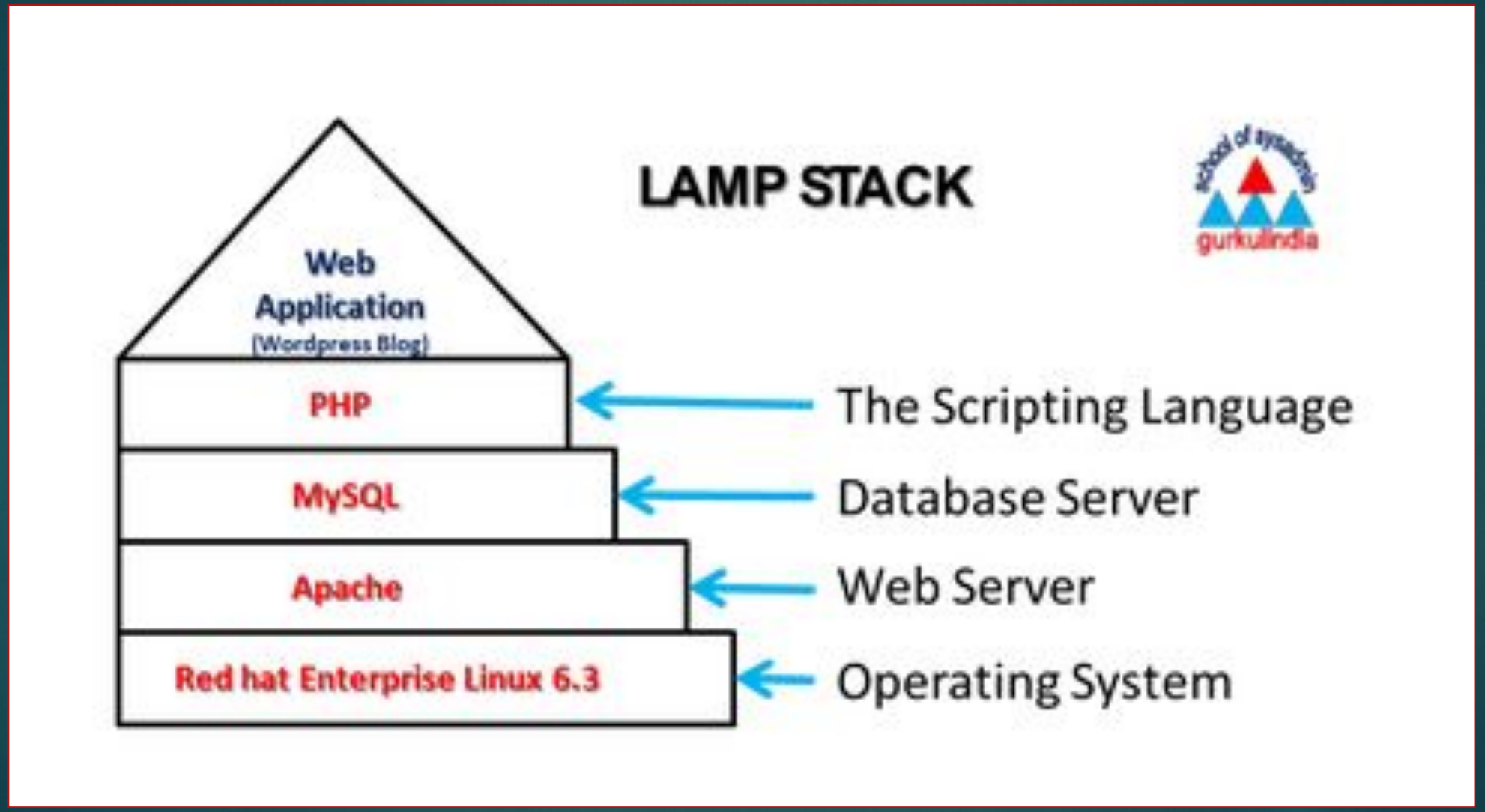
echo $$

```
os-class@vince:~$ echo $$
2155
os-class@vince:~$ ps -aux | grep "2155"
os-class  2155  0.0  0.1   7012  4428 pts/17   Ss   Mar24   0:00 bash
os-class  4770  0.0  0.0   5108   848 pts/17   S+   00:11   0:00 grep --color=auto 2155
os-class@vince:~$
```

What happens if I do `kill -9 2155`?

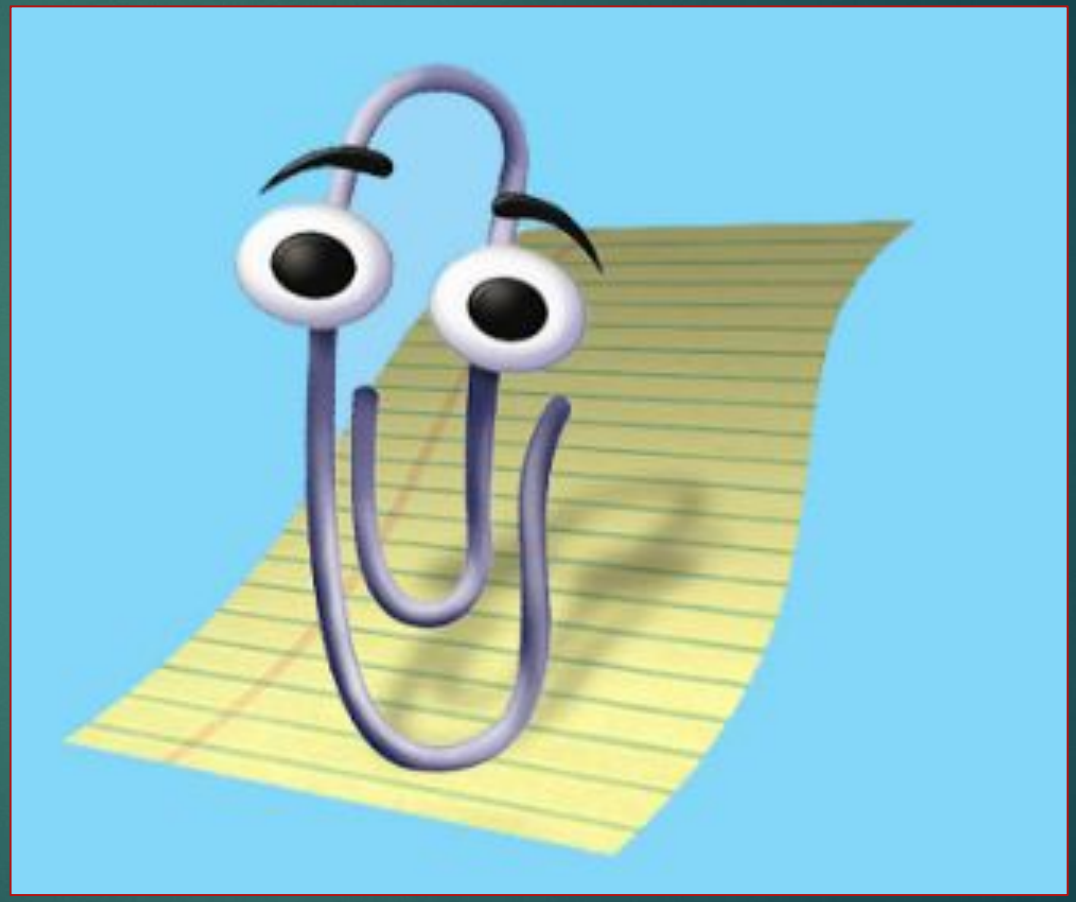


LAMP Stack

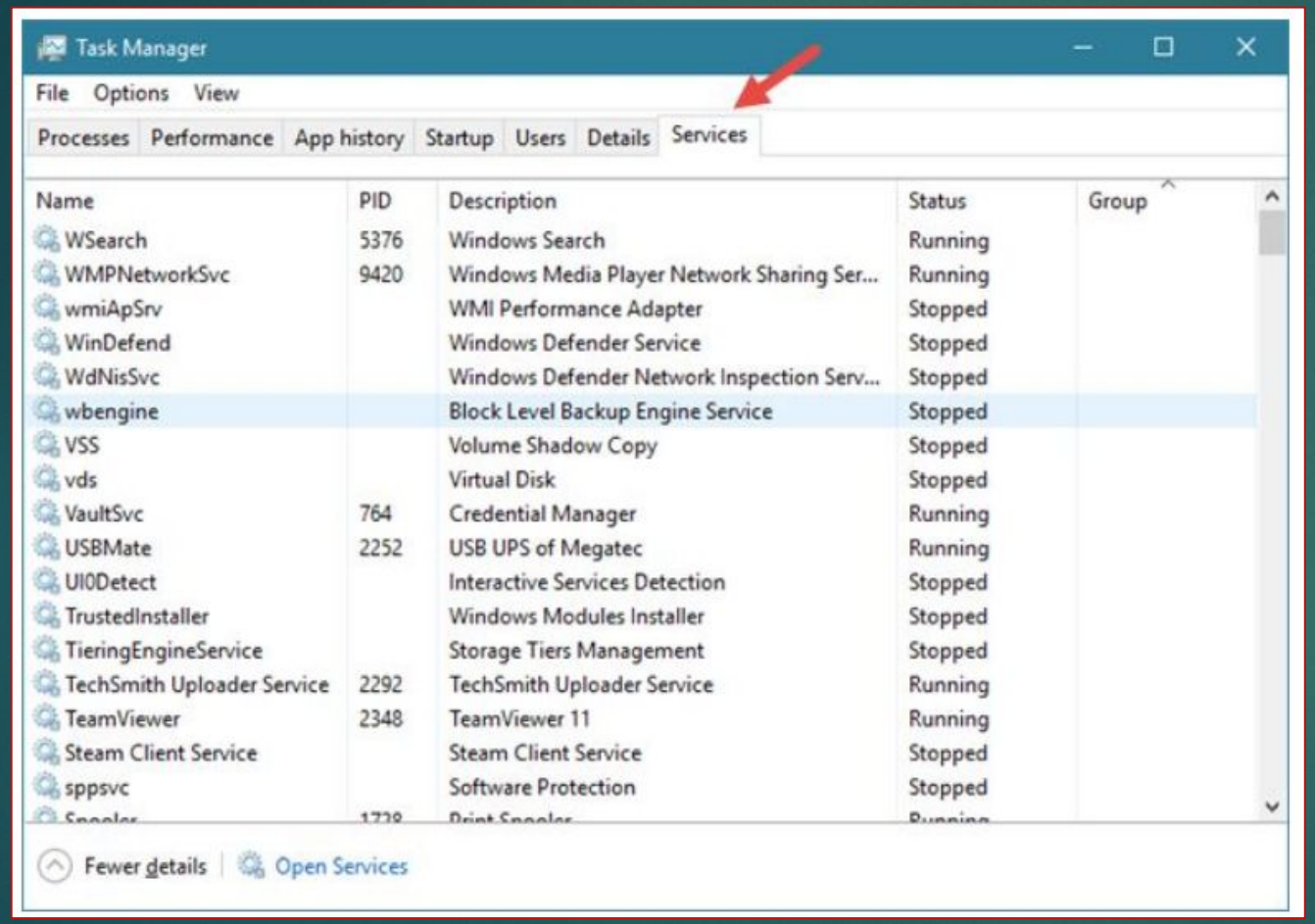

LAMP STACK
Web Application
(Wordpress Blog)
PHP
MySQL
Apache
Red hat Enterprise Linux 6.3
The Scripting Language
Database Server
Web Server
Operating System


INTERMISSION
1
10
9
2
8
3
7
4
6
5
VISIT OUR SNACK BAR

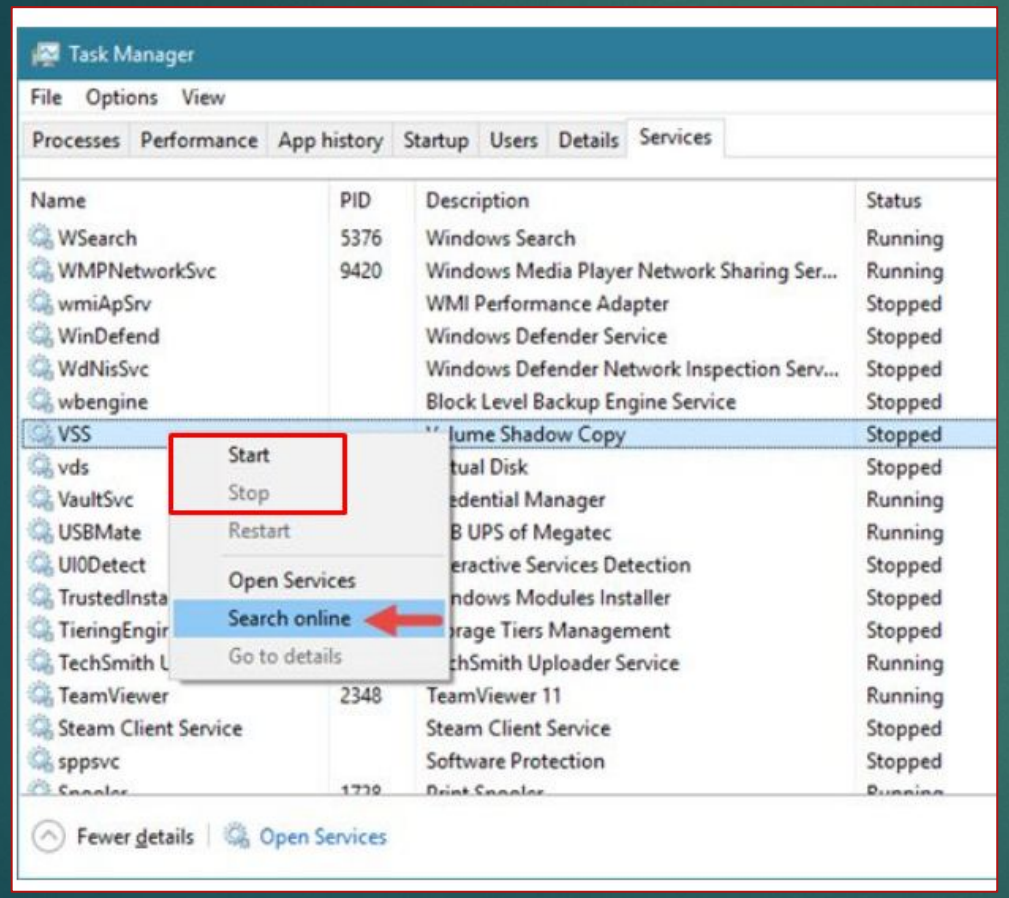
WINDOWS LAND!



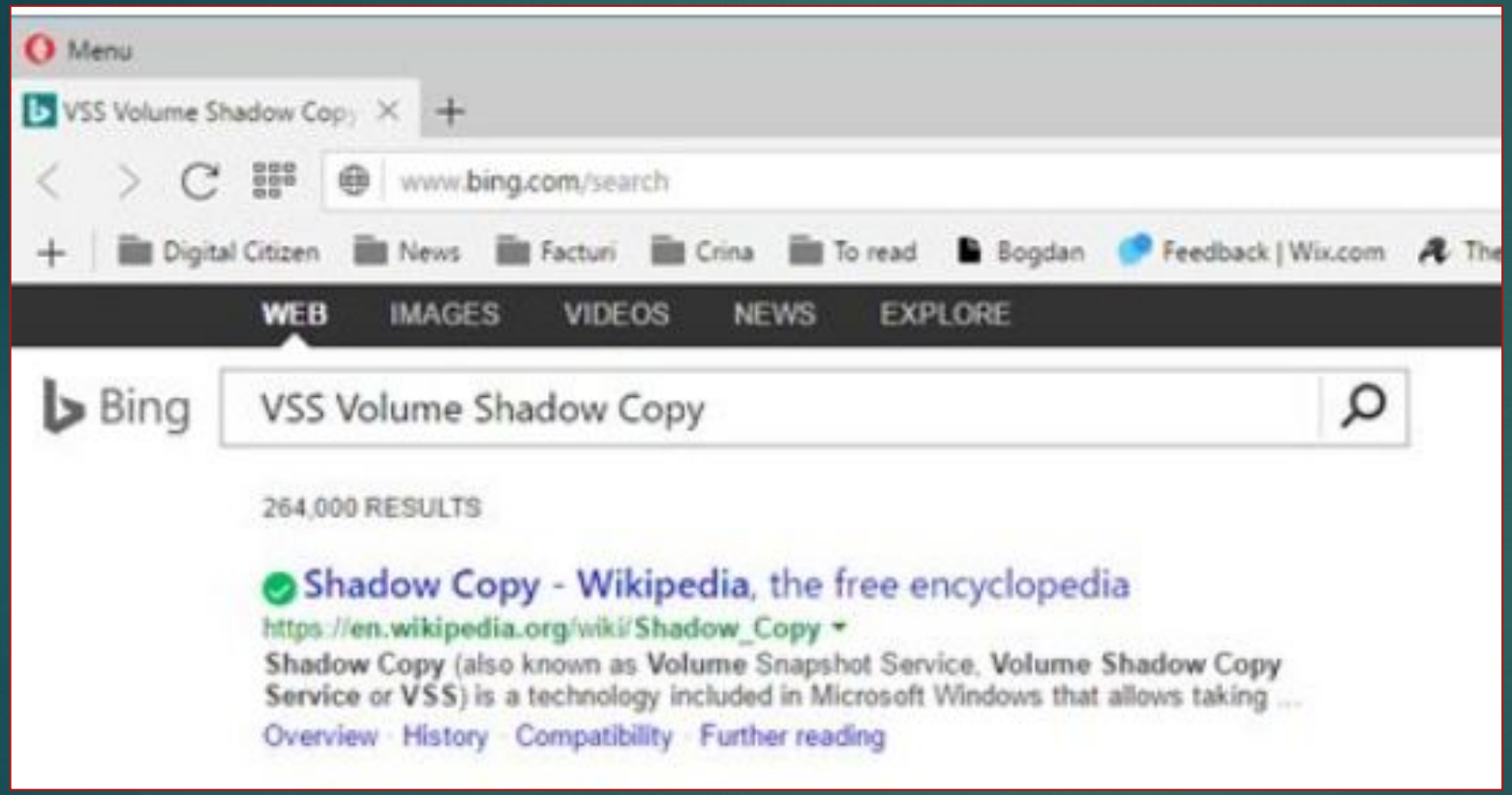
Task Manager



Right click on a service to start **or** stop it?

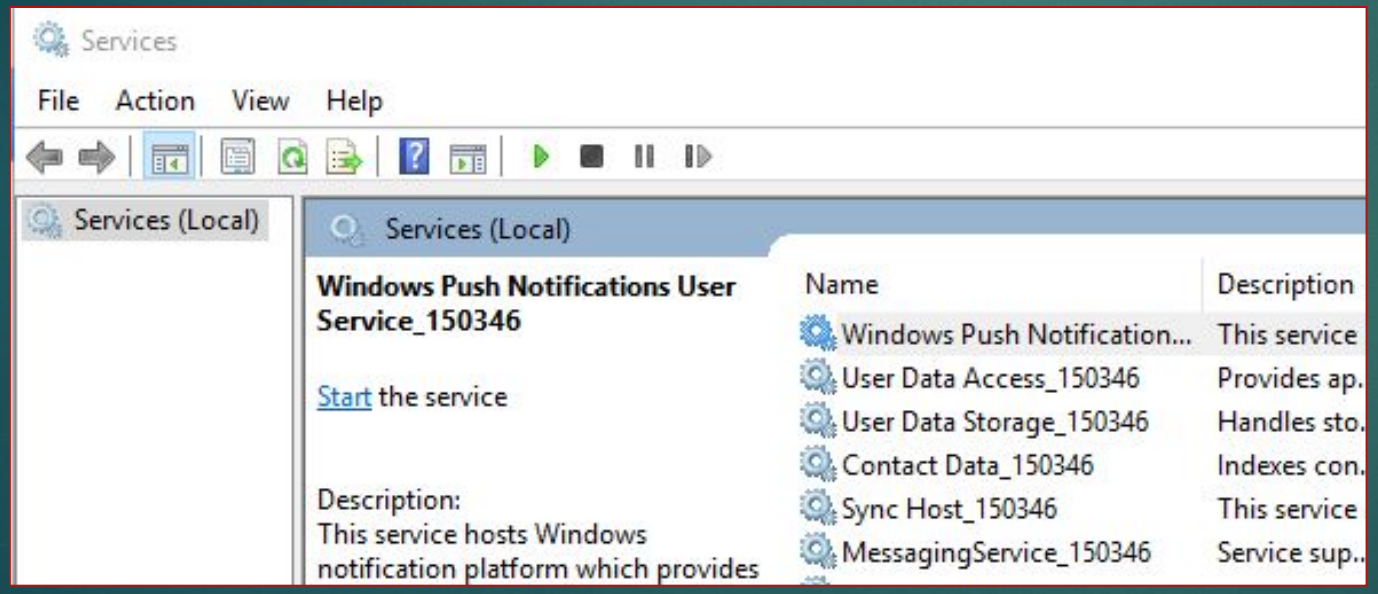


You can search online too!

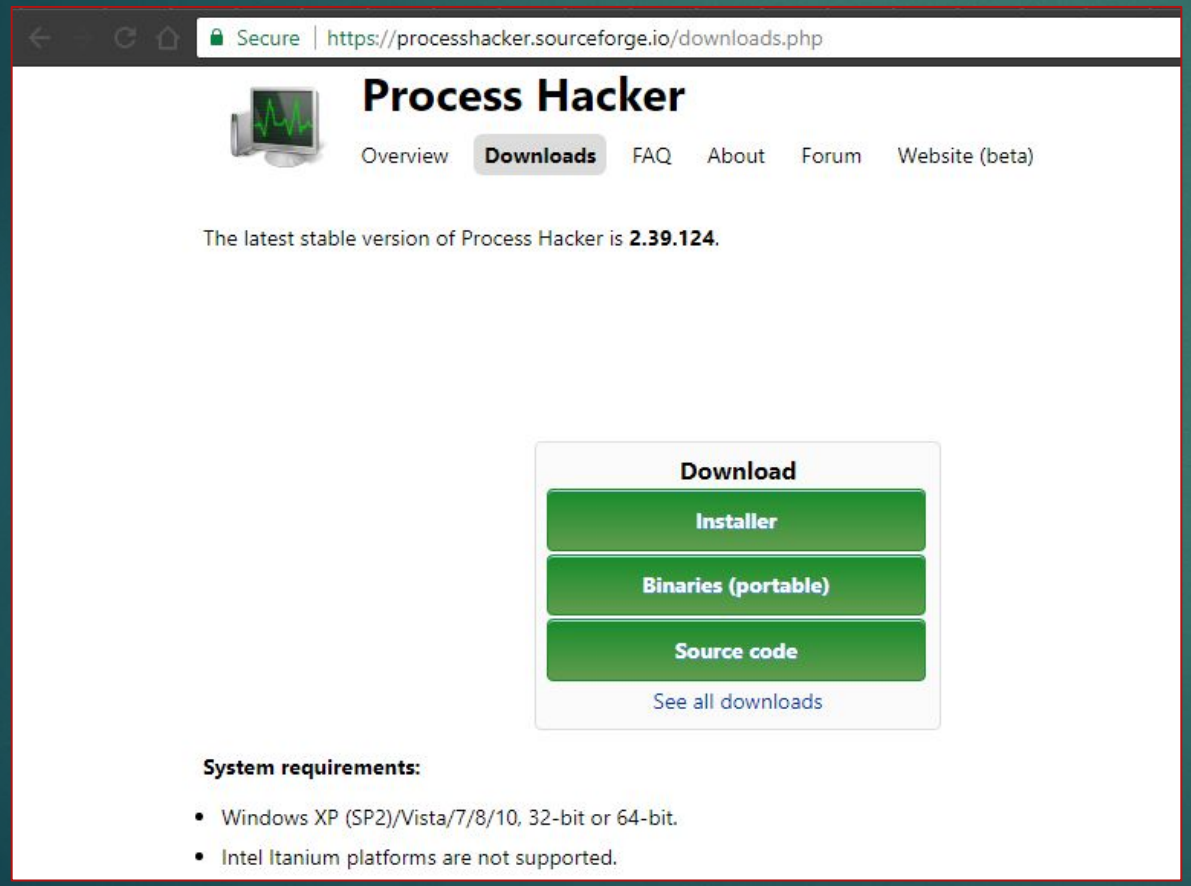


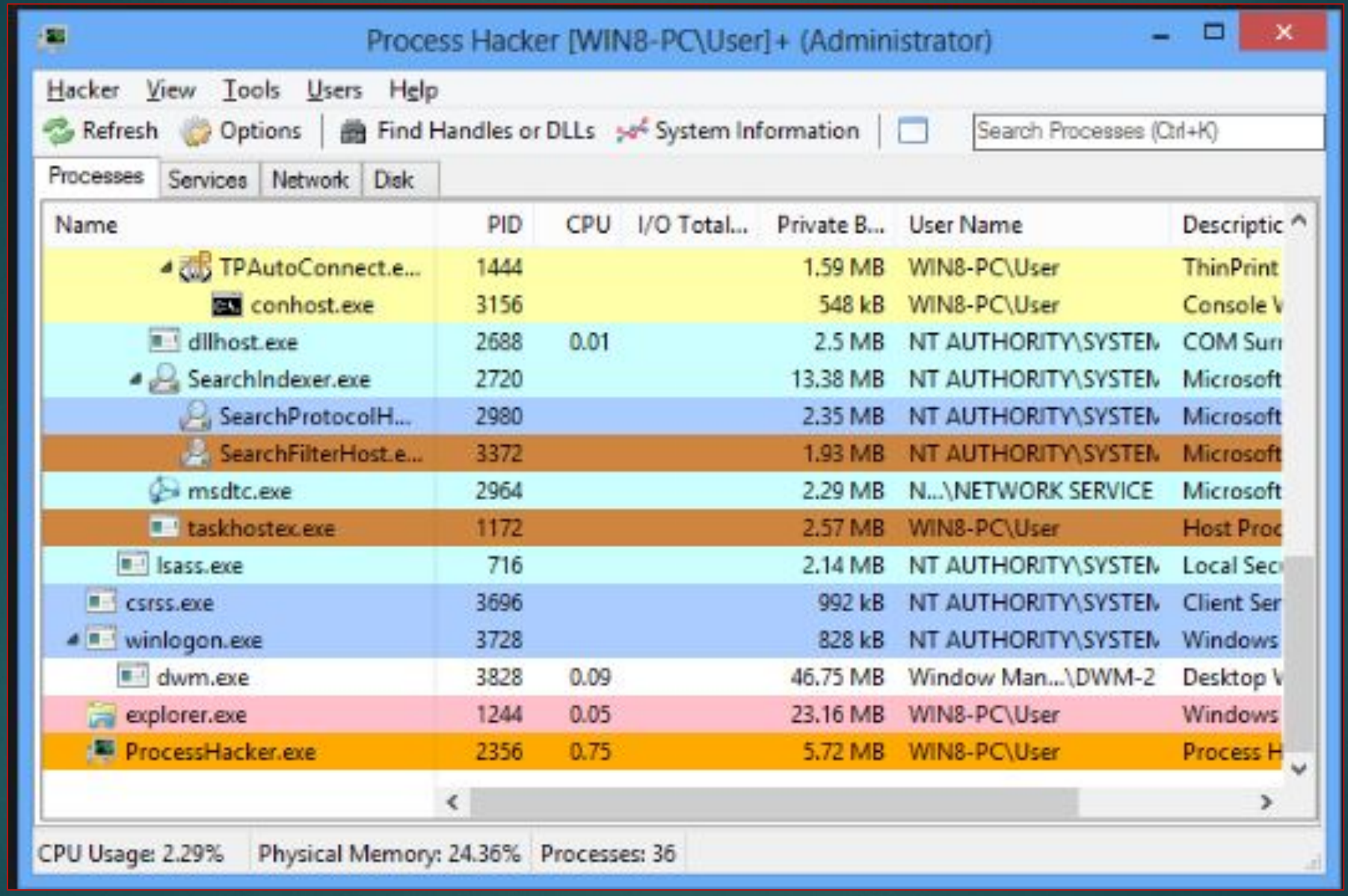
services.msc

- CMD -> services.msc
- Windows search for “Services”



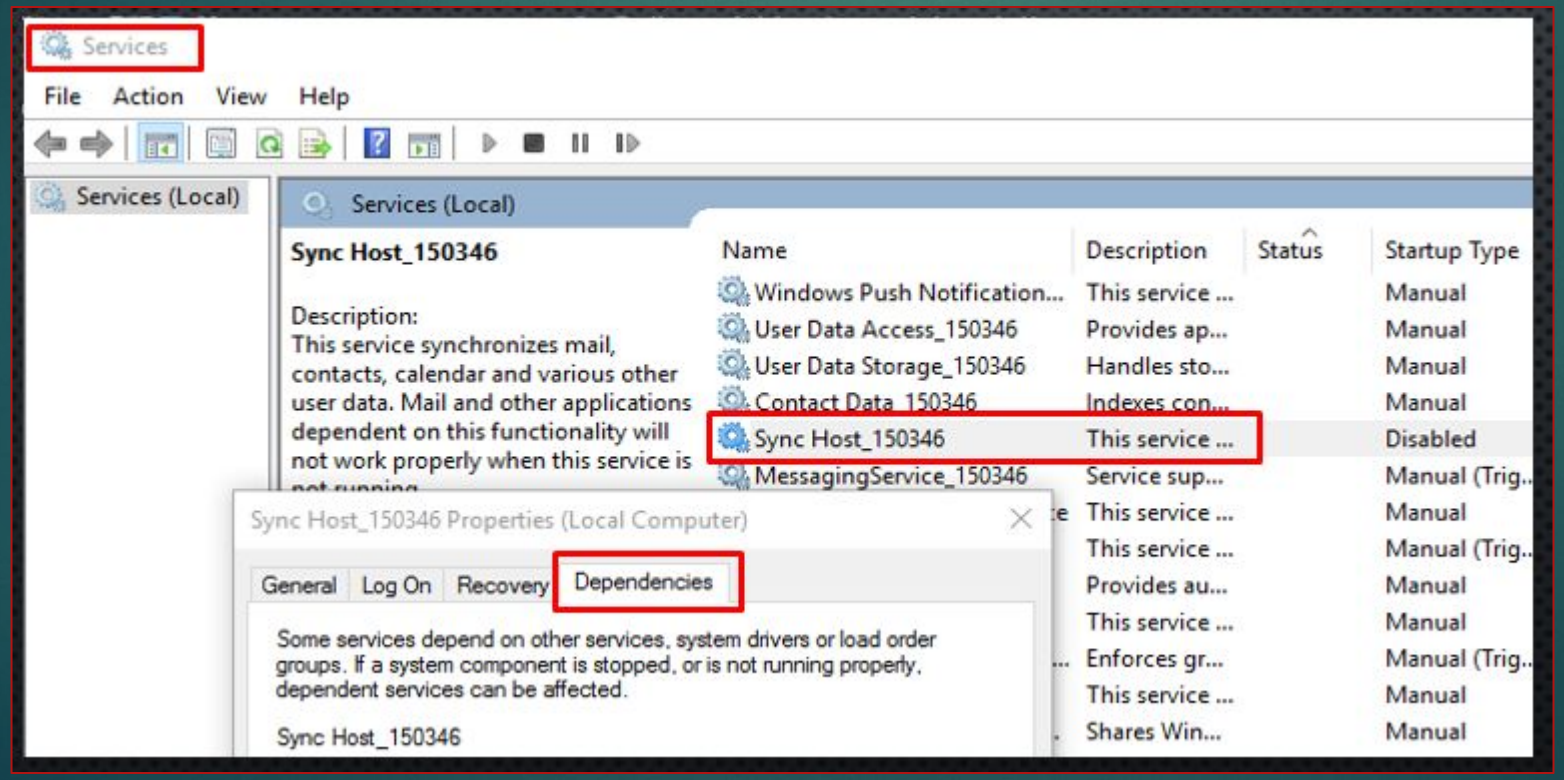
These tools are sort of… bland… incomes “Process hacker”




Process Hacker [WIN8-PC\User] + (Administrator)
Hacker View Tools Users Help
Refresh Options Find Handles or DLLs System Information
Search Processes (Ctrl+K)
Processes Services Network Disk
Name PID CPU I/O Total... Private B... User Name Descriptic
TPAutoConnect.e... 1444 1.59 MB WIN8-PC\User ThinPrint
conhost.exe 3156 548 kB WIN8-PC\User Console
dllhost.exe 2688 0.01 2.5 MB NT AUTHORITY\SYSTEM COM Sur
SearchIndexer.exe 2720 13.38 MB NT AUTHORITY\SYSTEM Microsoft
SearchProtocolH... 2980 2.35 MB NT AUTHORITY\SYSTEM Microsoft
SearchFilterHost.e... 3372 1.93 MB NT AUTHORITY\SYSTEM Microsoft
msdtc.exe 2964 2.29 MB N...\NETWORK SERVICE Microsoft
taskhostex.exe 1172 2.57 MB WIN8-PC\User Host Proc
lsass.exe 716 2.14 MB NT AUTHORITY\SYSTEM Local Sec
csrss.exe 3696 992 kB NT AUTHORITY\SYSTEM Client Ser
winlogon.exe 3728 828 kB NT AUTHORITY\SYSTEM Windows
dwm.exe 3828 0.09 46.75 MB Window Man...\DWM-2 Desktop
explorer.exe 1244 0.05 23.16 MB WIN8-PC\User Windows
ProcessHacker.exe 2356 0.75 5.72 MB WIN8-PC\User Process H
CPU Usage: 2.29% Physical Memory: 24.36% Processes: 36

Beware some services have dependencies!

- Windows Firewall service depends on base filtering engine
- some services may not stop or start if a dependency is stopped



Awesome Windows talks that Ross recommends

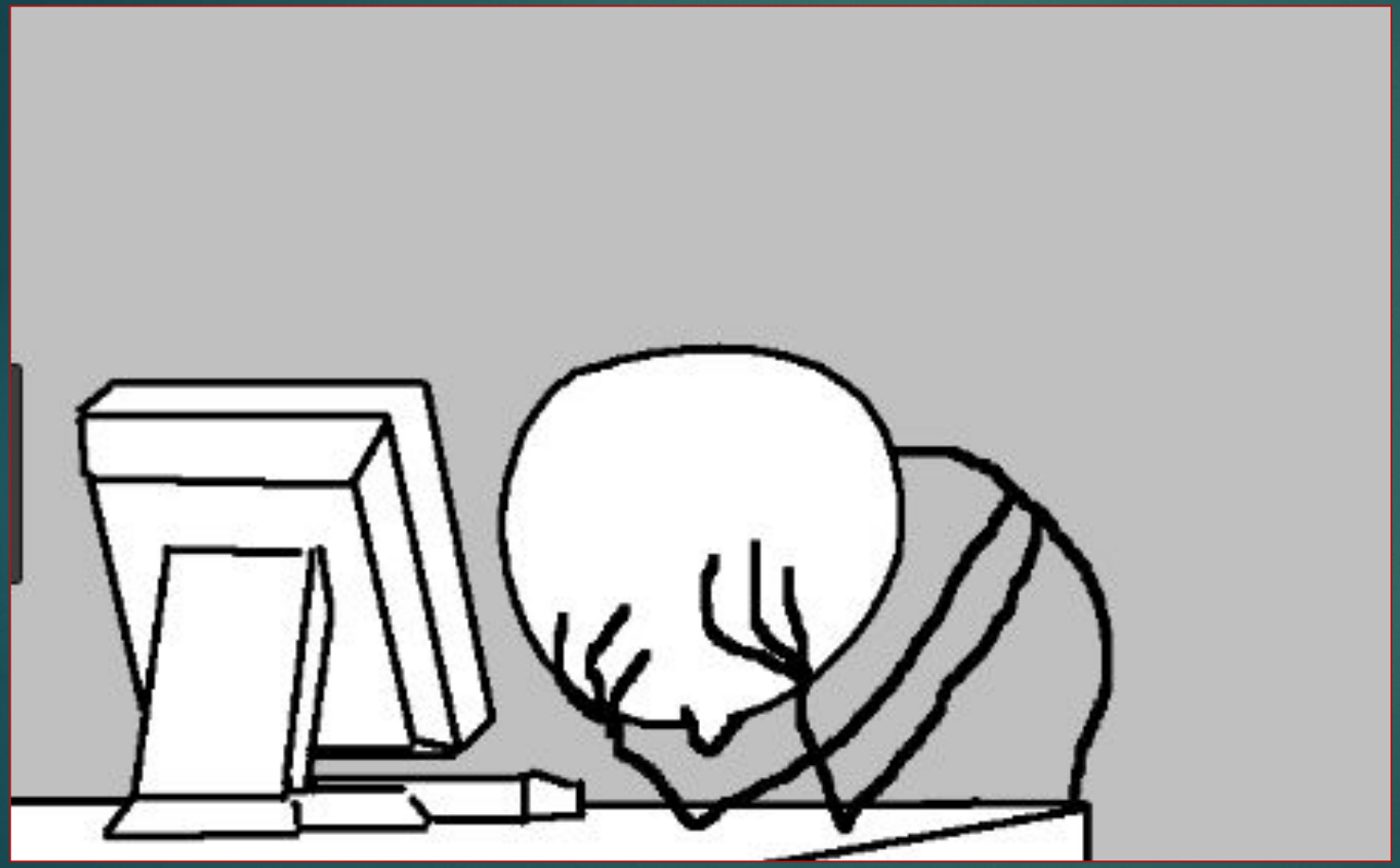
- https://www.youtube.com/watch?v=pjKNx41Ubxw&list=PLuWOygGyQTQWreyGno5FzLq44Jw2FQ1Sy

- https://www.youtube.com/watch?v=Wuy_Pm3KaV8

Bringing it all together, this is what it is like in the wild…

- https://www.youtube.com/watch?v=W8_Kfjo3VjU

That’s all for services, any questions?



STUFF I DIDN'T COVER

- crontabs
- Firewall appliances (UFW, IPTABLES, Palo Alto)
- central logging (Graylog!)
- host based IDS (OSSEC)
- IDS in general (Snort)
- **chmod** and **lsattr** commands
- ssh keys and securing ssh
- /etc/shadow
- /etc/pam.d
- lot's of Windows stuff):
- logs