COMPUTER ENGINEERING

INDEX NUMBER: 8266019

OPERATING SYSTEM TUTORIALS

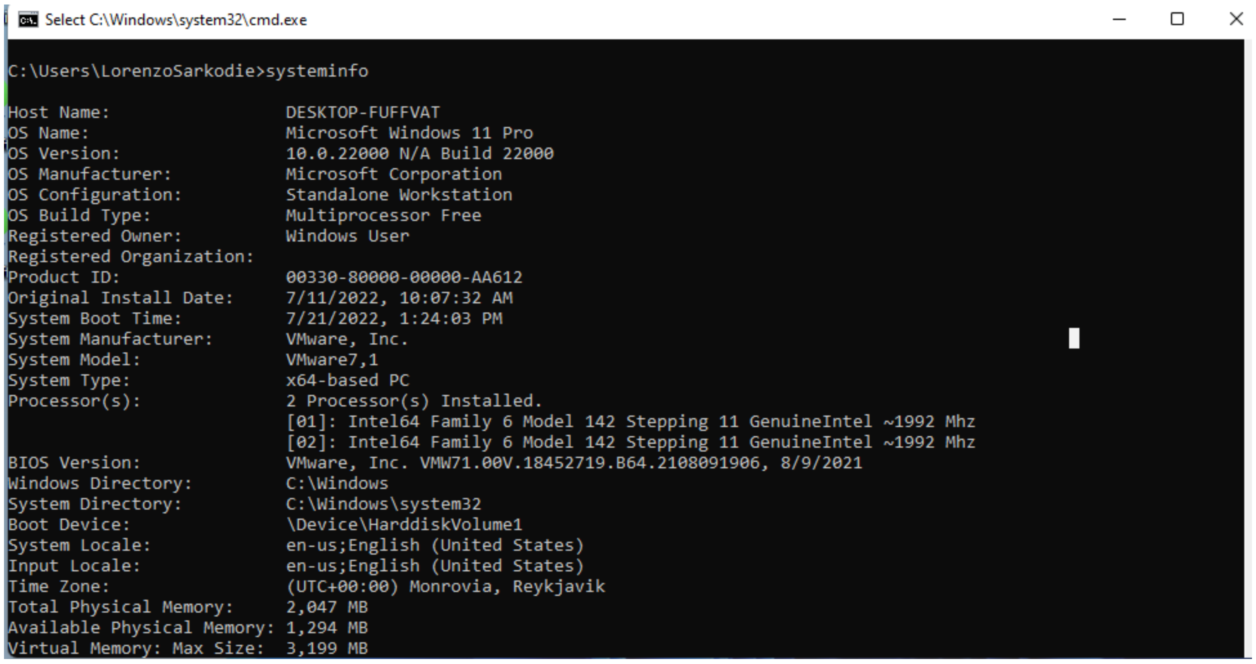
INSTALLATION OF OPERATING SYSTEMS

To facilitate the installation of different OS for this tutorial a Virtual Machine was installed (VM ware). UBUNTU and WINDOWS 11 operating systems were installed on to the virtual machine.

WINDOWS 11 INSTALLATION

TIME STAMP OF THE INSTALLATION OF WINDOWS OS

The date of installation can be found by running a “systeminfo” command at the terminal of windows 11 OS



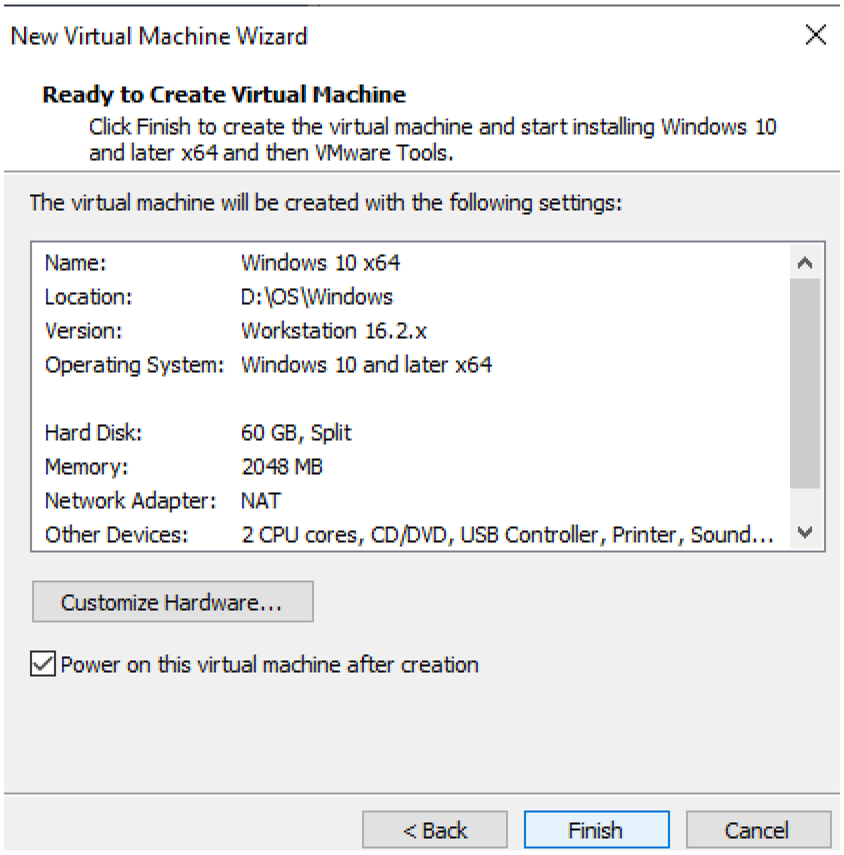
```
C:\Users\LorenzoSarkodie>systeminfo

Host Name:                 DESKTOP-FUFFVAT
OS Name:                   Microsoft Windows 11 Pro
OS Version:                10.0.22000 N/A Build 22000
OS Manufacturer:           Microsoft Corporation
OS Configuration:          Standalone Workstation
OS Build Type:             Multiprocessor Free
Registered Owner:          Windows User
Registered Organization:
Product ID:                00330-80000-00000-AA612
Original Install Date:     7/11/2022, 10:07:32 AM
System Boot Time:          7/21/2022, 1:24:03 PM
System Manufacturer:       VMware, Inc.
System Model:              VMware7,1
System Type:               x64-based PC
Processor(s):              2 Processor(s) Installed.
                           [01]: Intel64 Family 6 Model 142 Stepping 11 GenuineIntel ~1992 Mhz
                           [02]: Intel64 Family 6 Model 142 Stepping 11 GenuineIntel ~1992 Mhz
BIOS Version:              VMware, Inc. VMW71.00V.18452719.B64.2108091906, 8/9/2021
Windows Directory:         C:\Windows
System Directory:          C:\Windows\system32
Boot Device:               \Device\HarddiskVolume1
System Locale:             en-us;English (United States)
Input Locale:              en-us;English (United States)
Time Zone:                 (UTC+00:00) Monrovia, Reykjavik
Total Physical Memory:     2,047 MB
Available Physical Memory: 1,294 MB
Virtual Memory: Max Size:  3,199 MB
```

RESOURCE ALLOCATION

The windows OS installation was created with 2048 MB of an 8GB memory, 60 GB hard disk and 2 CPU cores (for multiprocessing).

Below is an allocation of the resources the virtual machine used in the installation of WINDOWS OS



New Virtual Machine Wizard

Ready to Create Virtual Machine

Click Finish to create the virtual machine and start installing Windows 10 and later x64 and then VMware Tools.

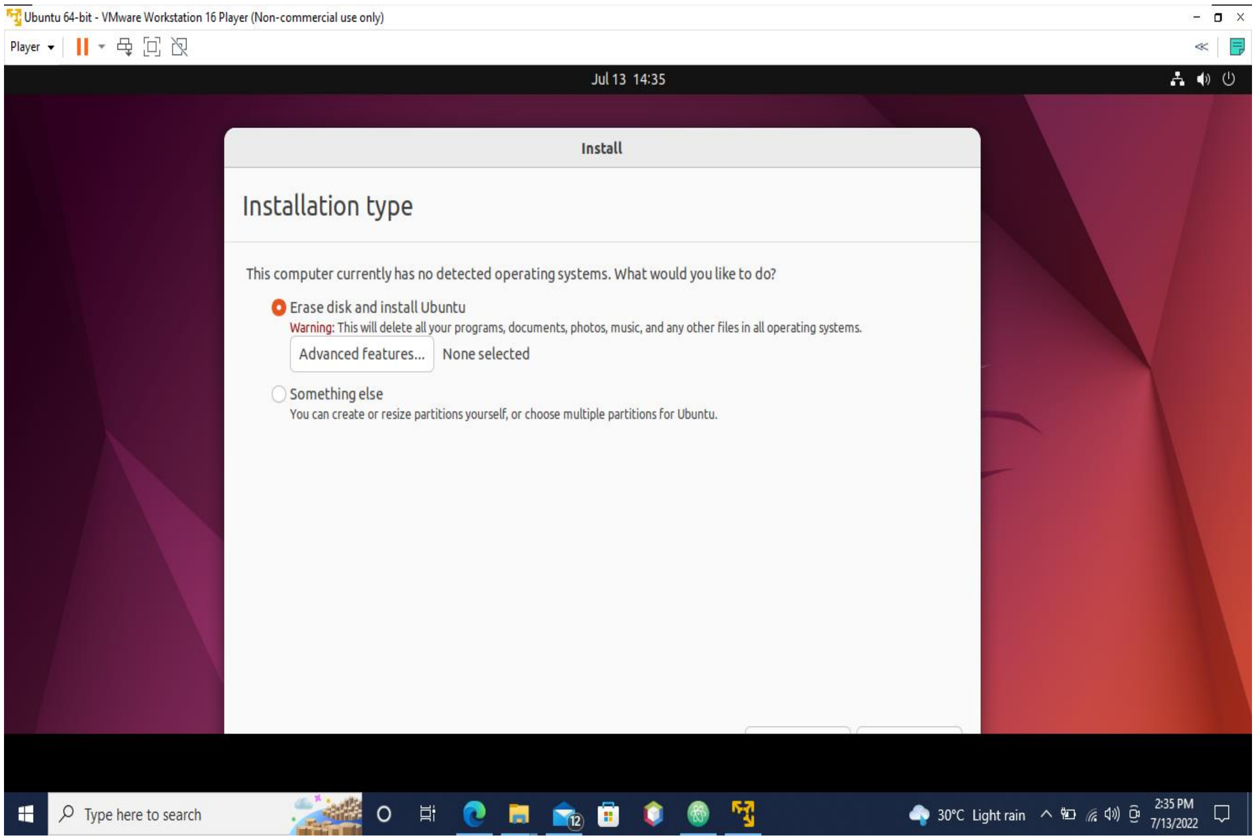
The virtual machine will be created with the following settings:

Name:	Windows 10 x64
Location:	D:\OS\Windows
Version:	Workstation 16.2.x
Operating System:	Windows 10 and later x64
Hard Disk:	60 GB, Split
Memory:	2048 MB
Network Adapter:	NAT
Other Devices:	2 CPU cores, CD/DVD, USB Controller, Printer, Sound...

☑ Power on this virtual machine after creation

LINUX UBUNTU INSTALLATION

UBUNTU OS INSTALLATION

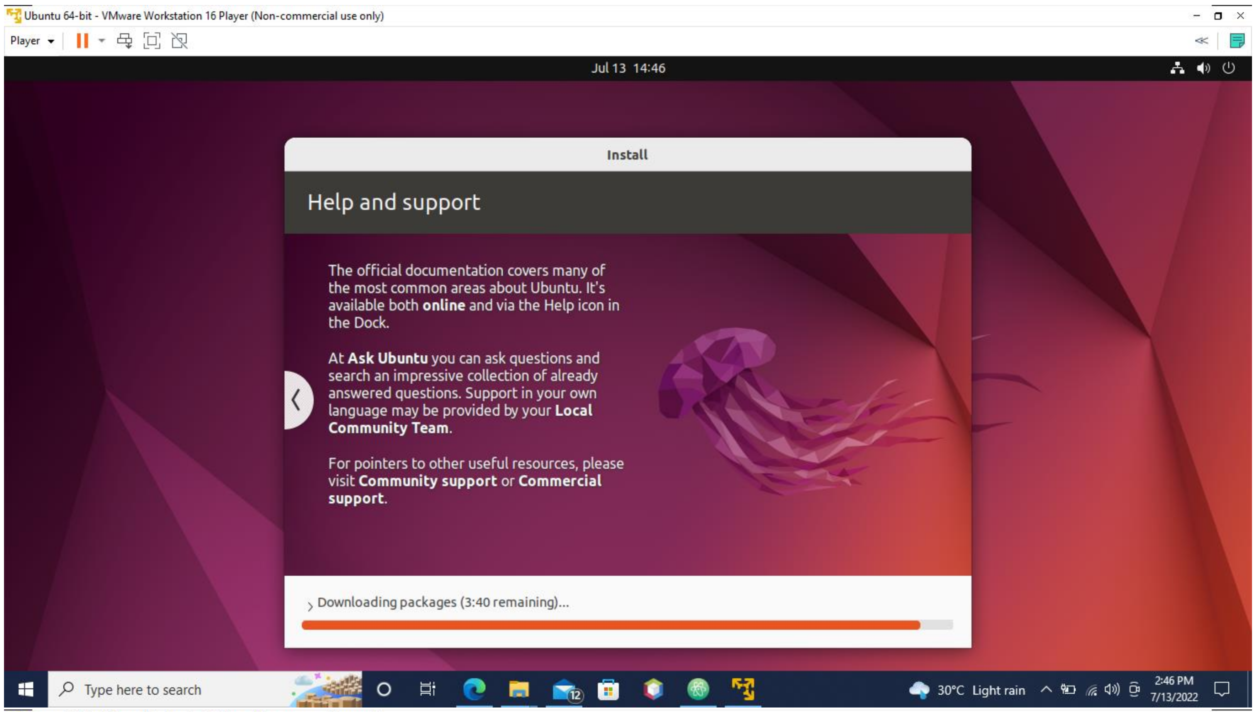


Installation type

This computer currently has no detected operating systems. What would you like to do?

[✓ Erase disk and install Ubuntu]
Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.
Advanced features... None selected

Something else
You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.



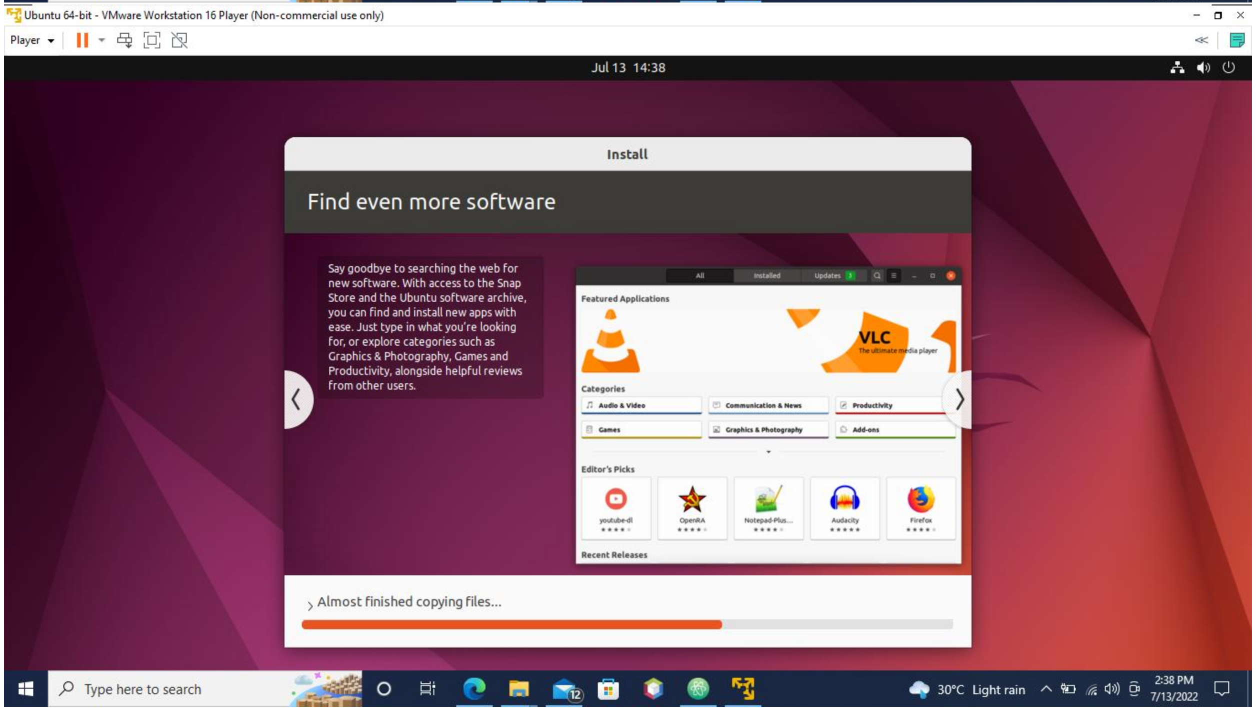
Help and support

The official documentation covers many of the most common areas about Ubuntu. It's available both **online** and via the Help icon in the Dock.

At **Ask Ubuntu** you can ask questions and search an impressive collection of already answered questions. Support in your own language may be provided by your **Local Community Team**.

For pointers to other useful resources, please visit **Community support** or **Commercial support**.

Downloading packages (3:40 remaining)...



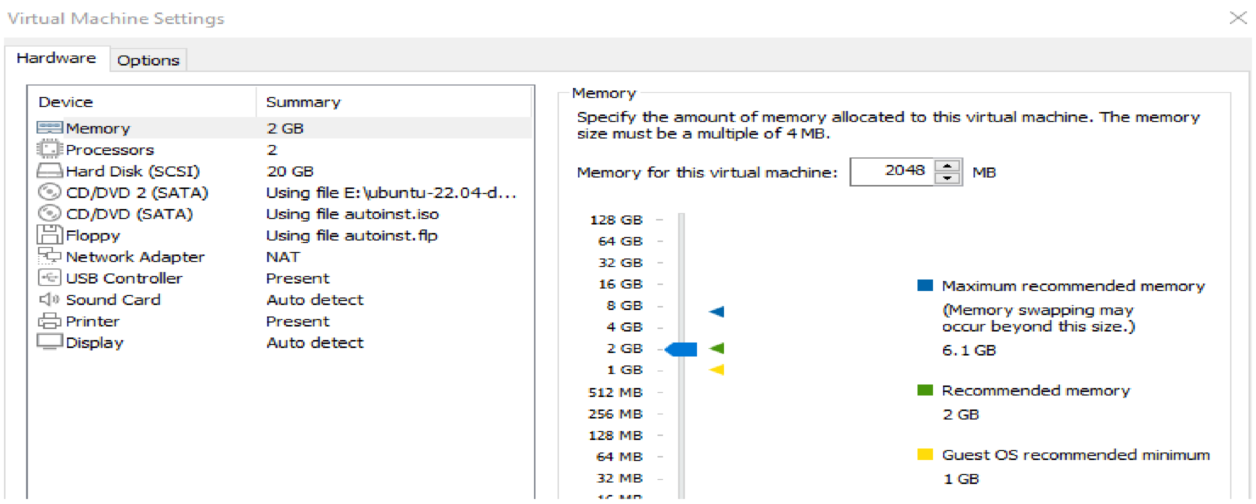
Find even more software

Say goodbye to searching the web for new software. With access to the Snap Store and the Ubuntu software archive, you can find and install new apps with ease. Just type in what you're looking for, or explore categories such as Graphics & Photography, Games and Productivity, alongside helpful reviews from other users.

Almost finished copying files...

RESOURCE ALLOCATION OF UBUNTU OS

2048 MB of memory, 2 processor cores and 20GB hard disk are allocated by VMWARE as the resources available for the UBUNTU OS


Virtual Machine Settings

Hardware | Options

Device	Summary
Memory	2 GB
Processors	2
Hard Disk (SCSI)	20 GB
CD/DVD 2 (SATA)	Using file E:\ubuntu-22.04-d...
CD/DVD (SATA)	Using file autoinst.iso
Floppy	Using file autoinst.flp
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Printer	Present
Display	Auto detect

Memory

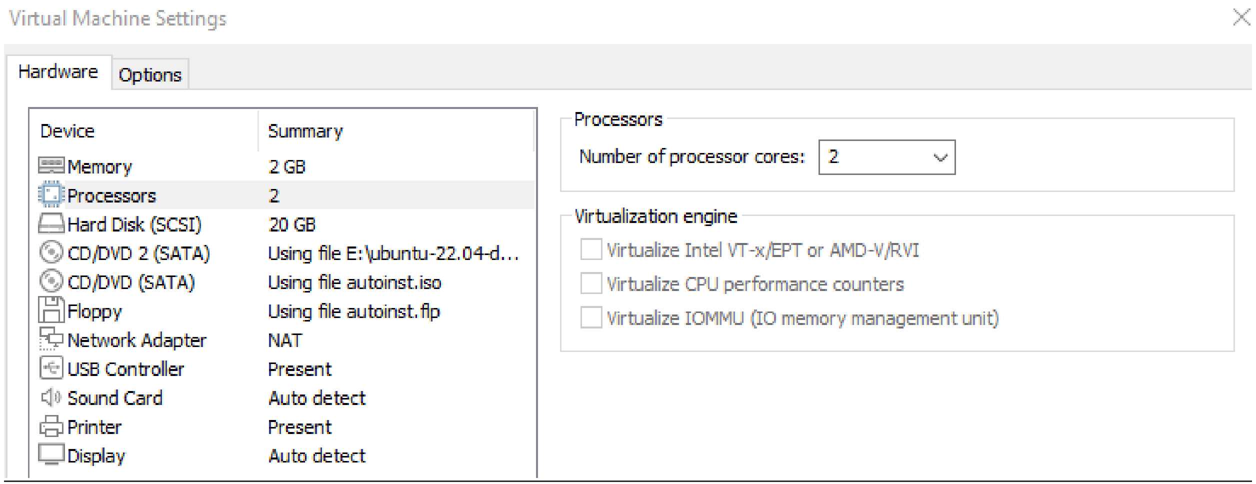
Specify the amount of memory allocated to this virtual machine. The memory size must be a multiple of 4 MB.

Memory for this virtual machine: 2048 MB

🟦 Maximum recommended memory
(Memory swapping may occur beyond this size.)
6.1 GB

🟩 Recommended memory
2 GB

🟨 Guest OS recommended minimum
1 GB


Virtual Machine Settings

Hardware | Options

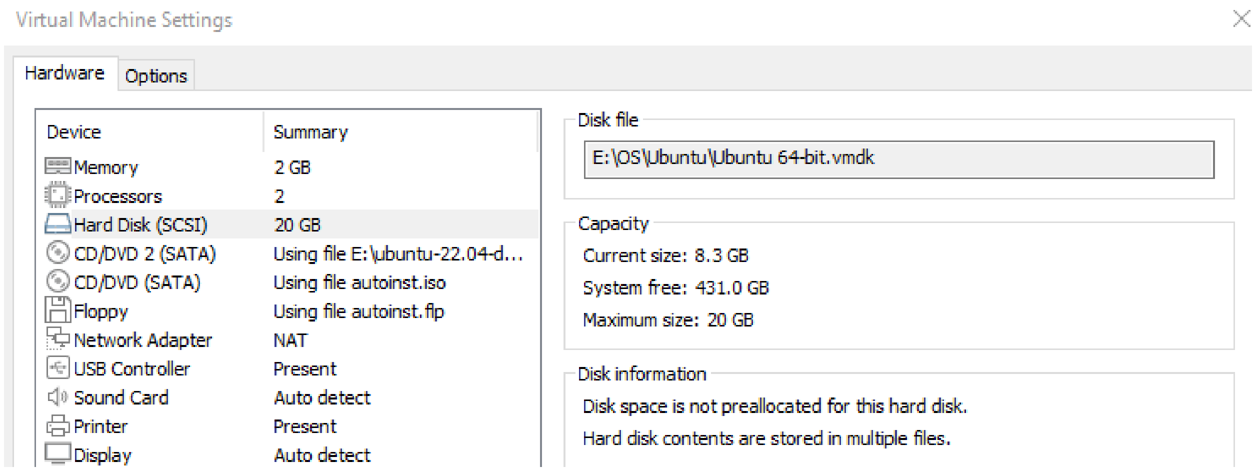
Device	Summary
Memory	2 GB
Processors	2
Hard Disk (SCSI)	20 GB
CD/DVD 2 (SATA)	Using file E:\ubuntu-22.04-d...
CD/DVD (SATA)	Using file autoinst.iso
Floppy	Using file autoinst.flp
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Printer	Present
Display	Auto detect

Processors

Number of processor cores: 2

Virtualization engine

☐ Virtualize Intel VT-x/EPT or AMD-V/RVI
☐ Virtualize CPU performance counters
☐ Virtualize IOMMU (IO memory management unit)


Virtual Machine Settings

Hardware | Options

Device	Summary
Memory	2 GB
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Hard Disk (SCSI)	20 GB
CD/DVD 2 (SATA)	Using file E:\ubuntu-22.04-d...
CD/DVD (SATA)	Using file autoinst.iso
Floppy	Using file autoinst.flp
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Printer	Present
Display	Auto detect

Disk file

E:\OS\Ubuntu\Ubuntu 64-bit.vmdk

Capacity

Current size: 8.3 GB
System free: 431.0 GB
Maximum size: 20 GB

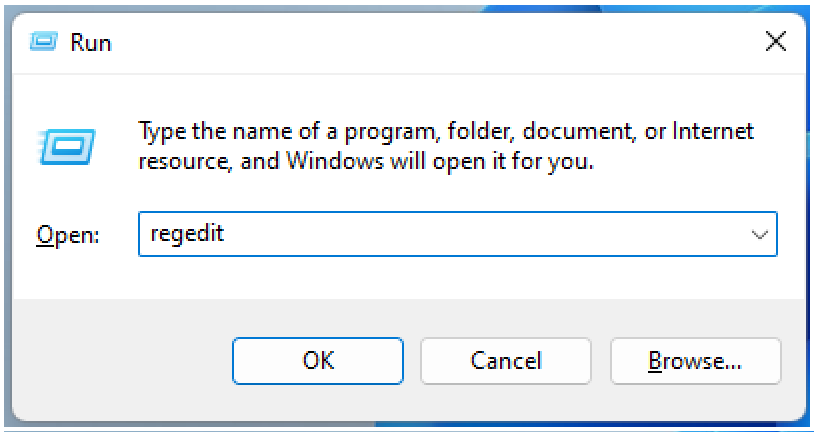
Disk information

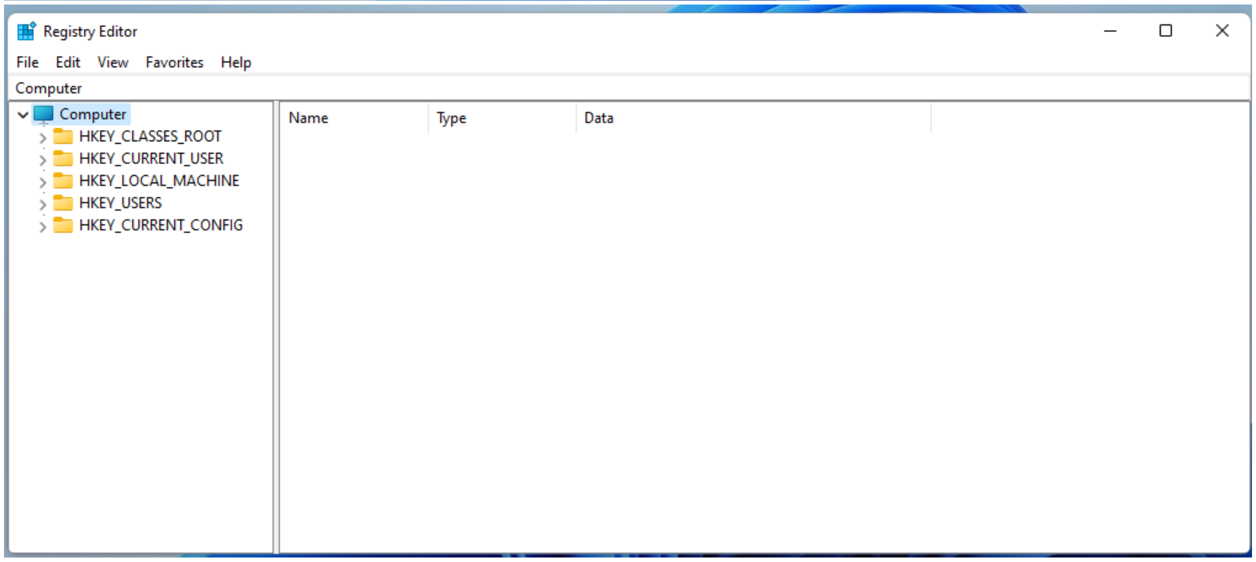
Disk space is not preallocated for this hard disk.
Hard disk contents are stored in multiple files.

HOW TO ACCESS THE REGISTRY

The registry contains settings for the hardware, system software and applications in the PC. It comprises the SYSTEM.DAT and USER.DAT files.

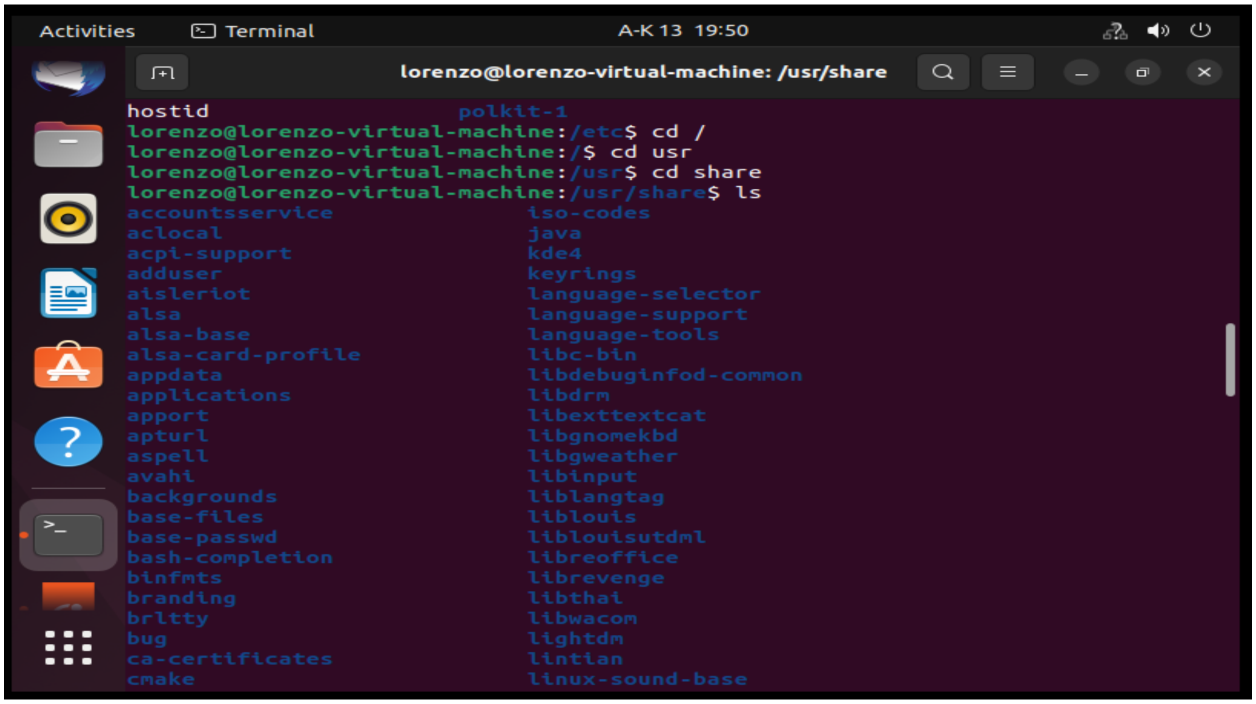
WINDOWS registry can be accessed by typing “regedit” in the ‘run’ window.


Run
Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.
Open:
regedit
OK
Cancel
Browse...

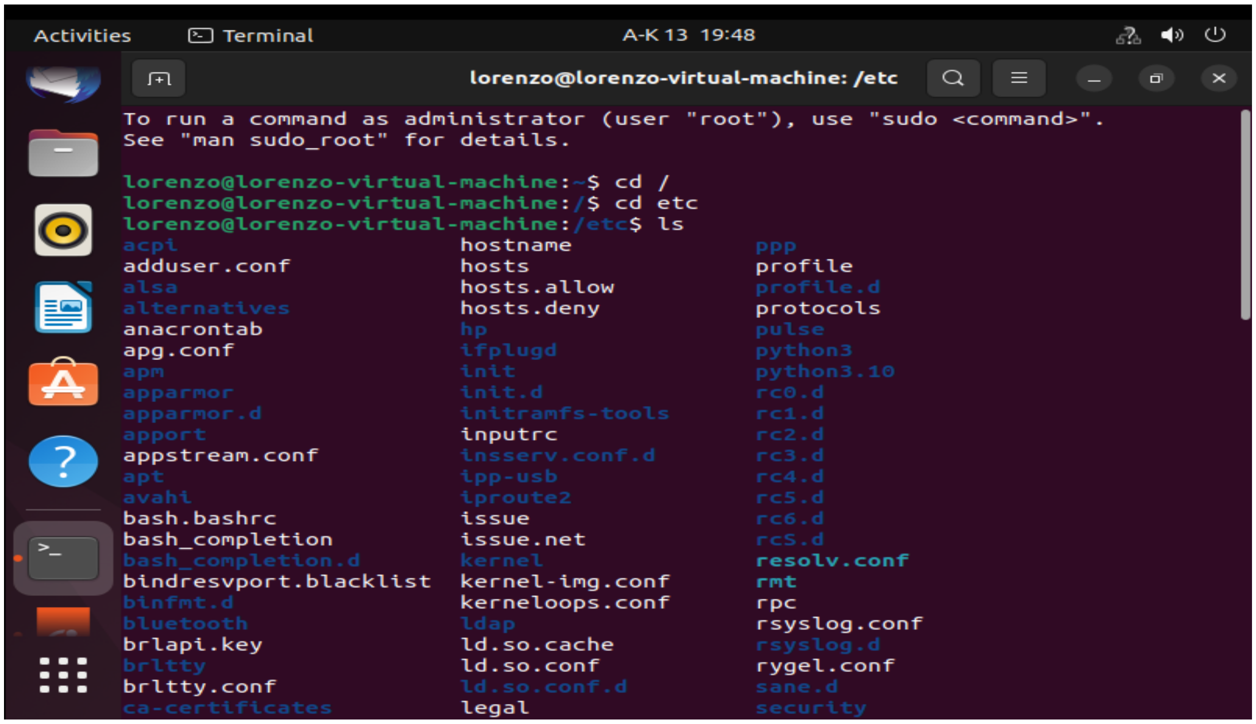


Unlike windows, UBUNTU’s registry is spread across different locations, these locations can be accessed by using the following codes in the terminal

Registry 1	Registry 2
cd / cd etc ls	cd / cd usr cd share ls



```
hostid                  polkit-1
lorenzo@lorenzo-virtual-machine:/etc$ cd /
lorenzo@lorenzo-virtual-machine:/$ cd usr
lorenzo@lorenzo-virtual-machine:/usr$ cd share
lorenzo@lorenzo-virtual-machine:/usr/share$ ls
accountsservice              iso-codes
aclocal                      java
acpi-support                 kde4
adduser                      keyrings
aisleriot                    language-selector
alsa                         language-support
alsa-base                    language-tools
alsa-card-profile            libc-bin
appdata                      libdebuginfod-common
applications                 libdrm
apport                       libexttextcat
apturl                       libgnomekbd
aspell                       libgweather
avahi                        libinput
backgrounds                  liblangtag
base-files                   liblouis
base-passwd                  liblouisutdml
bash-completion              libreoffice
binfmts                      librevenge
branding                     libthai
brltty                       libwacom
bug                          lightdm
ca-certificates              lintian
cmake                        linux-sound-base
```



```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

lorenzo@lorenzo-virtual-machine:~$ cd /
lorenzo@lorenzo-virtual-machine:/$ cd etc
lorenzo@lorenzo-virtual-machine:/etc$ ls
acpi                    hostname                 ppp
adduser.conf            hosts                    profile
alsa                    hosts.allow              profile.d
alternatives            hosts.deny               protocols
anacrontab              hp                       pulse
apg.conf                ifplugd                  python3
apm                     init                     python3.10
apparmor                init.d                   rc0.d
apparmor.d              initramfs-tools          rc1.d
apport                  inputrc                  rc2.d
appstream.conf          insserv.conf.d           rc3.d
apt                     ipp-usb                  rc4.d
avahi                   iproute2                 rc5.d
bash.bashrc             issue                    rc6.d
bash_completion         issue.net                rcS.d
bash_completion.d       kernel                   resolv.conf
bindresvport.blacklist  kernel-img.conf          rmt
binfmt.d                kerneloops.conf          rpc
bluetooth               ldap                     rsyslog.conf
brlapi.key              ld.so.cache              rsyslog.d
brltty                  ld.so.conf               rygel.conf
brltty.conf             ld.so.conf.d             sane.d
ca-certificates         legal                    security
```

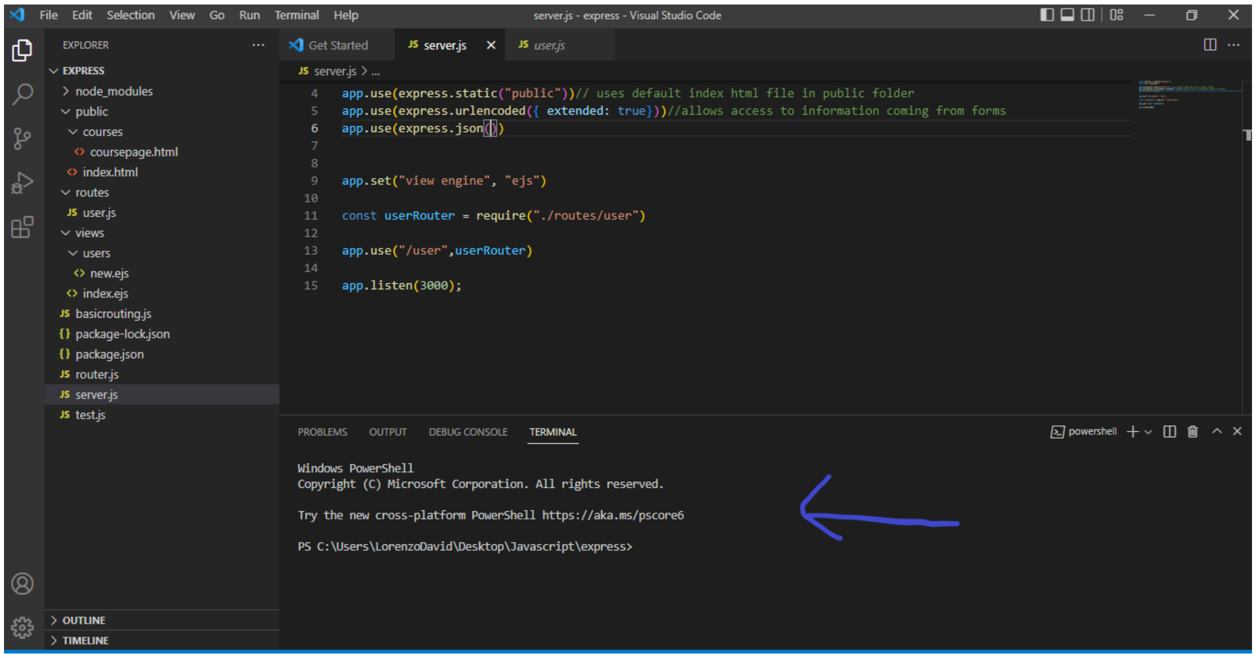
PROCESSES

A process is a program in execution. Process requires resources such as memory, CPU, Input-Output devices.

PARENT AND CHILD PROCESSES

When a process invokes a fork () it creates another process. The process created becomes the CHILD PROCESS and the creator of the process becomes a PARENT PROCESS

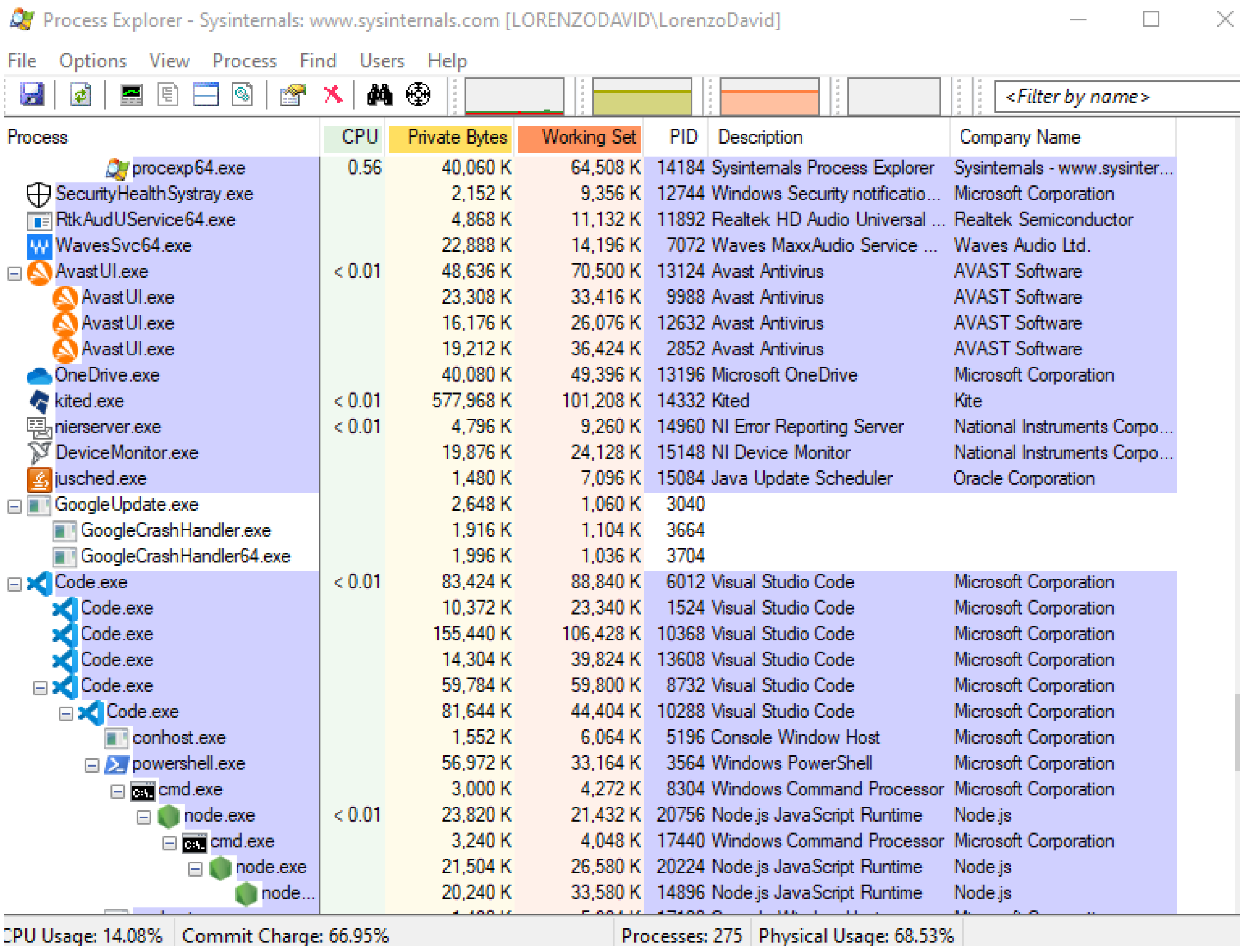
A parent and child process can be created in WINDOWS by opening visual code and running a terminal



```
app.use(express.static("public"))// uses default index html file in public folder
app.use(express.urlencoded({ extended: true}))//allows access to information coming from forms
app.use(express.json())


app.set("view engine", "ejs")

const userRouter = require("./routes/user")

app.use("/user",userRouter)

app.listen(3000);
```

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\LorenzoDavid\Desktop\Javascript\express>
```

With the help of a process explorer, the child and parent processes are monitored



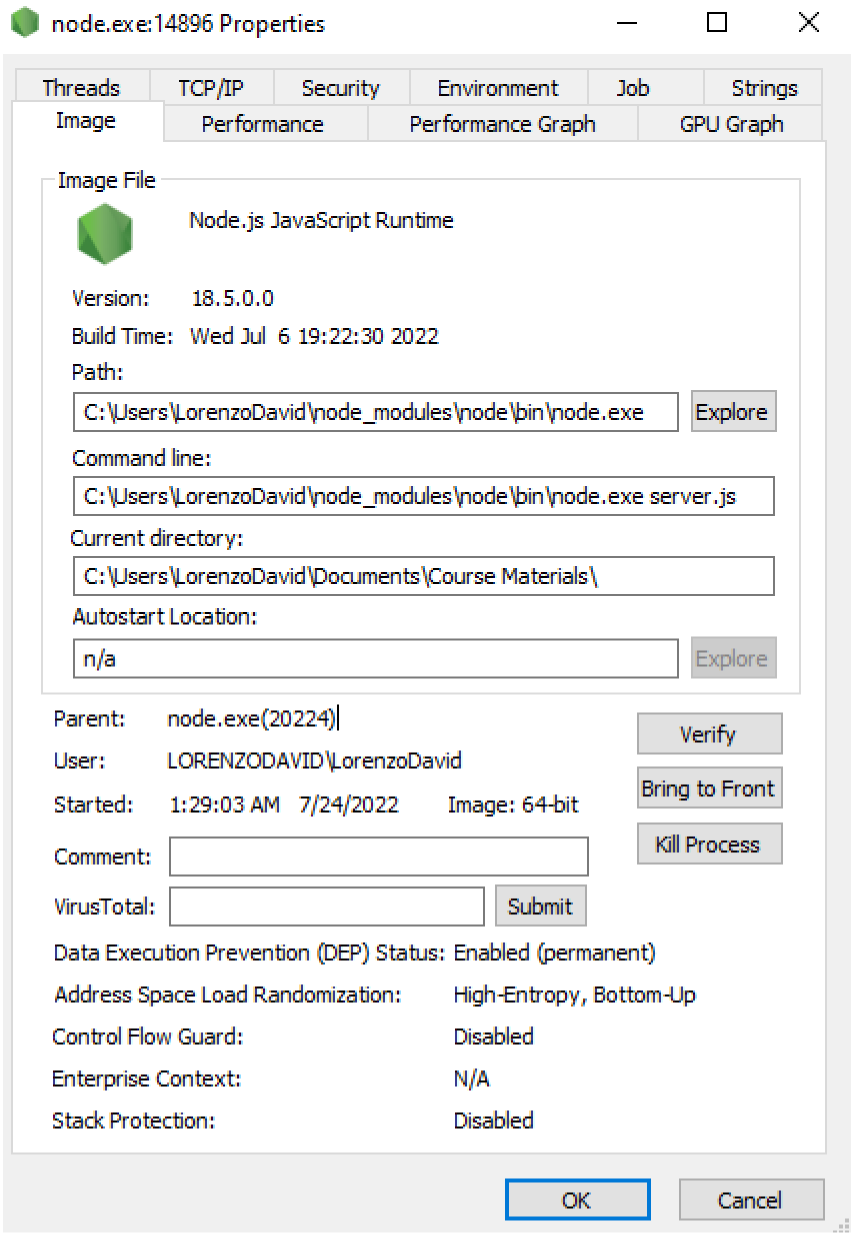
Process Explorer - Sysinternals: www.sysinternals.com [LORENZODAVID\LorenzoDavid]

Process	CPU	Private Bytes	Working Set	PID	Description	Company Name
procexp64.exe	0.56	40,060 K	64,508 K	14184	Sysinternals Process Explorer	Sysinternals - www.sysinter...
SecurityHealthSystray.exe		2,152 K	9,356 K	12744	Windows Security notificatio...	Microsoft Corporation
RtkAudUService64.exe		4,868 K	11,132 K	11892	Realtek HD Audio Universal ...	Realtek Semiconductor
WavesSvc64.exe		22,888 K	14,196 K	7072	Waves MaxxAudio Service ...	Waves Audio Ltd.
AvastUI.exe	< 0.01	48,636 K	70,500 K	13124	Avast Antivirus	AVAST Software
AvastUI.exe		23,308 K	33,416 K	9988	Avast Antivirus	AVAST Software
AvastUI.exe		16,176 K	26,076 K	12632	Avast Antivirus	AVAST Software
AvastUI.exe		19,212 K	36,424 K	2852	Avast Antivirus	AVAST Software
OneDrive.exe		40,080 K	49,396 K	13196	Microsoft OneDrive	Microsoft Corporation
kited.exe	< 0.01	577,968 K	101,208 K	14332	Kited	Kite
nierserver.exe	< 0.01	4,796 K	9,260 K	14960	NI Error Reporting Server	National Instruments Corpo...
DeviceMonitor.exe		19,876 K	24,128 K	15148	NI Device Monitor	National Instruments Corpo...
jusched.exe		1,480 K	7,096 K	15084	Java Update Scheduler	Oracle Corporation
GoogleUpdate.exe		2,648 K	1,060 K	3040		
GoogleCrashHandler.exe		1,916 K	1,104 K	3664		
GoogleCrashHandler64.exe		1,996 K	1,036 K	3704		
Code.exe	< 0.01	83,424 K	88,840 K	6012	Visual Studio Code	Microsoft Corporation
Code.exe		10,372 K	23,340 K	1524	Visual Studio Code	Microsoft Corporation
Code.exe		155,440 K	106,428 K	10368	Visual Studio Code	Microsoft Corporation
Code.exe		14,304 K	39,824 K	13608	Visual Studio Code	Microsoft Corporation
Code.exe		59,784 K	59,800 K	8732	Visual Studio Code	Microsoft Corporation
Code.exe		81,644 K	44,404 K	10288	Visual Studio Code	Microsoft Corporation
conhost.exe		1,552 K	6,064 K	5196	Console Window Host	Microsoft Corporation
powershell.exe		56,972 K	33,164 K	3564	Windows PowerShell	Microsoft Corporation
cmd.exe		3,000 K	4,272 K	8304	Windows Command Processor	Microsoft Corporation
node.exe	< 0.01	23,820 K	21,432 K	20756	Node.js JavaScript Runtime	Node.js
cmd.exe		3,240 K	4,048 K	17440	Windows Command Processor	Microsoft Corporation
node.exe		21,504 K	26,580 K	20224	Node.js JavaScript Runtime	Node.js
node...		20,240 K	33,580 K	14896	Node.js JavaScript Runtime	Node.js

CPU Usage: 14.08% | Commit Charge: 66.95% | Processes: 275 | Physical Usage: 68.53%

The process explorer shows the process trees which consists of parent and child processes, along with their process resources

Using node.exe (PID: 20224) as a parent and its CHILD PROCESS node (PID: 14896) to demonstrate that killing a parent process kills a child process



node.exe:14896 Properties

Image File

Node.js JavaScript Runtime

Version: 18.5.0.0

Build Time: Wed Jul 6 19:22:30 2022

Path:

C:\Users\LorenzoDavid\node_modules\node\bin\node.exe

Command line:

C:\Users\LorenzoDavid\node_modules\node\bin\node.exe server.js

Current directory:

C:\Users\LorenzoDavid\Documents\Course Materials\

Autostart Location:

n/a

Parent: node.exe(20224)

User: LORENZODAVID\LorenzoDavid

Started: 1:29:03 AM 7/24/2022 Image: 64-bit

Comment:

VirusTotal:

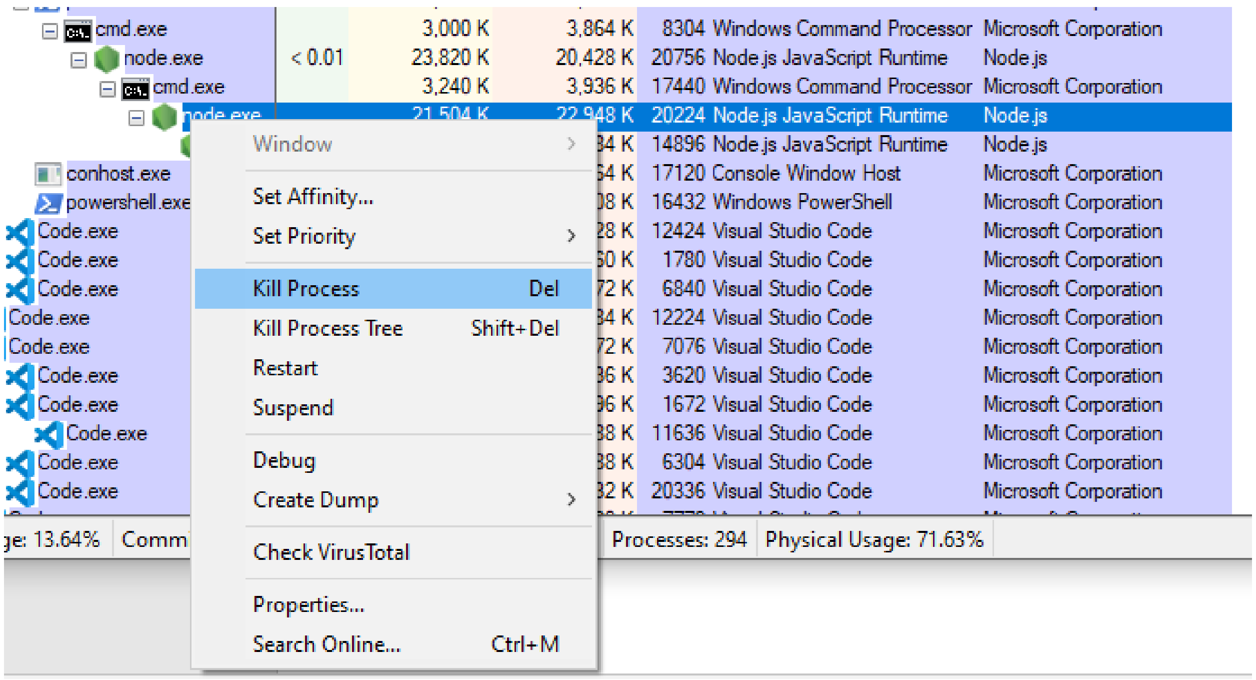
Data Execution Prevention (DEP) Status: Enabled (permanent)

Address Space Load Randomization: High-Entropy, Bottom-Up

Control Flow Guard: Disabled

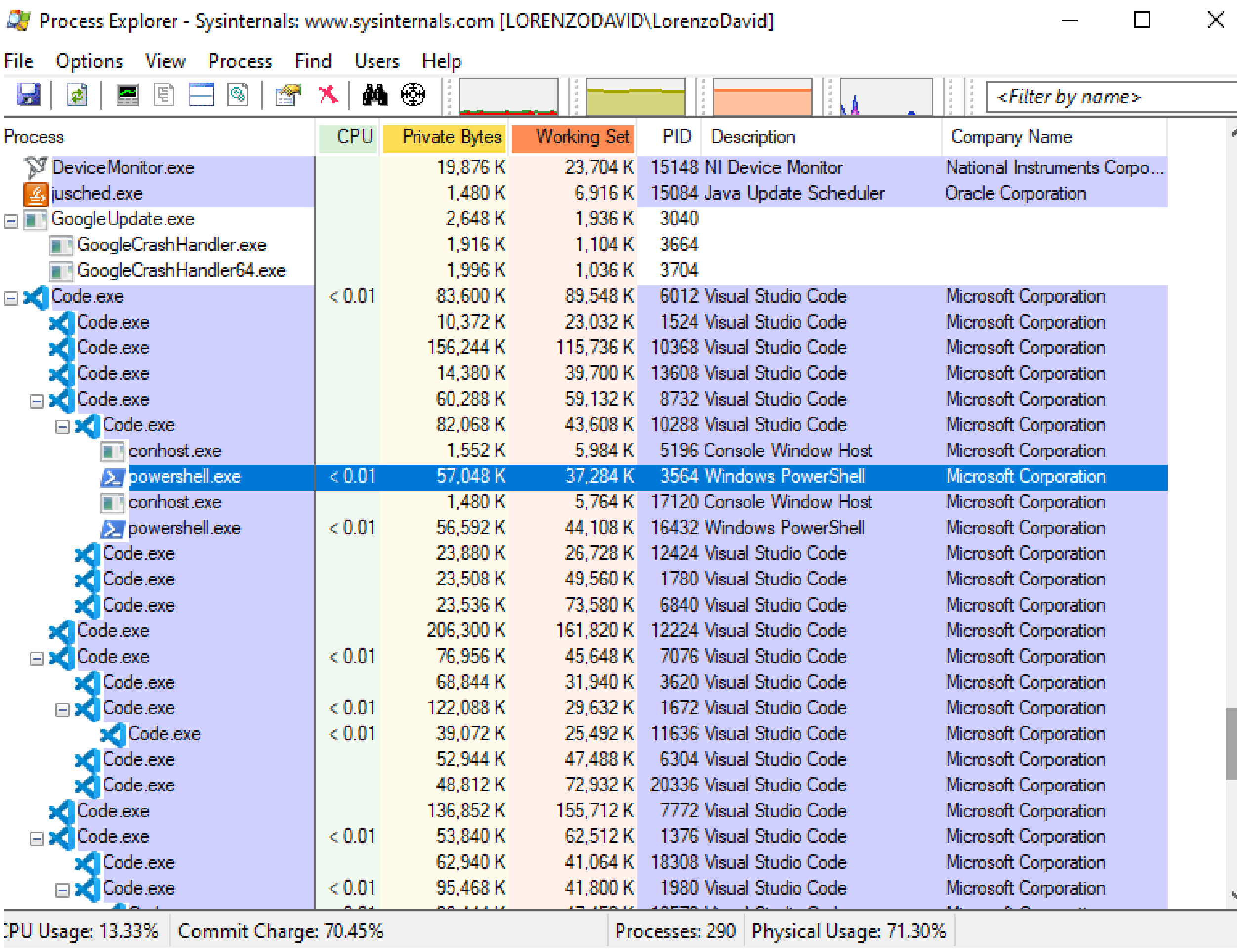
Enterprise Context: N/A

Stack Protection: Disabled



cmd.exe		3,000 K	3,864 K	8304	Windows Command Processor	Microsoft Corporation
node.exe	< 0.01	23,820 K	20,428 K	20756	Node.js JavaScript Runtime	Node.js
cmd.exe		3,240 K	3,936 K	17440	Windows Command Processor	Microsoft Corporation
node.exe		21,504 K	22,948 K	20224	Node.js JavaScript Runtime	Node.js
			34 K	14896	Node.js JavaScript Runtime	Node.js
conhost.exe			54 K	17120	Console Window Host	Microsoft Corporation
powershell.exe			08 K	16432	Windows PowerShell	Microsoft Corporation
Code.exe			28 K	12424	Visual Studio Code	Microsoft Corporation
Code.exe			60 K	1780	Visual Studio Code	Microsoft Corporation
Code.exe			72 K	6840	Visual Studio Code	Microsoft Corporation
Code.exe			34 K	12224	Visual Studio Code	Microsoft Corporation
Code.exe			72 K	7076	Visual Studio Code	Microsoft Corporation
Code.exe			36 K	3620	Visual Studio Code	Microsoft Corporation
Code.exe			96 K	1672	Visual Studio Code	Microsoft Corporation
Code.exe			38 K	11636	Visual Studio Code	Microsoft Corporation
Code.exe			38 K	6304	Visual Studio Code	Microsoft Corporation
Code.exe			32 K	20336	Visual Studio Code	Microsoft Corporation

ge: 13.64% | Comm | Processes: 294 | Physical Usage: 71.63%



Process Explorer - Sysinternals: www.sysinternals.com [LORENZODAVID\LorenzoDavid]

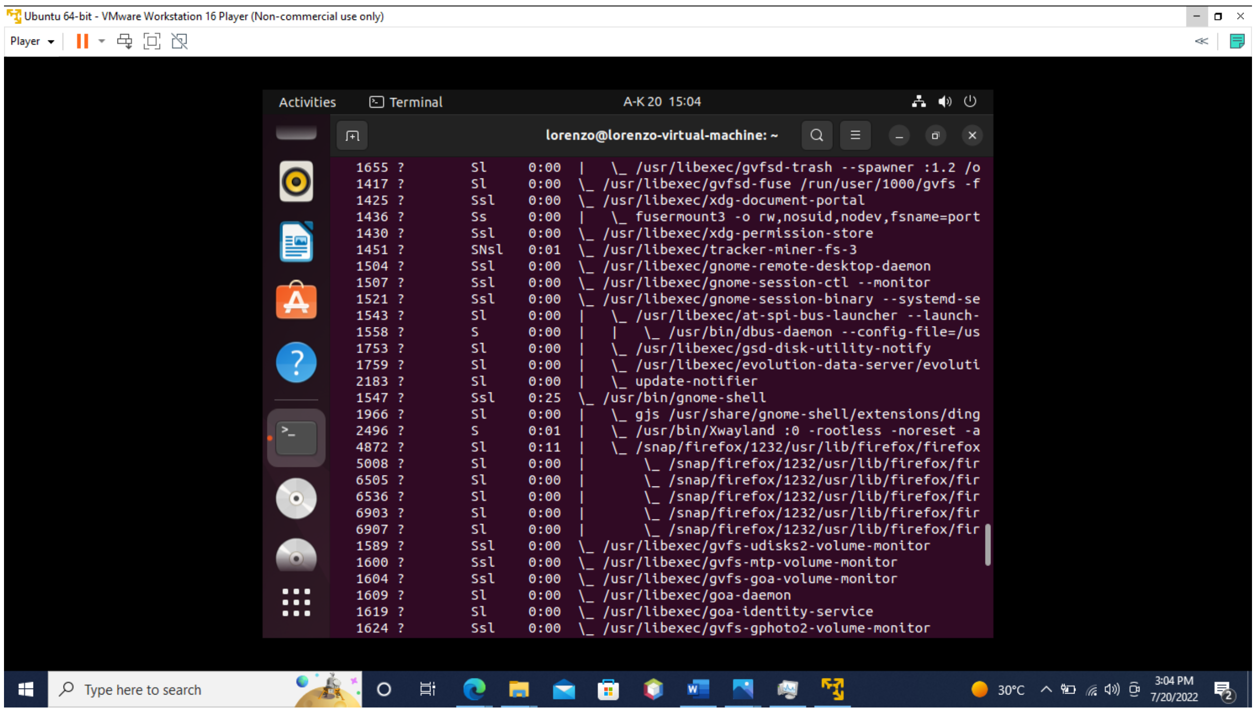
Process	CPU	Private Bytes	Working Set	PID	Description	Company Name
DeviceMonitor.exe		19,876 K	23,704 K	15148	NI Device Monitor	National Instruments Corpo...
jusched.exe		1,480 K	6,916 K	15084	Java Update Scheduler	Oracle Corporation
GoogleUpdate.exe		2,648 K	1,936 K	3040		
GoogleCrashHandler.exe		1,916 K	1,104 K	3664		
GoogleCrashHandler64.exe		1,996 K	1,036 K	3704		
Code.exe	< 0.01	83,600 K	89,548 K	6012	Visual Studio Code	Microsoft Corporation
Code.exe		10,372 K	23,032 K	1524	Visual Studio Code	Microsoft Corporation
Code.exe		156,244 K	115,736 K	10368	Visual Studio Code	Microsoft Corporation
Code.exe		14,380 K	39,700 K	13608	Visual Studio Code	Microsoft Corporation
Code.exe		60,288 K	59,132 K	8732	Visual Studio Code	Microsoft Corporation
Code.exe		82,068 K	43,608 K	10288	Visual Studio Code	Microsoft Corporation
conhost.exe		1,552 K	5,984 K	5196	Console Window Host	Microsoft Corporation
powershell.exe	< 0.01	57,048 K	37,284 K	3564	Windows PowerShell	Microsoft Corporation
conhost.exe		1,480 K	5,764 K	17120	Console Window Host	Microsoft Corporation
powershell.exe	< 0.01	56,592 K	44,108 K	16432	Windows PowerShell	Microsoft Corporation
Code.exe		23,880 K	26,728 K	12424	Visual Studio Code	Microsoft Corporation
Code.exe		23,508 K	49,560 K	1780	Visual Studio Code	Microsoft Corporation
Code.exe		23,536 K	73,580 K	6840	Visual Studio Code	Microsoft Corporation
Code.exe		206,300 K	161,820 K	12224	Visual Studio Code	Microsoft Corporation
Code.exe	< 0.01	76,956 K	45,648 K	7076	Visual Studio Code	Microsoft Corporation
Code.exe		68,844 K	31,940 K	3620	Visual Studio Code	Microsoft Corporation
Code.exe	< 0.01	122,088 K	29,632 K	1672	Visual Studio Code	Microsoft Corporation
Code.exe	< 0.01	39,072 K	25,492 K	11636	Visual Studio Code	Microsoft Corporation
Code.exe		52,944 K	47,488 K	6304	Visual Studio Code	Microsoft Corporation
Code.exe		48,812 K	72,932 K	20336	Visual Studio Code	Microsoft Corporation
Code.exe		136,852 K	155,712 K	7772	Visual Studio Code	Microsoft Corporation
Code.exe	< 0.01	53,840 K	62,512 K	1376	Visual Studio Code	Microsoft Corporation
Code.exe		62,940 K	41,064 K	18308	Visual Studio Code	Microsoft Corporation
Code.exe	< 0.01	95,468 K	41,800 K	1980	Visual Studio Code	Microsoft Corporation

CPU Usage: 13.33% | Commit Charge: 70.45% | Processes: 290 | Physical Usage: 71.30%

When the parent process was terminated the child died with it

DEMONSTRATING PARENT – CHILD PROCESSES IN UBUNTU

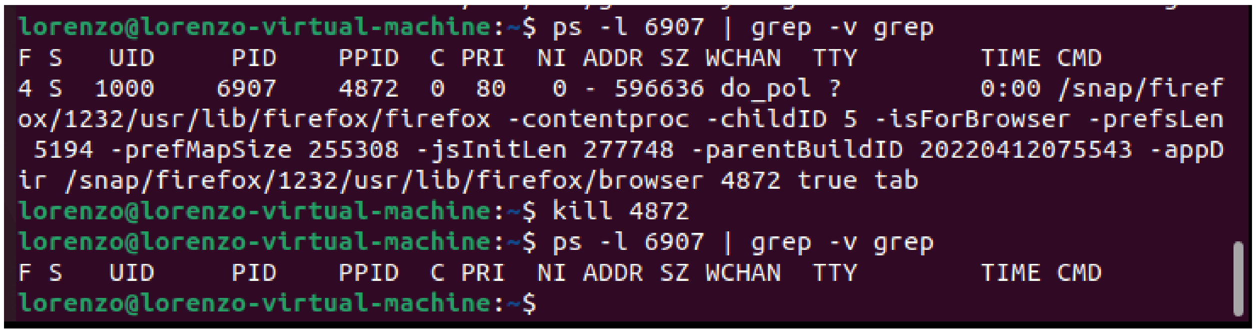
Processes can be accessed in UBUNTU using “ps fax” command in the ubuntu terminal


Ubuntu 64-bit - VMware Workstation 16 Player (Non-commercial use only)
Player
Activities
Terminal
A-K 20 15:04
lorenzo@lorenzo-virtual-machine: ~
Type here to search
30°C
3:04 PM
7/20/2022

```
   1655 ?        Sl     0:00  |   \_ /usr/libexec/gvfsd-trash --spawner :1.2 /o
   1417 ?        Sl     0:00  \_ /usr/libexec/gvfsd-fuse /run/user/1000/gvfs -f
   1425 ?        Ssl    0:00  \_ /usr/libexec/xdg-document-portal
   1436 ?        Ss     0:00  |   \_ fusermount3 -o rw,nosuid,nodev,fsname=port
   1430 ?        Ssl    0:00  \_ /usr/libexec/xdg-permission-store
   1451 ?        SNsl   0:01  \_ /usr/libexec/tracker-miner-fs-3
   1504 ?        Ssl    0:00  \_ /usr/libexec/gnome-remote-desktop-daemon
   1507 ?        Ssl    0:00  \_ /usr/libexec/gnome-session-ctl --monitor
   1521 ?        Ssl    0:00  \_ /usr/libexec/gnome-session-binary --systemd-se
   1543 ?        Sl     0:00  |   \_ /usr/libexec/at-spi-bus-launcher --launch-
   1558 ?        S      0:00  |   |   \_ /usr/bin/dbus-daemon --config-file=/us
   1753 ?        Sl     0:00  |   \_ /usr/libexec/gsd-disk-utility-notify
   1759 ?        Sl     0:00  |   \_ /usr/libexec/evolution-data-server/evoluti
   2183 ?        Sl     0:00  |   \_ update-notifier
   1547 ?        Ssl    0:25  \_ /usr/bin/gnome-shell
   1966 ?        Sl     0:00  |   \_ gjs /usr/share/gnome-shell/extensions/ding
   2496 ?        S      0:01  |   \_ /usr/bin/Xwayland :0 -rootless -noreset -a
   4872 ?        Sl     0:11  |   \_ /snap/firefox/1232/usr/lib/firefox/firefox
   5008 ?        Sl     0:00  |       \_ /snap/firefox/1232/usr/lib/firefox/fir
   6505 ?        Sl     0:00  |       \_ /snap/firefox/1232/usr/lib/firefox/fir
   6536 ?        Sl     0:00  |       \_ /snap/firefox/1232/usr/lib/firefox/fir
   6903 ?        Sl     0:00  |       \_ /snap/firefox/1232/usr/lib/firefox/fir
   6907 ?        Sl     0:00  |       \_ /snap/firefox/1232/usr/lib/firefox/fir
   1589 ?        Ssl    0:00  \_ /usr/libexec/gvfs-udisks2-volume-monitor
   1600 ?        Ssl    0:00  \_ /usr/libexec/gvfs-mtp-volume-monitor
   1604 ?        Ssl    0:00  \_ /usr/libexec/gvfs-goa-volume-monitor
   1609 ?        Sl     0:00  \_ /usr/libexec/goa-daemon
   1619 ?        Sl     0:00  \_ /usr/libexec/goa-identity-service
   1624 ?        Ssl    0:00  \_ /usr/libexec/gvfs-gphoto2-volume-monitor
```

This displays various process trees made up of parent and child processes.

Using Firefox (PPID: 4872) as a PARENT PROCESS and its CHILD PROCESS (PID: 6907) to demonstrate that killing a parent process kills a child process



```
lorenzo@lorenzo-virtual-machine:~$ ps -l 6907 | grep -v grep
F S   UID     PID    PPID  C PRI  NI ADDR SZ WCHAN  TTY        TIME CMD
4 S  1000    6907    4872  0  80   0 - 596636 do_pol ?         0:00 /snap/firef
ox/1232/usr/lib/firefox/firefox -contentproc -childID 5 -isForBrowser -prefsLen
 5194 -prefMapSize 255308 -jsInitLen 277748 -parentBuildID 20220412075543 -appD
ir /snap/firefox/1232/usr/lib/firefox/browser 4872 true tab
lorenzo@lorenzo-virtual-machine:~$ kill 4872
lorenzo@lorenzo-virtual-machine:~$ ps -l 6907 | grep -v grep
F S   UID     PID    PPID  C PRI  NI ADDR SZ WCHAN  TTY        TIME CMD
lorenzo@lorenzo-virtual-machine:~$
```

The details of process with ID:6907 is invoked with the “ps -l 6907 | grep -v grep”, this displays the parent process (PPID: 4872) of PID:6907. After the parent is killed using the “kill 4872” command, an empty set is produced when the “ps -l 6907 | grep -v grep” command is invoked. This concludes that killing a parent kills the CHILD PROCESS

STATIC AND DYNAMIC LOADING PROCESSES

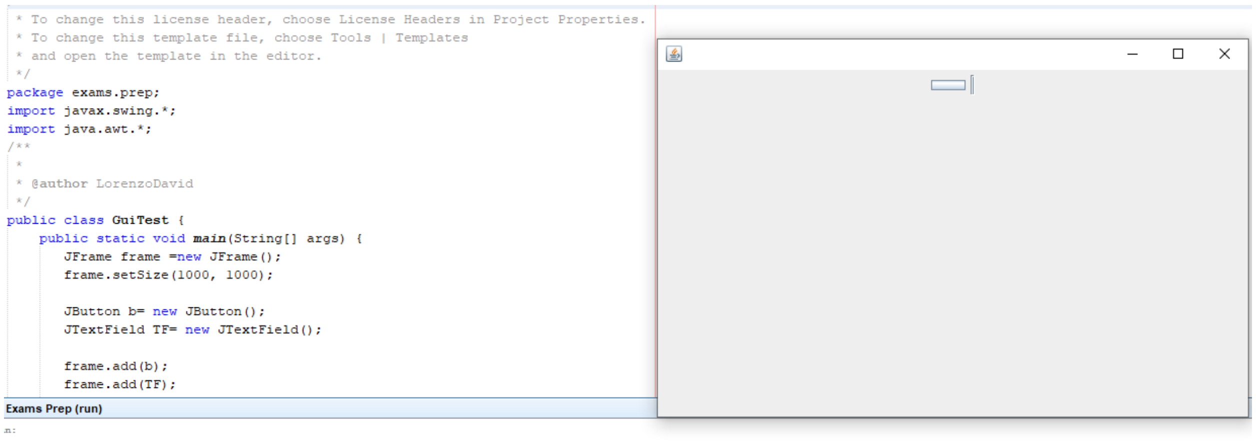
Static loading is the process of loading the whole program into memory before the execution. This improves processing time as no files are modified in the process.

Dynamic loading is the process of loading a routine only when it is invoked. This ensures optimal use of memory by the system

An example of process that utilizes static loading is running a C PROGRAM

C PROGRAMMING is a well structured language so the whole program is loaded into memory before the execution takes place

An example of a process which utilizes dynamic loading is running a JAVA program



```
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */
package exams.prep;
import javax.swing.*;
import java.awt.*;
/**
 *
 * @author LorenzoDavid
 */
public class GuiTest {
    public static void main(String[] args) {
       JFrame frame =new JFrame();
       frame.setSize(1000, 1000);

       JButton b= new JButton();
       JTextField TF= new JTextField();

       frame.add(b);
       frame.add(TF);
```

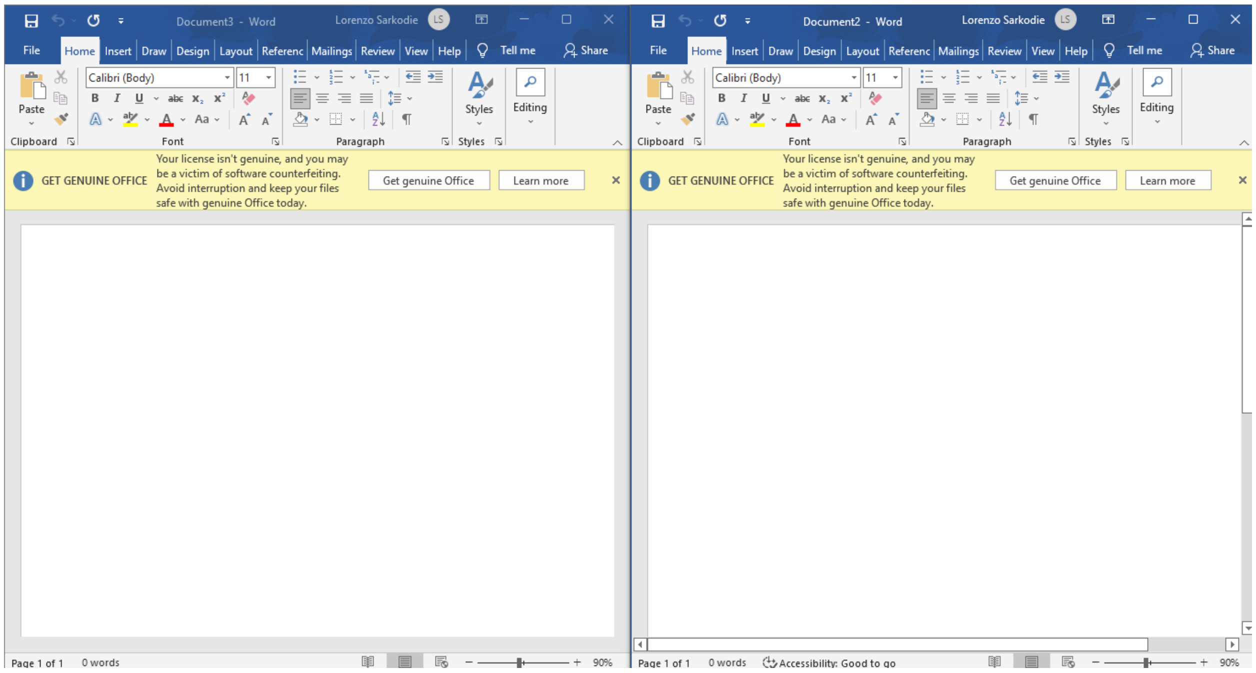
JAVA is an Object-Oriented Programming language hence its routine is loaded dynamically in to memory only when it is needed

INDEPENDENT AND COOPERATING PROCESSES

An independent process is a process operating concurrently but can neither affect other processes or be affected by other processes.

A cooperating process is a process that can affect or be affected by other processes.

Independent processes in WINDOWS OS: The different instances of a word document constitute different processes which are independent.



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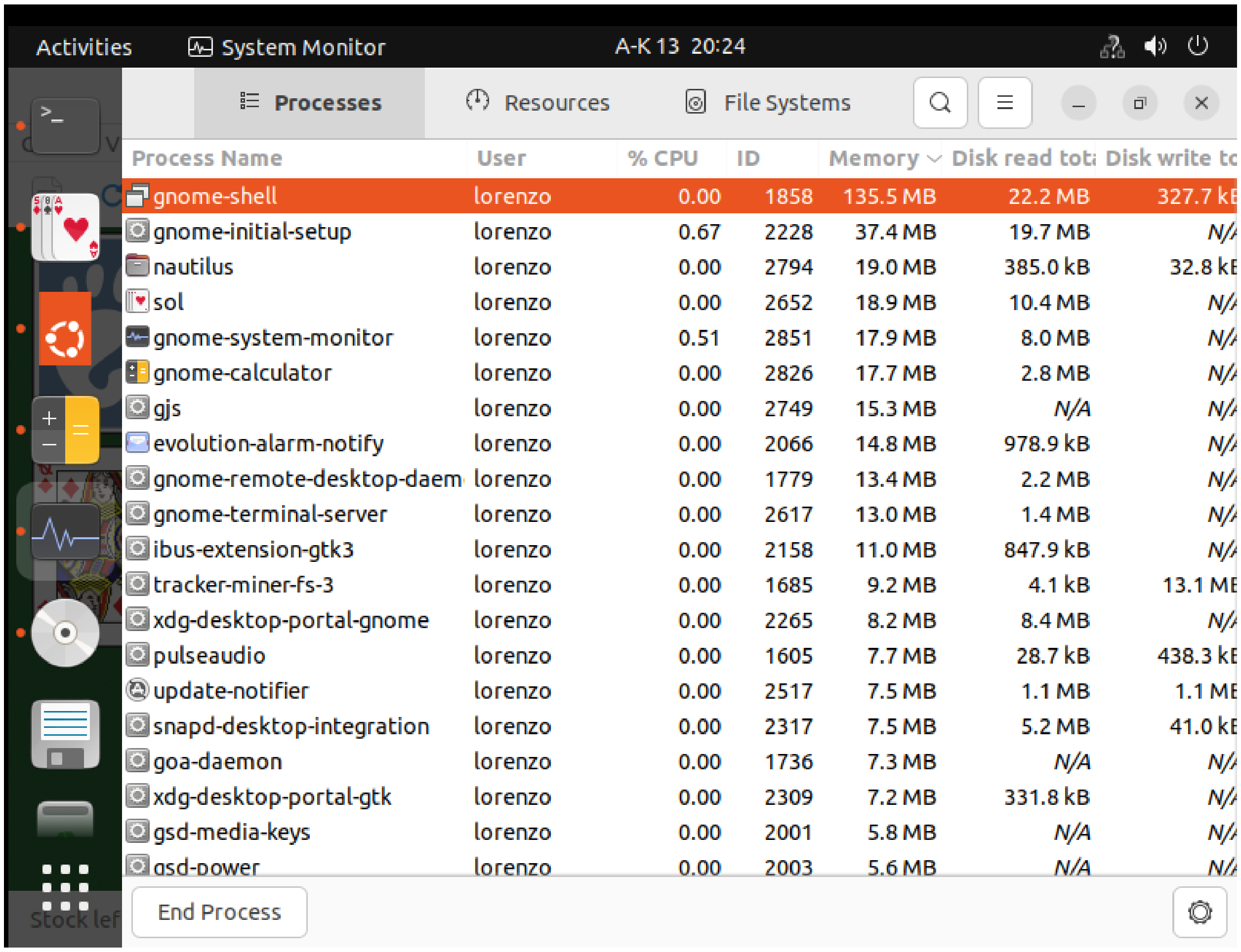
Cooperating processes in UBUNTU OS: The system monitor is an example of a cooperating process. This is because it can affect other process and it displays other processes



Process Name	User	% CPU	ID	Memory	Disk read tot	Disk write to
gnome-shell	lorenzo	0.00	1858	135.5 MB	22.2 MB	327.7 k
gnome-initial-setup	lorenzo	0.67	2228	37.4 MB	19.7 MB	N/
nautilus	lorenzo	0.00	2794	19.0 MB	385.0 kB	32.8 k
sol	lorenzo	0.00	2652	18.9 MB	10.4 MB	N/
gnome-system-monitor	lorenzo	0.51	2851	17.9 MB	8.0 MB	N/
gnome-calculator	lorenzo	0.00	2826	17.7 MB	2.8 MB	N/
gjs	lorenzo	0.00	2749	15.3 MB	N/A	N/
evolution-alarm-notify	lorenzo	0.00	2066	14.8 MB	978.9 kB	N/
gnome-remote-desktop-daem	lorenzo	0.00	1779	13.4 MB	2.2 MB	N/
gnome-terminal-server	lorenzo	0.00	2617	13.0 MB	1.4 MB	N/
ibus-extension-gtk3	lorenzo	0.00	2158	11.0 MB	847.9 kB	N/
tracker-miner-fs-3	lorenzo	0.00	1685	9.2 MB	4.1 kB	13.1 M
xdg-desktop-portal-gnome	lorenzo	0.00	2265	8.2 MB	8.4 MB	N/
pulseaudio	lorenzo	0.00	1605	7.7 MB	28.7 kB	438.3 k
update-notifier	lorenzo	0.00	2517	7.5 MB	1.1 MB	1.1 M
snapd-desktop-integration	lorenzo	0.00	2317	7.5 MB	5.2 MB	41.0 k
goa-daemon	lorenzo	0.00	1736	7.3 MB	N/A	N/
xdg-desktop-portal-gtk	lorenzo	0.00	2309	7.2 MB	331.8 kB	N/
gsd-media-keys	lorenzo	0.00	2001	5.8 MB	N/A	N/
gsd-power	lorenzo	0.00	2003	5.6 MB	N/A	N/