



Project Report - Manual Exercises (Bac +2)

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CLOUD COMPUTING

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INTRODUCTION:

In today's digital age, the cloud has become the backbone of modern computing, offering scalable and flexible solutions for businesses and individuals alike. As part of our cloud computing course, we embarked on a journey to explore the fundamentals of cloud infrastructure through Amazon Web Services (AWS), one of the leading cloud service providers.

Our objective was to delve into the intricacies of setting up a virtual server instance on AWS's Elastic Compute Cloud (EC2) platform and transforming it into a fully functional web server. By mastering these skills, we aimed to gain a deeper understanding of cloud architecture and web hosting principles.

Throughout our journey, we encountered various challenges and opportunities to learn and grow. From configuring security settings to installing web server software and implementing HTTPS encryption, each step provided valuable insights into the complexities of managing cloud-based infrastructure.

As we delved deeper into the world of cloud computing, we discovered the power of customization and automation, enabling us to tailor our virtual environment to meet specific requirements. Additionally, exploring additional features such as PHP integration and API calls allowed us to expand the functionality of our web server, opening up new possibilities for dynamic content delivery.

In this report, we document our experiences, challenges, and achievements as we navigate the landscape of cloud computing and web server management. Through hands-on experimentation and practical application, we aim to lay the foundation for future exploration and innovation in this ever-evolving field.

INSTALLATION OF UBUNTU LTS SERVER

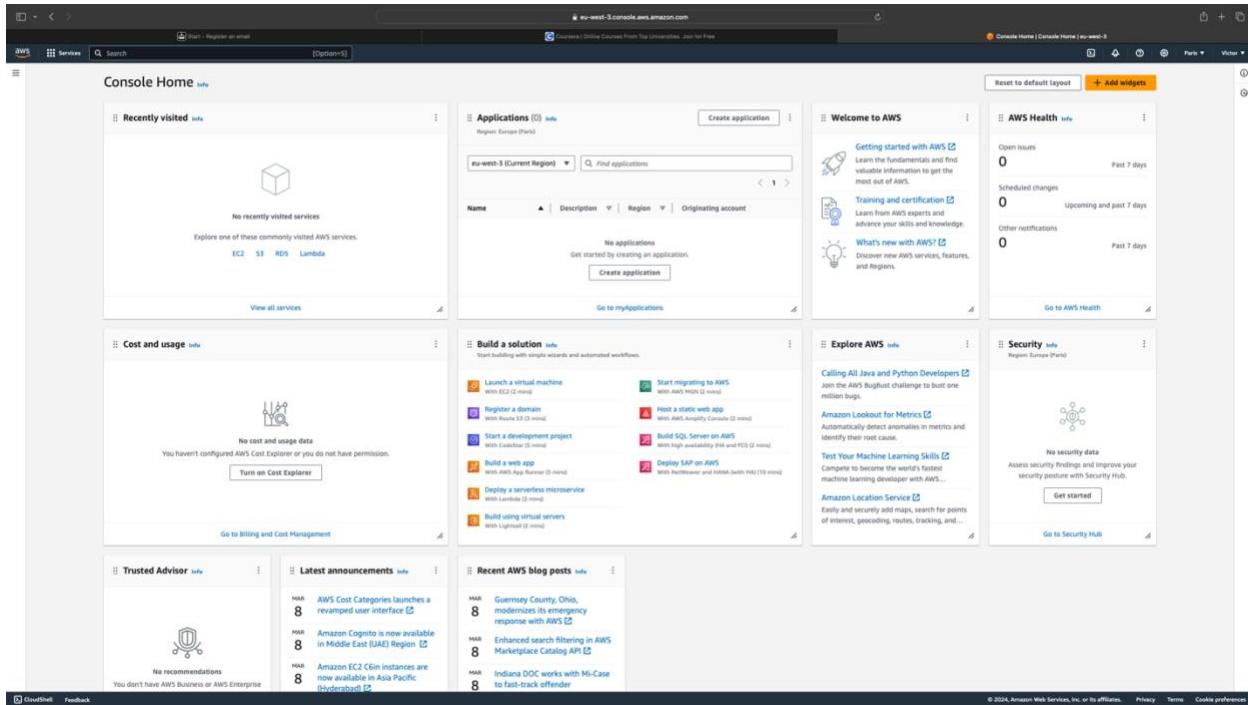


Figure 1 - AWS Home

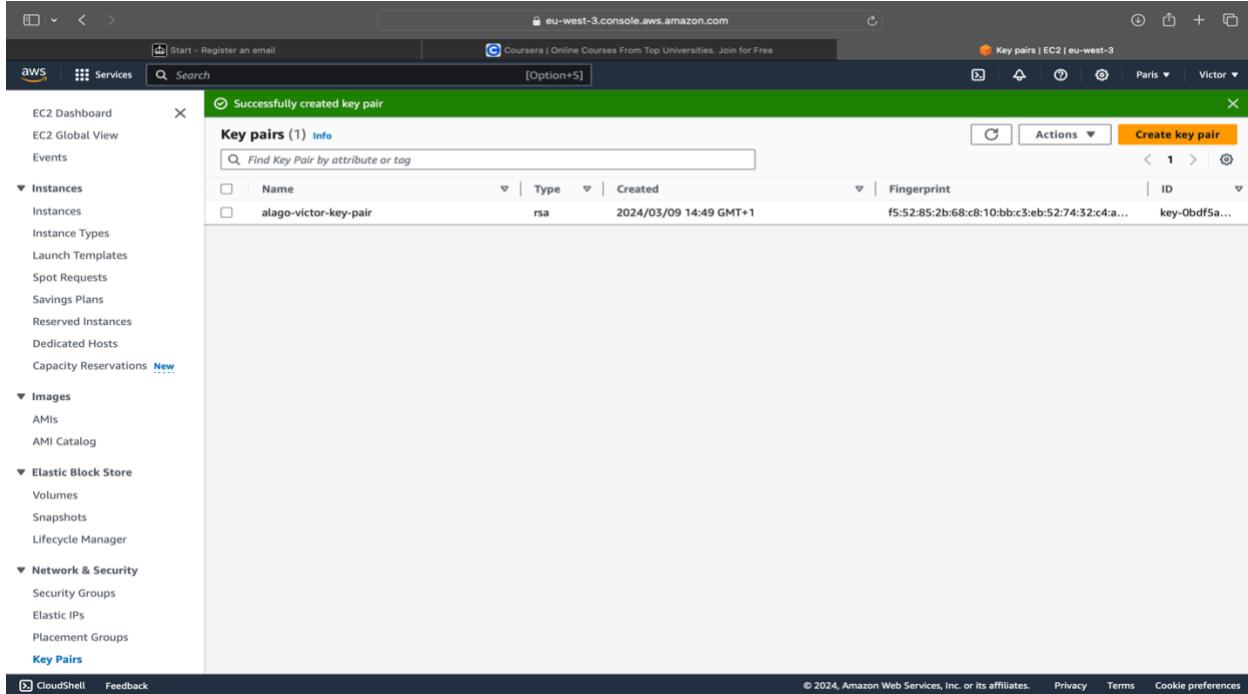


Figure 2 - key pair created

```
Last login: Mon Mar  4 01:49:41 on ttys043
tiago@Tiagos-Mac ~ %

tiago@Tiagos-Mac: ~
tiago@Tiagos-Mac: ~
tiago@Tiagos-Mac: ~ % cd downloads
tiago@Tiagos-Mac: ~ chmod 400 alago-victor-key-pair.pem
tiago@Tiagos-Mac: ~ ls -la
total 13727448
drwx-----+ 30 tiago staff   960 Mar  9 14:49
drwxr-x---+ 30 tiago staff   960 Mar  9 14:49 .
drwxr-x---+  1 tiago staff  8159 Mar  8 17:11 DS_Store
drwxr-x---+  1 tiago staff   960 Dec 26 09:03 localized
-rw-r--r--@  1 tiago staff 1082589 Feb  9 17:27 20240208-ATT-Loyer_ALAO0_Chimela.pdf
-rw-r--r--@  1 tiago staff 5964408832 Feb 26 09:37 22631_2861_231284-0538_23H_NI_RELEASE_SVC_REFRESH_CLIENTCONSUMER_RET_A64FRE_en-us.iso
-rw-r--r--@  1 tiago staff 75972 Feb 22 17:06 385793430-zettle-product-001-7084512-2.jpg
-rw-r--r--@  1 tiago staff 46402 Feb 22 17:06 385793430-zettle-product-001-7084512-2.pdf
-rw-r--r--@  1 tiago staff 54468 Feb 19 15:13 ALAO0-July2023-2423075612665.pdf
-rw-r--r--@  1 tiago staff 1578949 Mar  5 15:22 Abed_Agile_presentation.pptx
-rw-r--r--@  1 tiago staff 177923826 Jan 26 05:59 Asana.dmg
-rw-r--r--@  1 tiago staff 124315 Feb  8 07:53 Attestation de l'oyer CAF.pdf
-rw-r--r--@  1 tiago staff 4318169 Feb 22 16:48 DevOps.jpg
-rw-r--r--@  1 tiago staff 107545 Mar  7 05:36 GitHubDesktop-1.41.0-darwin-arm64.app
-rw-r--r--@  1 tiago staff 138716347 Jan 26 04:23 GitHubDesktop-x64.zip
drwx-----+ 11 tiago staff   352 Mar  7 05:36 Kali Linux 2622.2 ARM64.pvm
-rw-r--r--@  1 tiago staff 29294 Feb 25 10:37 LoginForm.aspx.html
-rw-r--r--@  1 tiago staff 131082554 Jan 26 06:04 Postman for macOS (arm64).zip
drwxr-xr-x@  1 tiago staff 100968 Jan 28 06:18 Postman.app
-rw-r--r--@  1 tiago staff 210945974 Jan 28 06:18 VSCode-darwin-universal.zip
drwxr-xr-x@  3 tiago admin   96 Jan 18 15:51 Visual Studio Code.app
-r-----@  1 tiago staff 1678 Mar  9 14:49 alago-victor-key-pair.pem
-rw-r--r--@  1 tiago staff 286527886 Jan 11 23:06 googlechrome dmg
-rw-r--r--@  1 tiago staff 131659364 Jan 26 05:09 mongodb-community-1.41.0-darwin-arm64.dmg
-rw-r--r--@  1 tiago staff 6847552 Feb 16 12:38 nodejs-16.15.1-darwin-arm64-7.6.5.tgz
drwxr-xr-x@  4 tiago staff 1128 Feb 15 15:46 Twitter Functions
-rw-r--r--@  1 tiago staff 134434 Feb 16 12:38 twitter functions (1).zip
drwxr-xr-x@  4 tiago staff 1128 Feb 16 12:38 twitter functions 2
-rw-r--r--@  1 tiago staff 125754 Feb 16 15:45 twitter functions.zip
-rw-r--r--@  1 tiago staff 15634 Feb  3 00:42 twitter-logo.png
tiago@Tiagos-Mac: ~ ]
```

Figure 3 - key pair user permissions

The screenshot shows the AWS EC2 Security Groups page. A green header bar at the top indicates that a security group was created successfully. The main content area displays the details of the new security group, including its name, ID, owner, and VPC ID. Below this, there are tabs for Inbound rules, Outbound rules, and Tags, with the Inbound rules tab currently selected. The Inbound rules section shows a search bar and a table with columns for Name, Security group rule..., IP version, Type, Protocol, and Port range. A message states 'No security group rules found'.

Figure 4 - security group created

The screenshot shows the AWS Launch Instance wizard. On the left, under 'Key pair (login)', a key pair named 'alago-victor-key-pair' is selected. Under 'Network settings', network and subnet options are set to 'vpc-049afabd4da5e6cb2'. A note about auto-assigning public IP is present, along with a link to 'Additional charges apply'. A 'Firewall (security groups)' section allows selecting an existing security group, with 'alago-victor-sg' selected. On the right, the 'Summary' section shows 'Number of instances' set to 1, 'Software Image (AMI)' as 'Ubuntu Server 22.04 LTS (HVM)', 'Virtual server type (instance type)' as 't2.micro', and 'Storage (volumes)' as '1 volume(s) - 8 GiB'. A callout box provides information about the 'Free tier'. At the bottom, there are 'Cancel' and 'Launch instance' buttons.

Figure 5 - creating instance

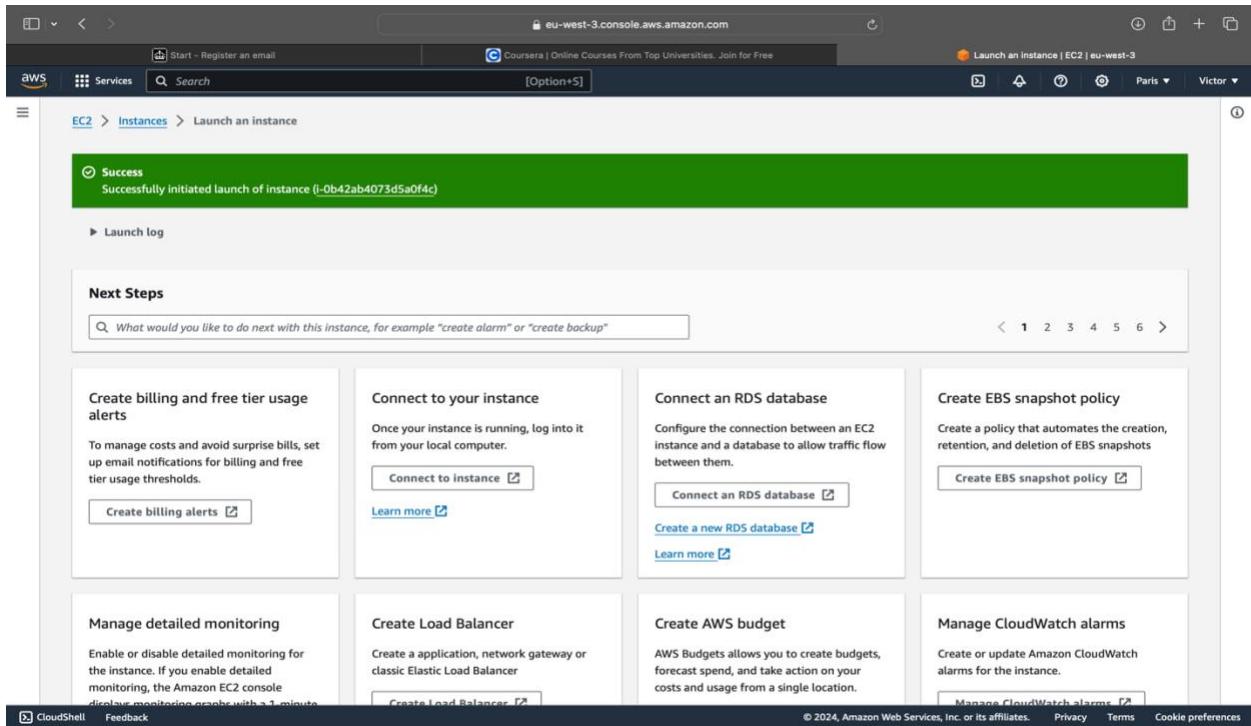


Figure 6 - instance created successfully

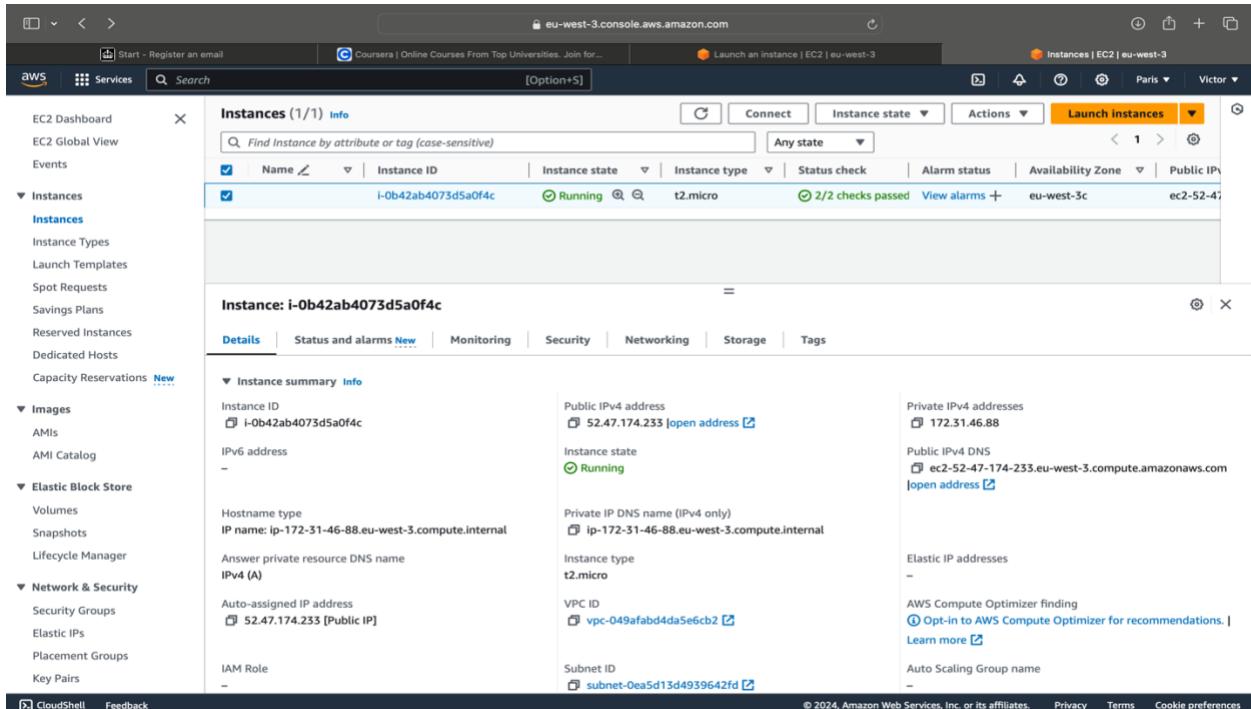


Figure 7 - instance details

```

tiago@Iagos-Mac ~
tiago@Iagos-Mac ~
tiago@Iagos-Mac ~
tiago@Iagos-Mac ~ % cd downloads
tiago@Iagos-Mac downloads % ssh -i "alago-victor-key-pair.pem" ubuntu@ec2-52-47-174-233.eu-west-3.compute.amazonaws.com

ssh: connect to host ec2-52-47-174-233.eu-west-3.compute.amazonaws.com port 22: Operation timed out
tiago@Iagos-Mac downloads %
tiago@Iagos-Mac downloads %
tiago@Iagos-Mac downloads % sudo ufw allow 22
[Password:
sudo: ufw: command not found
tiago@Iagos-Mac downloads % sudo apt update

The operation couldn't be completed. Unable to locate a Java Runtime.
Please visit http://www.java.com for information on installing Java.

tiago@Iagos-Mac downloads % cd ..
tiago@Iagos-Mac ~ % sudo apt update

The operation couldn't be completed. Unable to locate a Java Runtime.
Please visit http://www.java.com for information on installing Java.

(tiago@Iagos-Mac: ~ $ ssh -i "downloads/alago-victor-key-pair.pem" ubuntu@ec2-52-47-174-233.eu-west-3.compute.amazonaws.com
The authenticity of host 'ec2-52-47-174-233.eu-west-3.compute.amazonaws.com (52.47.174.233)' can't be established.
This key is not known by me. Are you sure you want to connect (yes/no/fingerprint)? yes
Warning: Permanently added 'ec2-52-47-174-233.eu-west-3.compute.amazonaws.com' (ED25519) to the list of known hosts.
Welcome to Ubuntu 22.04 LTS (GNU/Linux x.2.6-1818-aws x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/pro

System information as of Sat Mar 9 15:03:28 UTC 2024

System load: 0.0 Processes: 95
Usage of /: 20.3% of 7.67GB Users logged in: 0
Memory usage: 21% IP address for eth0: 172.31.46.88
Swap usage: 0K

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/eos or run: sudo pro status

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

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

ubuntu@ip-172-31-46-88: ~

```

Figure 8 - instance connected via ssh in terminal

```

ubuntu@ip-172-31-46-88: ~
ubuntu@ip-172-31-46-88: ~ whoami
ubuntu
ubuntu@ip-172-31-46-88: ~
ubuntu@ip-172-31-46-88: ~
ubuntu@ip-172-31-46-88: ~ ls -la
total 28
drwxr-x--- 4 ubuntu ubuntu 4096 Mar 9 15:03 .
drwxr-xr-x 3 root root 4096 Mar 9 14:48 ..
-rw-r--r-- 1 ubuntu ubuntu 228 Jan 6 2022 .bash_logout
-rw-r--r-- 1 ubuntu ubuntu 296 Jan 6 2022 .bashrc
drwxr-xr-x 2 ubuntu ubuntu 4096 Mar 9 15:03 .cache
-rw-r--r-- 1 ubuntu ubuntu 897 Jan 6 2022 .profile
drwxrwx--- 2 ubuntu ubuntu 4096 Mar 9 14:48 .ssh
ubuntu@ip-172-31-46-88: ~
ubuntu@ip-172-31-46-88: ~
ubuntu@ip-172-31-46-88: ~
ubuntu@ip-172-31-46-88: ~ sudo apt-get update
Hit:1 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:3 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease [109 kB]
Get:4 http://security.ubuntu.com/ubuntu jammy-security InRelease [119 kB]
Get:5 http://security.ubuntu.com/ubuntu jammy-security universe amd64 Packages [14.1 kB]
Get:6 http://security.ubuntu.com/ubuntu jammy-security universe amd64 c-n-f Metadata [5452 kB]
Get:7 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 c-n-f Metadata [286 kB]
Get:8 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [217 kB]
Get:9 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy/multiverse Translation-en [131 kB]
Get:10 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [892 B]
Get:11 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [1458 kB]
Get:12 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [283 kB]
Get:13 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [1557 kB]
Get:14 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1054 kB]
Get:15 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 c-n-f Metadata [22.1 kB]
Get:16 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 c-n-f Metadata [22.1 kB]
Get:17 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 c-n-f Metadata [22.1 kB]
Get:18 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [42.1 kB]
Get:19 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation-en [10.1 kB]
Get:20 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 c-n-f Metadata [472 B]
Get:21 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation-en [10.1 kB]
Get:22 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted Packages [10.5 kB]
Get:23 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-backports/main amd64 c-n-f Metadata [388 B]
Get:24 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-backports/restricted amd64 c-n-f Metadata [116 B]
Get:25 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [24.3 kB]
Get:26 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe Translation-en [16.5 kB]
Get:27 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [644 B]
Get:28 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Metadata [116 B]
Get:29 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [1239 kB]
Get:30 http://security.ubuntu.com/ubuntu jammy-security/restricted Packages [1523 kB]
Get:31 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [2581 B]
Get:32 http://security.ubuntu.com/ubuntu jammy-security/universe Packages [840 kB]
Get:33 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [162 kB]
Get:34 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [162 kB]
Get:35 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Metadata [16.8 kB]
Get:36 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [37.1 kB]
Get:37 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-en [7476 B]
Get:38 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f Metadata [260 B]
Fetched 39.0 MB in 4s (5418 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-46-88: ~ sudo apt-get upgrade
Reading package lists... Done
Building dependency tree... Done
Reading status information... Done
Calculating upgrade... Done
The following packages have been kept back:
  linux-aws linux-headers-aws linux-image-aws
The following packages will be upgraded:

```

Figure 9 - updated the system

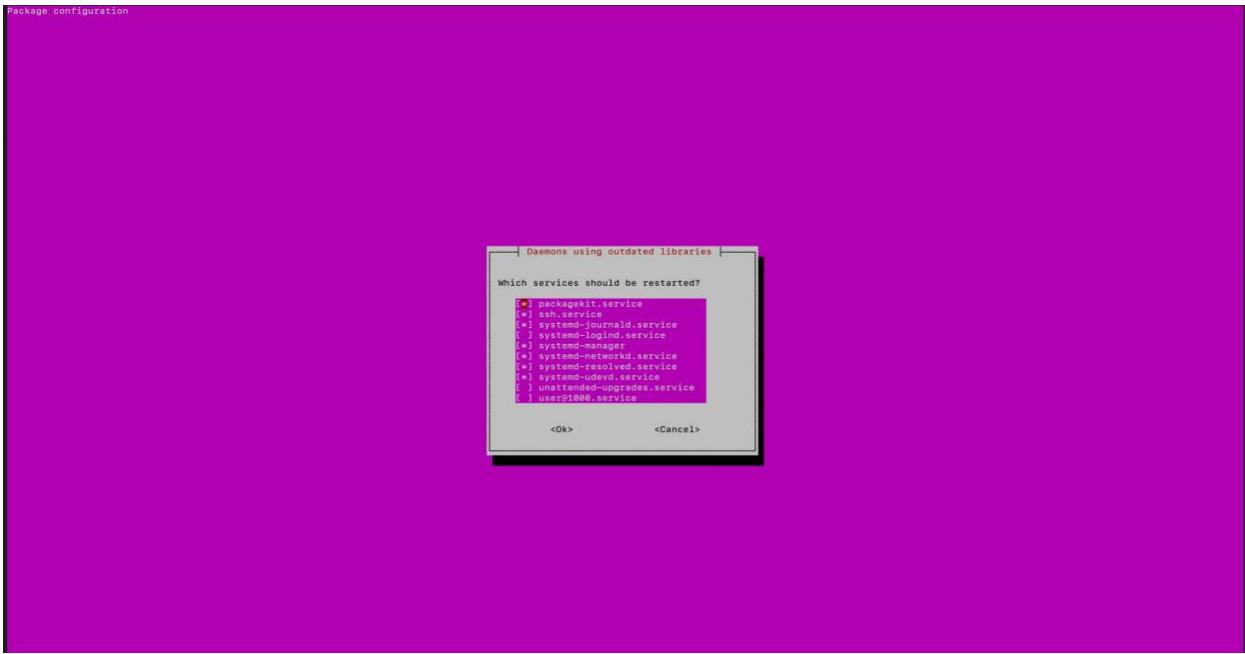


Figure 10 - pop up while updating

```
No containers need to be restarted.
No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.

ubuntu@ip-172-31-46-88:~$ 
ubuntu@ip-172-31-46-88:~$ 
ubuntu@ip-172-31-46-88:~$ 
ubuntu@ip-172-31-46-88:~$ uname -a
Linux ip-172-31-46-88 6.2.0-1018-aws #18~22.04.1-Ubuntu SMP Wed Jan 10 22:54:16 UTC 2024 x86_64 x86_64 x86_64 GNU/Linux
ubuntu@ip-172-31-46-88:~$ uname -r
6.2.0-1018-aws
ubuntu@ip-172-31-46-88:~$ cat /etc/lsb-release
DISTRIB_ID=Ubuntu
DISTRIB_RELEASE=22.04
DISTRIB_CODENAME=jammy
DISTRIB_DESCRIPTION="Ubuntu 22.04.4 LTS"
ubuntu@ip-172-31-46-88:~$ dpkg -l | sed "1.5d" | wc -l
sed: -e expression #1, char 2: unknown command: `..'
0
ubuntu@ip-172-31-46-88:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       7.6G  1.8G  5.8G  24% /
tmpfs          475M     0  475M   0% /dev/shm
tmpfs          190M  860K  190M   1% /run
tmpfs          5.0M     0  5.0M   0% /run/lock
/dev/xvda15    105M   6.1M   99M   6% /boot/efi
tmpfs          976M  41.0K  955M  1% /run/user/1000
ubuntu@ip-172-31-46-88:~$ ifconfig
Command 'ifconfig' not found, but can be installed with:
sudo apt install net-tools
ubuntu@ip-172-31-46-88:~$ sudo apt install net-tools
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  net-tools
0 upgraded, 1 newly installed, 0 to remove and 3 not upgraded.
Need to get 204 kB of archives.
After this operation, 819 kB of additional disk space will be used.
Get:1 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 net-tools amd64 1.60+git20181103.0eebece-1 [204 kB]
Fetched 204 kB in 0s (10.3 MB/s)
Selecting previously unselected package net-tools.
```

Figure 11 - system characteristics 01

```
No VM guests are running outdated hypervisor (qemu) binaries on this host.
eth0: flags=4163UBROADCAST RUNNING MULTICAST  mtu 9001
      inet 172.31.46.86 brd 255.255.240.0 broadcast 172.31.47.255
        netmask 255.255.240.0 scopeid 0x20clink>
      ether 0e:ee:3c:37:68:a1 txqueuelen 1000  (Ethernet)
        RX packets 34654 bytes 40516384 (48.6 MB)
        RX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
      TX packets 4226 bytes 528815 (528.8 KB)
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
lo: flags=4163ULOOPBACK RUNNING NOQUEUE  mtu 65536
      inet 127.0.0.1 brd 127.0.0.1 broadcast 127.0.0.1
        netmask 255.255.255.255 scopeid 0x10<host>
          loop 0:1 preflinux 128  scopeid 0x10<host>
            link-layer <loopback> brd 0x000000000000
        RX packets 236 bytes 26897 (25.6 KB)
        RX errors 0 dropped 0 overruns 0 frame 0
        TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
ubuntu@ip-172-31-46-88:~$ runlevel
N 0
ubuntu@ip-172-31-46-88:~$ journalctl -u ssh
Mar 08 14:40:48 ip-172-31-46-88 systemd[1]: Starting OpenSSH Secure Shell server...
Mar 08 14:40:48 ip-172-31-46-88 sshd[198]: Server listening on 0.0.0.0 port 22.
Mar 08 14:40:48 ip-172-31-46-88 sshd[199]: Server listening on :: port 22.
Mar 09 15:03:28 ip-172-31-46-88 sshd[1174]: Accepted publickey for ubuntu from 46.193.160.63 port 62538 ssh2: RSA SHA256:Eo9Jz4OujMrk9J0vzDrRQbzmlJguqBmIuEHNyK3I
Mar 09 15:03:28 ip-172-31-46-88 sshd[1174]: pam_unix(sshd:session): session opened for user ubuntu(uid=1000) by (uid=0)
Mar 09 15:03:28 ip-172-31-46-88 sshd[1174]: pam_unix(sshd:session): session closed for user ubuntu
Mar 09 15:26:13 ip-172-31-46-88 sshd[7352]: Server listening on :: port 22.
Mar 09 15:26:13 ip-172-31-46-88 sshd[7352]: Started OpenSSH Secure Shell server.
ubuntu@ip-172-31-46-88:~$ journalctl -p err
Mar 09 14:40:38 ubuntu kernel: Cannot get hw parameter CONSOLE_EVTCHN (18) --22
Mar 09 14:40:38 ubuntu kernel: Cannot get hw parameter CONSOLE_EVTCHN (18) --22
Mar 09 14:40:34 ubuntu dhclient[279]: execve (/bin/false, ...); Permission denied
Mar 09 14:40:34 ubuntu dhclient[280]: execve (/bin/false, ...); Permission denied
ubuntu@ip-172-31-46-88:~$ w
18:00:41 up 1:08, 1 user, load average: 0.00 0.00 0.00
  USER   TTY      FROM          IDLE    JCPU   PCPU    
ubuntu pts/0    46.193.160.63  15:03   0.00s  0.04s  0.00s w
ubuntu pts/0    46.193.160.63 Sat Mar  9 15:03 still logged in
reboot system boot 6.2.0-198-aws  Sat Mar  9 14:40 still running
wtmp begins Sat Mar  9 14:40:29 2024
ubuntu@ip-172-31-46-88:~$ cat /proc/cpuinfo
processor       : 0
vendor_id      : GenuineIntel
cpu family     : 79
model          : 79
model name    : Intel(R) Xeon(R) CPU E5-2686 v4 @ 2.30GHz
stepping       : 1
microcode     : 0xb000040
cpu MHz        : 2300.000
cache size    : 46880 KB
physical id   : 0
siblings       : 1
core id       : 0
cpu cores     : 1
apicid         : 0
initial apicid: 0
fpu            : yes
fpu_exception  : yes
fpu_exception  : yes


```

Figure 12 - system characteristics 02

```
initial_apicid : 0
fan             : yes
fan_exception  : yes
cpuid_level   : 13
mp             : yes
flags          : yes
seed_lms_cx16_pcid : 0xe6...sse4_2_x2apic_mvbe_pepopn_tsc_deading_timer_aes_xsse_vbe_ficc_rdrand_hypervisor_lahf_lm_abm_cpuid_fault_invcpid_single_pti_fsgsbase_bmi1_avx2_smp_bmi2_errms_invcpid_xsseavopt
bugs           : 4608.00
bugomips       : 0
clflush_size   : 64
cache_alignment : 64
address_sizes  : 46 bits physical, 48 bits virtual
power management: yes

ubuntu@ip-172-31-46-88:~$ free -h
              total        used        free      buff/cache  available
Mem:      949Mi       151Mi      188Mi       0.8Ki      699Mi       629Mi
Swap:      8Gi        0Gi        8Gi
ubuntu@ip-172-31-46-88:~$ lsusb
00:00.0 Host bridge: Intel Corporation 400 Series Chipset HECI Controller (rev 02)
00:01.0 PCI bridge: Intel Corporation 82371SB P11X3 ISA [Natoma/Triton II]
00:01.1 IDE interface: Intel Corporation 82371SB P11X3 IDE [Natoma/Triton II]
00:01.2 SATA controller: Intel Corporation 82371SB P11X3 AHCI [Natoma/Triton II]
00:02.0 VGA compatible controller: Cirrus Logic GD 5440
00:03.0 Unassigned class [IrF808]: Xensource, Inc. Xen Platform Device (rev 01)
ubuntu@ip-172-31-46-88:~$ sudo ufw status verbose
Status: inactive
ubuntu@ip-172-31-46-88:~$ ps x
  PID  TTY      STAT   TIME COMMAND
  1 ?        Ss     0:00 /sbin/initd/systemd --user
 1178 ?        S      0:00 (sd-pam)
  2 ?        S      0:00 /sbin/init
 1268 pts/0    Ss     0:00 -bash
 7698 pts/0    R+    0:00 ps x
ubuntu@ip-172-31-46-88:~$ top
top: 18:42:48 up 1:08, 1 user, load average: 0.00 0.00 0.00
Tasks: 96 total, 1 running, 94 sleeping, 0 stopped, 0 zombie
NCpu(s): 0.00 us, 0.00 sy, 0.0 ni, 100.0 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
Mem: 949Mi available: 629Mi
Swap: 8Gi Free: 629Mi available: 629Mi
Mem Swap: 0.0 MiB
ubuntu@ip-172-31-46-88:~$ sudo ps x
  PID  USER   PR  NI    VIRT    RES    SHB  S %CPU %MEM TIME+ COMMAND
  1 root    20   0 106528 11048 8448 S  0.0  1.2  0:05.05 systemd
  2 root    20   0 106528 11048 8448 S  0.0  1.2  0:05.05 systemd
  3 root    -20   0 0 0 0 I  0.0  0.0  0:00.00 rcu_gp
  4 root    -20   0 0 0 0 I  0.0  0.0  0:00.00 rcu_par_gp
  5 root    -20   0 0 0 0 0 0.0  0.0  0:00.00 rcu_fair_gp
  6 root    -20   0 0 0 0 I  0.0  0.0  0:00.00 netns
  7 root    -20   0 0 0 0 0 0.0  0.0  0:00.00 kmemcg_kmem_events_highpri
  10 root    -20   0 0 0 0 I  0.0  0.0  0:00.00 kmemcg_kmem_events_lowpri
  11 root    20   0 0 0 0 I  0.0  0.0  0:00.00 rcu_tasks_rude_kthread
  12 root    20   0 0 0 0 0 0.0  0.0  0:00.00 rcu_tasks_rude_kthread
  13 root    20   0 0 0 0 0 0.0  0.0  0:00.00 rcu_tasks_rude_kthread
  14 root    20   0 0 0 0 0 0.0  0.0  0:00.00 rcu_tasks_rude_kthread
  15 root    20   0 0 0 0 0 0.0  0.0  0:00.00 rcu_tasks_rude_kthread
  16 root    20   0 0 0 0 0 0.0  0.0  0:00.02 migration/0
  16 root    51  0 0 0 0 0 0.0  0.0  0:00.00 idle_inject/0
  17 root    20   0 0 0 0 0 0.0  0.0  0:00.00 rcu_fair
  19 root    20   0 0 0 0 0 0.0  0.0  0:00.00 kdevtmpfs
  21 root    20   0 0 0 0 0 0.0  0.0  0:00.00 initrd_wq
  22 root    20   0 0 0 0 0 0.0  0.0  0:00.00 khungtaskd
  23 root    20   0 0 0 0 0 0.0  0.0  0:00.00 khungtaskd
  25 root    20   0 0 0 0 0 0.0  0.0  0:00.00 writeback
  26 root    -20   0 0 0 I  0.0  0.0  0:00.00 writeback


```

Figure 13 - system characteristics 03

```

ubuntu@ip-172-31-46-88:~$ cat /etc/passwd
root:x:0:0:root:/root:/bin/sh
daemon:x:1:1:daemon:/var/empty/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:4:sync:/bin:/bin/sync
games:x:5:5:games:/var/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/lib/news:/usr/sbin/nologin
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
www:x:34:34:www:/var/www:/usr/sbin/nologin
list:x:38:38:Waiting List Manager:/var/list:/usr/sbin/nologin
irc:x:39:39:ircd:/run/ircd:/usr/sbin/nologin
gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/usr/sbin/nologin
nobody:x:99:99:nobody:/var/run/nobody:/usr/sbin/nologin
systemd-network:x:100:102:system Network Management...:/run/systemd:/usr/sbin/nologin
systemd-resolve:x:101:103:systemd Resolver...:/run/systemd:/usr/sbin/nologin
messagebus:x:102:105:/nonexistent:/usr/sbin/nologin
syslog:x:104:111:/home/syslog:/usr/sbin/nologin
_apt:x:105:65534:/:/nonexistent:/usr/sbin/nologin
tss:x:106:112:TPM software stack...:/var/lib/tpm:/bin/false
underrun:x:107:113:underrun:/var/lib/underrun:/bin/false
rootdumper:x:108:114:/:/nonexistent:/usr/sbin/nologin
sshd:x:109:65534:/:/run/sshd:/usr/sbin/nologin
pollinate:x:110:115:/var/cache/pollinate:/bin/false
landscape:x:111:116:/var/lib/landscape:/usr/sbin/nologin
fingerprintd:x:112:117:/var/lib/fingerprintd:/usr/sbin/nologin
ec2-init:x:114:121:Chrony daemon...:/var/lib/chrony:/usr/sbin/nologin
chrony:x:114:121:Chrony daemon...:/var/lib/chrony:/usr/sbin/nologin
ubuntu@ip-172-31-46-88:~$ cat /etc/group
ubuntu@ip-172-31-46-88:~$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,ubuntu
tty:x:5:
disk:x:6:
lp:x:7:
mail:x:8:
news:x:9:
uucp:x:10:
man:x:12:
proxy:x:13:
kmem:x:15:
dialout:x:22:ubuntu
Fax:x:23:
voices:x:22:
cdrom:x:24:ubuntu
floppy:x:25:ubuntu
tape:x:26:
sudo:x:27:ubuntu
audio:x:29:ubuntu
dip:x:30:ubuntu
www-data:x:33:
backup:x:34:
operators:x:37:
list:x:38:

```

Figure 14 - system characteristics 04

```

kvm:x:109:
render:x:110:
sysfs:x:111:
textriv:x:112:
uidd:x:113:
tcpdump:x:114:
sshd:x:115:
lmcapture:x:116:
fwddump:perfmon:x:117:
admin:x:118:
netdev:x:119:ubuntu
lxde:x:120:ubuntu
_chrony:x:121:
ubuntu@ip-172-31-46-88:~$ 
ubuntu@ip-172-31-46-88:~$ dmesg
dmesg: read kernel buffer failed: Operation not permitted
ubuntu@ip-172-31-46-88:~$ sudo dmesg
[ 0.000000] Linux version 6.2.0-1018.18-22.04.1-aws (build0@lcyc02-mdm64-057) (x86_64-linux-gnu-gcc-11 (Ubuntu 11.4.0-1ubuntu1-22.04) 11.4.0, GNU ld (GNU Binutils for Ubuntu) 2.38) #18-22.04.1-Ubuntu SMP Wed Jan 10 22:54:16 UTC 2024 (Ubuntu 6.2.0-1018.18-22.04.1-aws 6.2.16)
[ 0.000000] Command line: BOOT_IMAGE=/boot/vmlinuz-6.2.0-1018-aws root=PARTUUID=e8236a68-bbd3-42a4-9e96-54b36cb5999e ro console=tty1 console=ttyS0 nvme_core.io_timeout=4294967295 panic=-1
[ 0.000000] KERNEL supported CPU(s):
[ 0.000000]   Intel GenuineIntel
[ 0.000000]     AuthenticAMD
[ 0.000000]     Hygon HygonGenuine
[ 0.000000]     Centaur CentaurHauls
[ 0.000000]     Zhaoxin Shanghai
[ 0.000000] BIOS-provided physical RAM map:
[ 0.000000] BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] usable
[ 0.000000] BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] reserved
[ 0.000000] BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] reserved
[ 0.000000] BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] usable
[ 0.000000] BIOS-e820: [mem 0x0000000000000000-0x000000000000ffff] reserved
[ 0.000000] NX (Execute Disable) protection active
[ 0.000000] SMBIOS 2.7 present.
[ 0.000000] DMI: Amazon AWS HVM Hypervisor, BIOS 4.11.amazon 08/24/2006
[ 0.000000] Hypervisor detected: Xen HVM
[ 0.000000] Xen version 4.11.
[ 0.000000] platform_pci_unplug: Netfront and the Xen platform PCI driver have been compiled for this kernel: unplug emulated NICs.
[ 0.000000] platform_pci_unplug: Blkfront and the Xen platform PCI driver have been compiled for this kernel: unplug emulated disks.
[ 0.000000] in your root= kernel command line option
[ 0.000000] HVMOP_pagetable_dying not supported
[ 0.000451] tsc: Detected 2380.004 MHz processor
[ 0.000970] e820: update [mem 0x00000000-0x00000000] 0x00000000-0x00000000 reserved
[ 0.000970] e820: update [mem 0x00000000-0x00000000] 0x00000000-0x00000000 reserved
[ 0.000950] last_pfn = 0x400000 max_pfn_drm = 0x40000000
[ 0.000923] x86/PAT: Configuration [0-7]: WB WC UC- UC WB WP UC- WT
[ 0.021852] found SMP MP-table at [mem 0x000fb9a0-0x000fb9af]
[ 0.022050] RAMDISK: [mem 0x37299000-0x378fffff]
[ 0.022047] ACPI: Early table checksum verification disabled
[ 0.022047] ACPI: Early table checksum verification disabled
[ 0.022047] ACPI: XSDT [mem 0x00000000-0x00000000] C00C780 000054 (v01 Xen HVM 00000000 HVM 00000000)
[ 0.022094] ACPI: FACP [mem 0x00000000-0x00000000] C00C4A8 0000F4 (v04 Xen HVM 00000000 HVM 00000000)
[ 0.022123] ACPI: DSDT [mem 0x00000000-0x00000000] C003740 008A7E (v02 Xen HVM 00000000 INTL 20090123)
[ 0.022127] ACPI: FACS [mem 0x00000000-0x00000000] C003740 000049
[ 0.022130] ACPI: FADT [mem 0x00000000-0x00000000] C00C540 000009 (v02 Xen HVM 00000000 HVM 00000000)
[ 0.022130] ACPI: XSDT [mem 0x00000000-0x00000000] C00C540 000009 (v02 Xen HVM 00000000 HVM 00000000)
[ 0.022130] ACPI: FACP [mem 0x00000000-0x00000000] C00C540 000038 (v01 Xen HVM 00000000 HVM 00000000)
[ 0.022130] ACPI: HPET [mem 0x00000000-0x00000000] C00C540 000028 (v01 Xen HVM 00000000 HVM 00000000)
[ 0.022147] ACPI: SSDT [mem 0x00000000-0x00000000] C00C780 000031 (v02 Xen HVM 00000000 INTL 20090123)
[ 0.022157] ACPI: SPCR [mem 0x00000000-0x00000000] C00C780 000009 (v02 Xen HVM 00000000 HVM 00000000)
[ 0.022155] ACPI: Reserving FACP table memory at [mem 0xfc003440-0xfc003533]
[ 0.022156] ACPI: Reserving DSDT table memory at [mem 0xfc003394-0xfc0033bd]
[ 0.022157] ACPI: Reserving FACS table memory at [mem 0xfc003980-0xfc00397f]

```

Figure 15 - system characteristics 05

```
[ 2747.259770] systemd[1]: Starting Rule-based Manager for Device Events and Files...
[ 2747.259820] systemd[1]: Started Journal Service.
ubuntu@ip-172-31-46-88:~$ 
ubuntu@ip-172-31-46-88:~$ 
ubuntu@ip-172-31-46-88:~$ 
ubuntu@ip-172-31-46-88:~$ tail /var/log/syslog
Mar 9 15:35:39 ip-172-31-46-88 amazon-ssm-agent.amazon-ssm-agent[1087]: <body>
Mar 9 15:35:39 ip-172-31-46-88 amazon-ssm-agent.amazon-ssm-agent[1087]:   <h1>404 - Not Found</h1>
Mar 9 15:35:39 ip-172-31-46-88 amazon-ssm-agent.amazon-ssm-agent[1087]: </body>
Mar 9 15:35:39 ip-172-31-46-88 amazon-ssm-agent.amazon-ssm-agent[1087]: </html>
Mar 9 15:35:39 ip-172-31-46-88 amazon-ssm-agent.amazon-ssm-agent[1087]: #011status code: 404, request id:
Mar 9 15:35:39 ip-172-31-46-88 amazon-ssm-agent.amazon-ssm-agent[1087]: 2024-03-09 15:35:39 ERROR EC2RoleProvider Failed to connect to Systems Manager with SSM role credentials. error calling RequestManagedInstanc
eRoleToken AccessDeniedException: Systems Manager's instance management role is not configured for account: 975069211573
Mar 9 15:35:39 ip-172-31-46-88 amazon-ssm-agent.amazon-ssm-agent[1087]: #011status code: 400, request id: 245c74e43-2628-4c72-b464-bcc9cf5b280e
Mar 9 15:35:39 ip-172-31-46-88 amazon-ssm-agent.amazon-ssm-agent[1087]: 2024-03-09 15:35:39 ERROR [CredentialRefresher] Retrieve credentials produced error: no valid credentials could be retrieved for ec2 identity
[Defunct] Manager's instance management role is not configured for account: 975069211573
Mar 9 15:35:39 ip-172-31-46-88 amazon-ssm-agent.amazon-ssm-agent[1087]: #011status code: 400, request id: 245c74e43-2628-4c72-b464-bcc9cf5b280e
Mar 9 15:35:39 ip-172-31-46-88 amazon-ssm-agent.amazon-ssm-agent[1087]: 2024-03-09 15:35:39 INFO [CredentialRefresher] Sleeping for 26m05s before retrying retrieve credentials
ubuntu@ip-172-31-46-88:~$ pwd
/home/ubuntu
ubuntu@ip-172-31-46-88:~$ alias
alias alert=notify-send --urgency=low -i "$( [ $? = 0 ] && echo terminal || echo error)" "$(history|tail -n1|sed -e '\''s/^[[\s]*\[[0-9]\]\s*//;s/\([;|\]\)\s*\[\!'\]/\1\'')"
alias egrep='egrep --color=auto'
alias fgrep='grep --color=auto'
alias grep='grep --color=auto'
alias l='ls -CF'
alias ll='ls -1F'
alias ll='ls -a1F'
alias ls='ls --color=auto'
ubuntu@ip-172-31-46-88:~$ 
```

Figure 16 - system characteristics 06

INSTALLING THE APACHE WEB SERVER

```
Last login: Sat Mar  9 15:03:29 2024 from 46.193.160.63
[ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ sudo apt-get install apache2
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
apache2-bin apache2-data apache2-utils bzip2 libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap liblbus5.3-0 mailcap mime-support ssl-cert
Suggested packages:
apache2-doc apache2-suexec-pristine | apache2-suexec-custom www-browser bzip2-doc
The following NEW packages will be installed:
apache2 apache2-bin apache2-data apache2-utils bzip2 libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap liblbus5.3-0 mailcap mime-support ssl-cert
0 upgraded, 13 newly installed, 0 to remove and 3 not upgraded.
Need to get 2139 kB of archives.
After this operation, 8534 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libapr1 amd64 1.7.0-0ubuntu0.22.04.1 [198 kB]
Get:2 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libaprutil1 amd64 1.6.1-5ubuntu4.22.04.2 [92.8 kB]
Get:3 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libaprutil1-dbd-sqlite3 amd64 1.6.1-5ubuntu4.22.04.2.2 [11.3 kB]
Get:4 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libaprutil1-ldap amd64 1.6.1-5ubuntu4.22.04.2 [9170 B]
Get:5 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 liblbus5.3-0 mailcap mime-support 0.1.0-1 [146 kB]
```

Figure 17 - installing apache2

```
[ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
     Active: active (running) since Sat 2024-03-09 20:36:57 UTC; 1min 54s ago
       Docs: https://httpd.apache.org/docs/2.4/
 Main PID: 8379 (apache2)
    Tasks: 55 (limit: 1121)
   Memory: 5.0M
      CPU: 36ms
     CGroup: /system.slice/apache2.service
             ├─8379 /usr/sbin/apache2 -k start
             ├─8381 /usr/sbin/apache2 -k start
             ├─8382 /usr/sbin/apache2 -k start

Mar 09 20:36:57 ip-172-31-46-88 systemd[1]: Starting The Apache HTTP Server...
Mar 09 20:36:57 ip-172-31-46-88 systemd[1]: Started The Apache HTTP Server.
[ubuntu@ip-172-31-46-88:~$ apache2 -v
Server version: Apache/2.4.52 (Ubuntu)
Server built:  2023-10-26T13:44:44
[ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ ]
```

Figure 18 - confirmed apache2 is running

```
[ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ sudo sh -c 'echo "<html><head><title>My first server</title></head><body>Just Created my First Server! Welcome Here!</body></html>" > /var/www/html/index.html'
[ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ ]
```

Figure 19 - my server home page -terminal

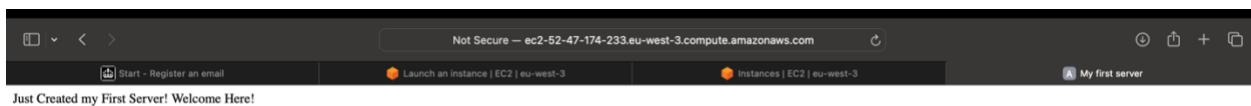


Figure 20 - my server home web page -web

The screenshot shows the CloudDNS.net dashboard. At the top, there are navigation links: Dashboard, Billing, Tools, API & Resellers, Services, Support, and a shopping cart icon. Below the navigation is a user profile section with the email 'chiemela-victor.alago@epita.fr', a 'Free' status, 'Free Monitoring' (0/500), '\$0.00', and a 'Logout' button. The main content area has sections for 'DNS Hosting' and 'Free Monitoring'. Under 'DNS Hosting', a table lists a single zone: 'avictor.cloudns.be' (Created on 2024-03-11, Last update 2024-03-11). Under 'Free Monitoring', it says 'There are no monitoring records found.'

Figure 21 - DNS created

The screenshot shows the 'Domain settings' page for the domain 'avictor.cloudns.be'. The top navigation bar includes links for ChatGPT, Professional Services Consultant, how to use CloudDNS - Google, CloudDNS: Domain settings, how to add a cname and alias, and Finish update. Below the navigation are several icons: DNS Records, SOA settings, Records Templates, Cloud domains, Mail forwards, DNS statistics, Zone transfers, Updated, Export zone file, Zone Import, Zone shares, Change the owner, Free SSL, and Delete the zone. A search bar at the top right contains the text 'avictor.cloudns.be'. The main content area displays a table of DNS records:

Host	Type	Points to	TTL	Actions
avictor.cloudns.be	ALIAS	ec2-52-47-174-233.eu-west-3.compute.amazonaws.com	1h	
avictor.cloudns.be	NS	ns51.cloudns.net	1h	
avictor.cloudns.be	NS	ns52.cloudns.net	1h	
avictor.cloudns.be	NS	ns53.cloudns.net	1h	
avictor.cloudns.be	NS	ns54.cloudns.net	1h	
www.avictor.cloudns.be	CNAME	ec2-52-47-174-233.eu-west-3.compute.amazonaws.com	1h	

At the bottom, there is a 'Cookies help us deliver our services. By using our services, you agree to our use of cookies.' message with 'Learn more' and 'Okay' buttons.

Figure 22 - DNS created - CNAME and Alias created


```
[ubuntu@ip-172-31-46-88: /etc/apache2/ssl]$ 
[ubuntu@ip-172-31-46-88: /etc/apache2/ssl]$ sudo vim /etc/apache2/sites-available/default-ssl.conf
[ubuntu@ip-172-31-46-88: /etc/apache2/ssl]$ sudo nano /etc/apache2/sites-available/default-ssl.conf
[ubuntu@ip-172-31-46-88: /etc/apache2/ssl]$ sudo nano /etc/apache2/sites-available/default-ssl.conf
[ubuntu@ip-172-31-46-88: /etc/apache2/ssl]$ 
[ubuntu@ip-172-31-46-88: /etc/apache2/ssl]$ 
[ubuntu@ip-172-31-46-88: /etc/apache2/ssl]$ sudo a2enmod ssl
Considering dependency setenvif for ssl:
Module setenvif already enabled
Considering dependency mime for ssl:
Module mime already enabled
Considering dependency socache_shmcb for ssl:
Enabling module socache_shmcb.
Enabling module ssl.
See /usr/share/doc/apache2/README.Debian.gz on how to configure SSL and create self-signed certificates.
To activate the new configuration, you need to run:
  systemctl restart apache2
[ubuntu@ip-172-31-46-88: /etc/apache2/ssl]$ sudo a2ensite default-ssl.conf
Enabling site default-ssl.
To activate the new configuration, you need to run:
  systemctl reload apache2
[ubuntu@ip-172-31-46-88: /etc/apache2/ssl]$ sudo systemctl restart apache2
[ubuntu@ip-172-31-46-88: /etc/apache2/ssl]$
```

Figure 26 - editing VirtualHost for HTTPS

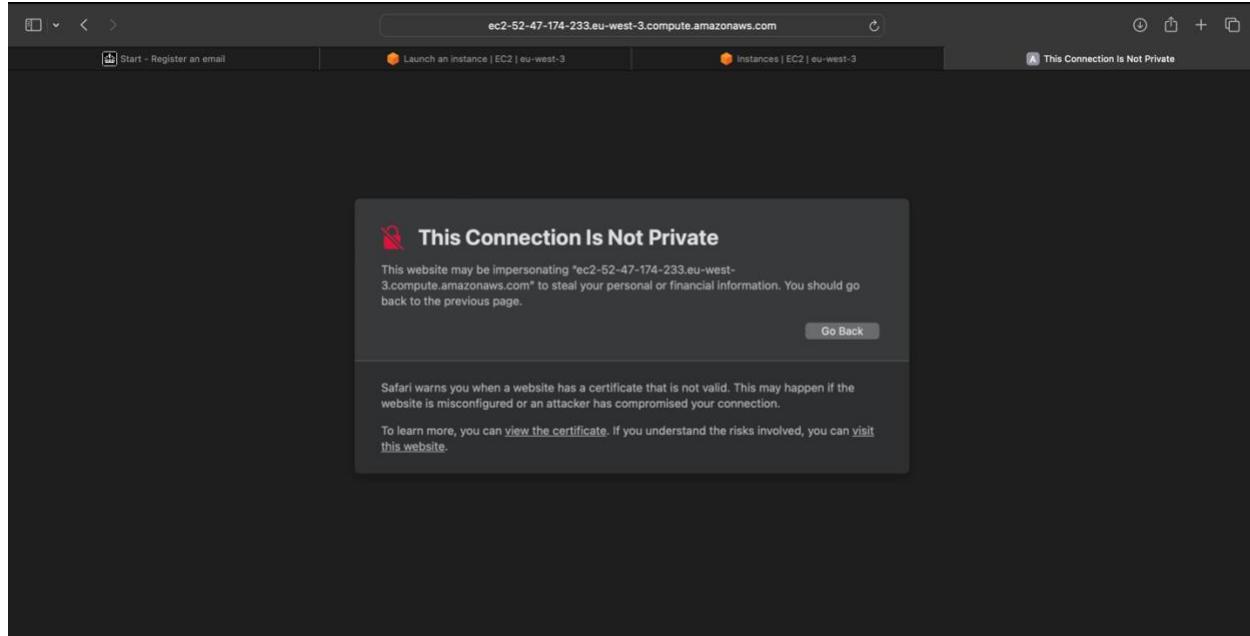


Figure 27 - testing with a browser

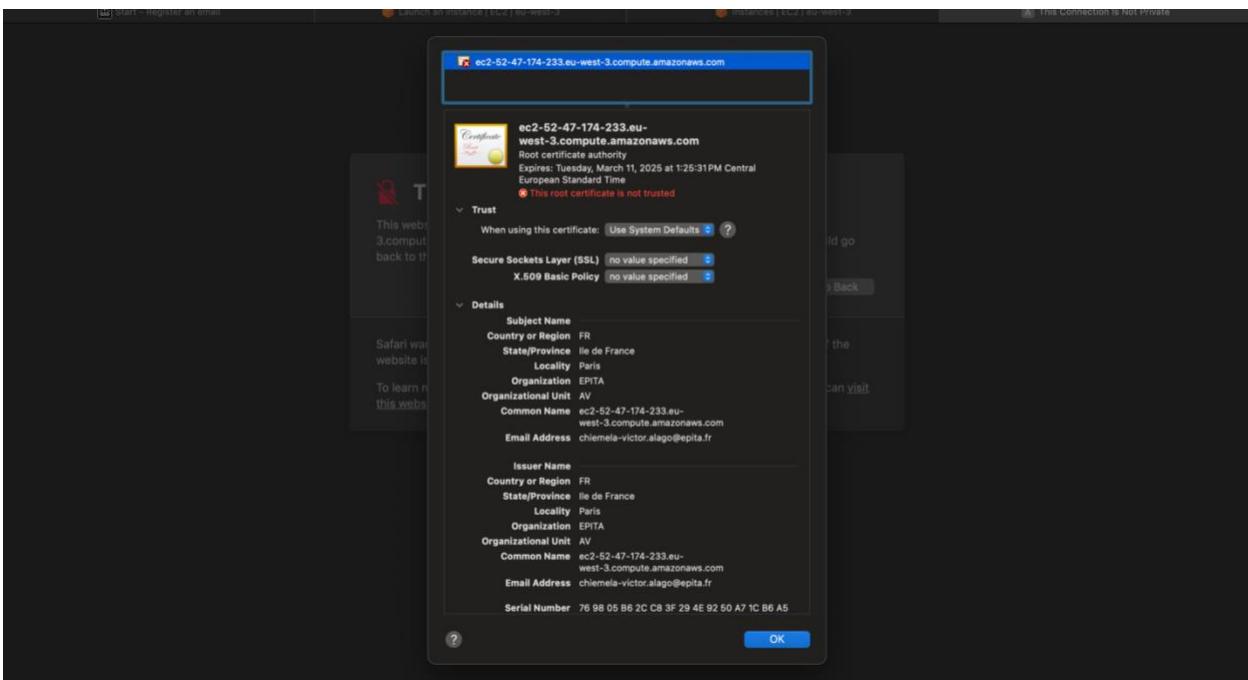


Figure 28 - view of certificate details

A screenshot of a DNS zone editor interface. The search bar at the top contains 'avictor.cloudns.be'. The main table lists several DNS records: an ALIAS record for 'avictor.cloudns.be' pointing to 'ec2-52-47-174-233.eu-west-3.compute.amazonaws.com' with a TTL of 1h; four NS records for 'ns51.cloudns.net', 'ns52.cloudns.net', 'ns53.cloudns.net', and 'ns54.cloudns.net' all pointing to 'ns51.cloudns.net' with a TTL of 1h; and two CNAME records for 'www.avictor.cloudns.be' and '_6c5f673c258191a6fd57078cea8db8cd.avictor.cloudns.b' both pointing to 'ec2-52-47-174-233.eu-west-3.compute.amazonaws.com' with a TTL of 1h. At the bottom of the interface are buttons for 'Copy', 'the selected records to', 'Select domain', 'execute', and '+ Add new record'.

Figure 29 - adding ZeroSSL to DNS Zone

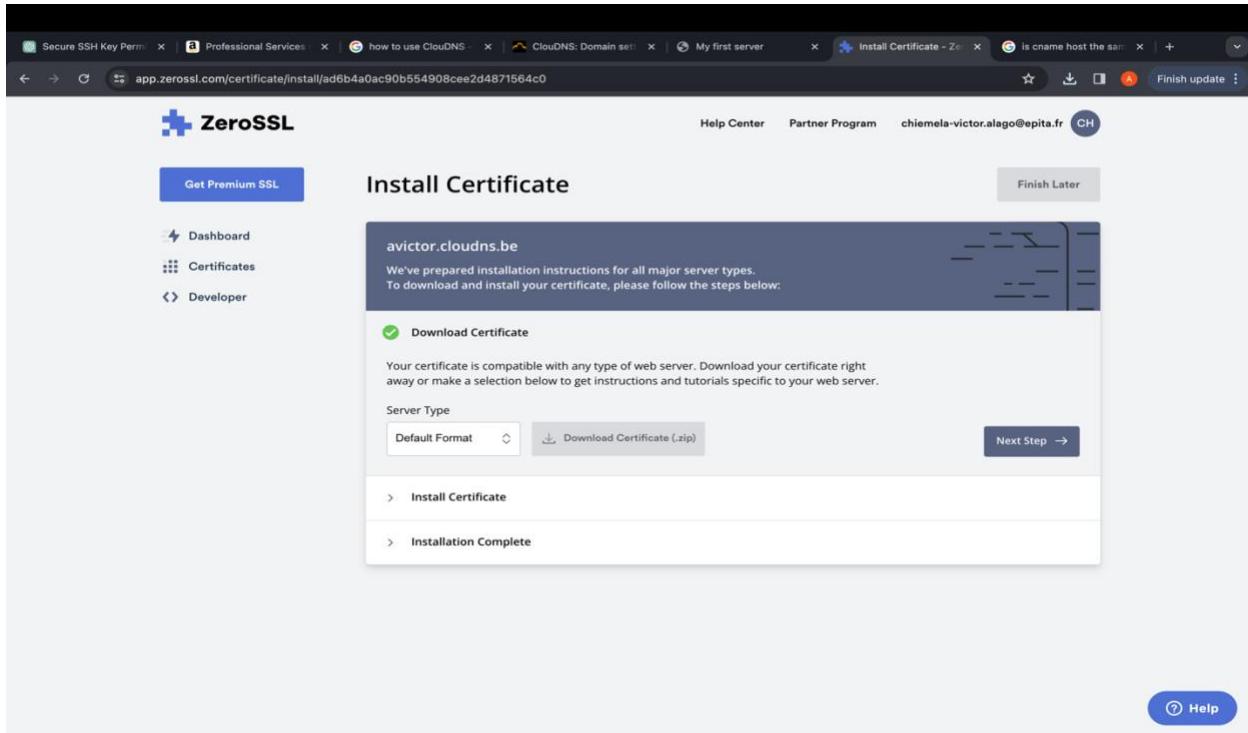


Figure 30 - ZeroSSL cert is ready

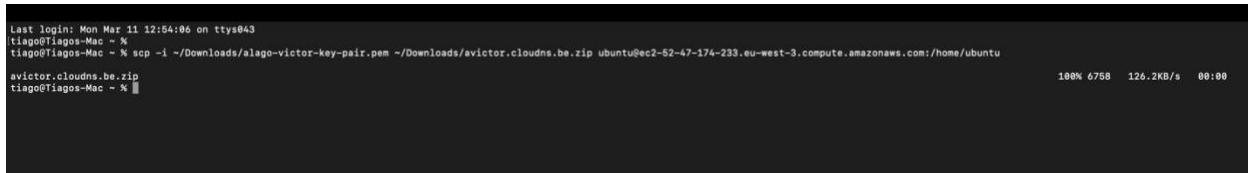


Figure 31 - ZeroSSL certificate added to EC2 AMI

```

ubuntu@ip-172-31-46-88:~$ ls
ubuntu@ip-172-31-46-88:~$ cd /etc/apache2/ssl
ubuntu@ip-172-31-46-88:/etc/apache2/ssl$ sudo mv /home/ubuntu/avictor.cloudns.be.zip /etc/apache2/ssl
ubuntu@ip-172-31-46-88:/etc/apache2/ssl$ ls
apache2.crt apache2.key avictor.cloudns.be.zip
ubuntu@ip-172-31-46-88:/etc/apache2/ssl$ sudo unzip avictor.cloudns.be.zip
Archive: avictor.cloudns.be.zip
  extracting: certificate.crt
  extracting: ca_bundle.crt
  extracting: private.key
ubuntu@ip-172-31-46-88:/etc/apache2/ssl$ sudo rm avictor.cloudns.be.zip
ubuntu@ip-172-31-46-88:/etc/apache2/ssl$ ls
apache2.crt apache2.key ca_bundle.crt certificate.crt private.key
ubuntu@ip-172-31-46-88:/etc/apache2/ssl$ sudo nano /etc/apache2/sites-available/default-ssl.conf
ubuntu@ip-172-31-46-88:/etc/apache2/ssl$ sudo systemctl restart apache2
ubuntu@ip-172-31-46-88:/etc/apache2/ssl$ 

```

Figure 32 - Certificate is moved and unzipped

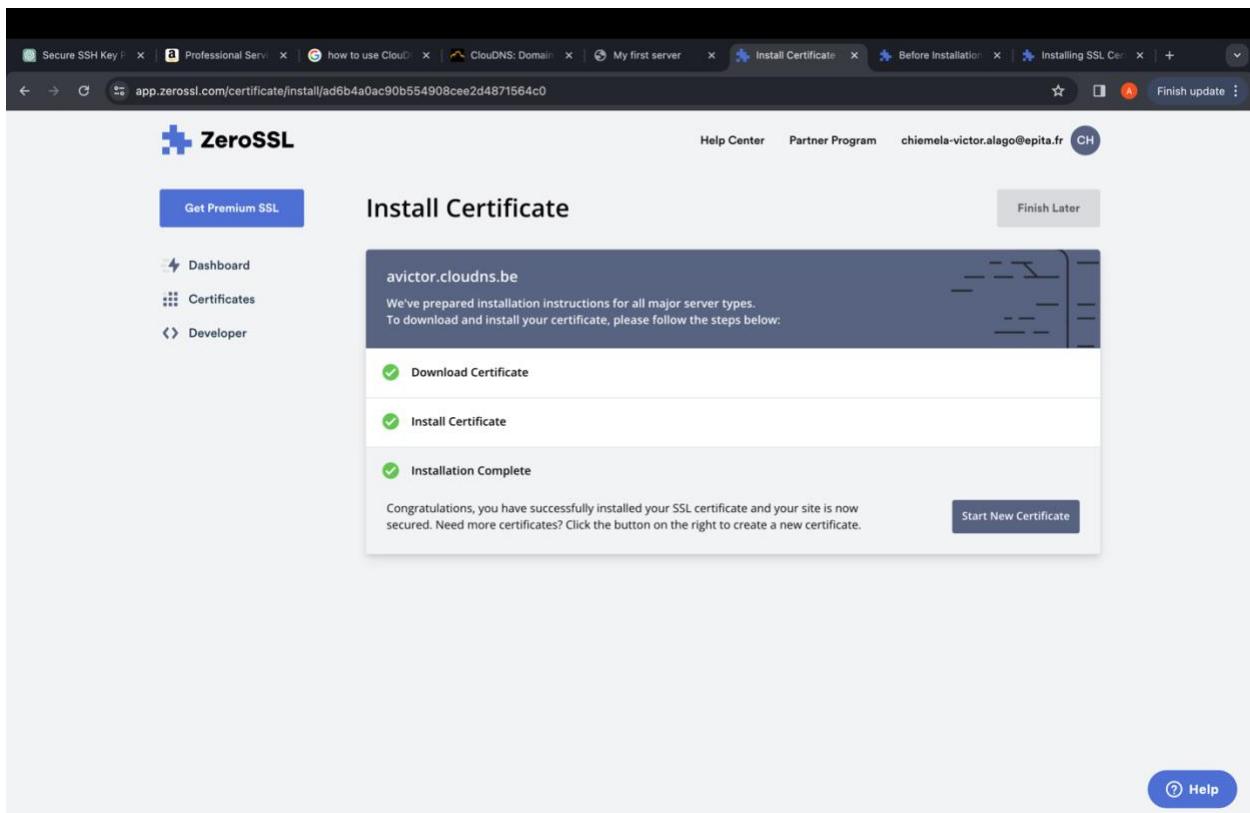


Figure 33 - ZeroSSL installation is complete

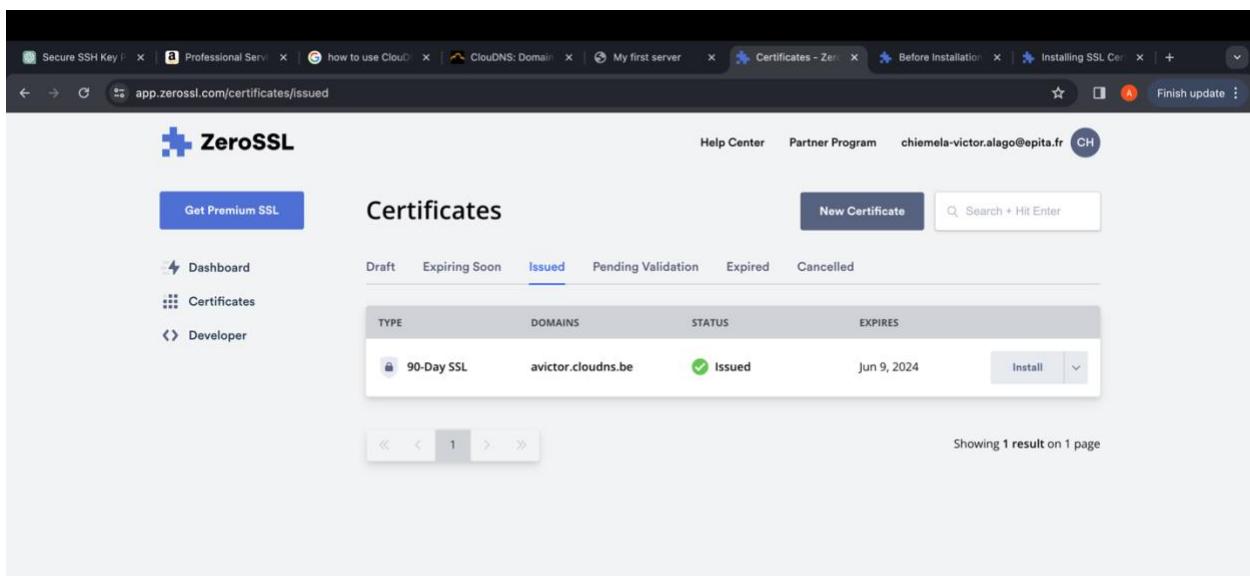


Figure 34 - ZeroSSL installation is complete 2

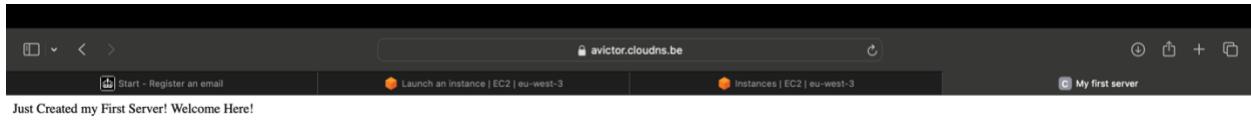


Figure 35 - server is now secure

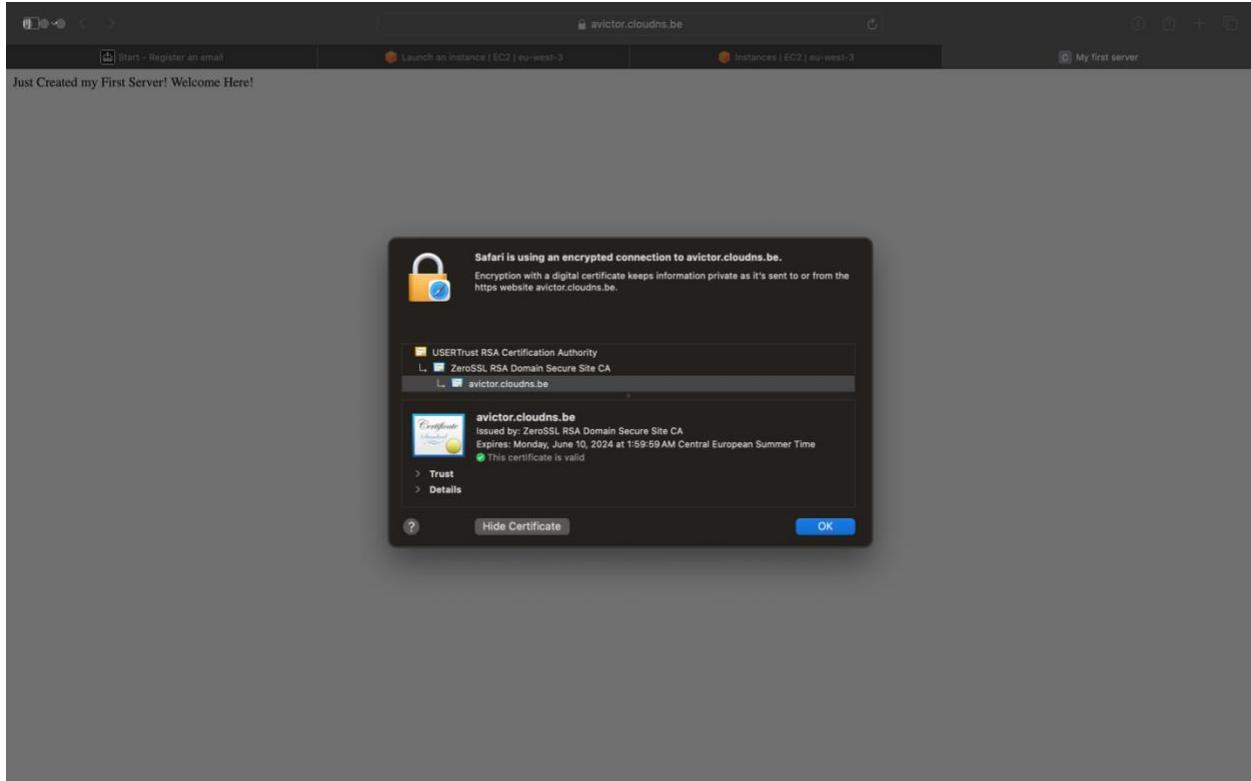


Figure 36 - server is now secure, cert shown.

```

ubuntu@ip-172-31-44-88:~$ sudo apt-get install software-properties-common
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
software-properties-common is already the newest version (0.99.22.9).
software-properties-common is set to manual installation.
0 packages upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
ubuntu@ip-172-31-44-88:~$ sudo add-apt-repository universe
Adding components('universe') to all repositories.
Press [ENTER] to continue or Ctrl-c to cancel...
Hit:1 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Hit:3 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Get:4 https://security.ubuntu.com/ubuntu jammy-security InRelease [119 kB]
Get:5 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [1460 kB]
Get:6 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [283 kB]
Get:7 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [1559 kB]
Get:8 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [259 kB]
Get:9 https://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [1241 kB]
Get:10 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [223 kB]
Get:11 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [1526 kB]
Get:12 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [253 kB]
Fetched 7033 kB in 27s (3572 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-44-88:~$ sudo add-apt-repository ppa:certbot/certbot
PPA publishes bpsym, you may need to include 'main/debug' component
Repository: deb https://ppa.launchpadcontent.net/certbot/certbot/ubuntu/ jammy main
Description:
The PPA has been DEPRECATED.

To get up to date instructions on how to get certbot for your systems, please see https://certbot.eff.org/docs/install.html.
More info: https://launchpad.net/~certbot/+archive/ubuntu/certbot
Adding repository...
Press [ENTER] to continue or Ctrl-c to cancel...
Adding entry to /etc/apt/sources.list.d/certbot-ubuntu-certbot-jammy.list
Adding disabled deb-src entry to /etc/apt/sources.list.d/certbot-ubuntu-certbot-jammy.list
Adding key to /etc/apt/trusted.gpg with fingerprint 7BF576B66ADA65728FC7E70A8C478EBE75BCA694
Hit:1 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu jammy-security InRelease
Ign:5 https://ppa.launchpadcontent.net/certbot/certbot/ubuntu jammy InRelease
Err:6 https://ppa.launchpadcontent.net/certbot/certbot/ubuntu jammy Release
  404 Not Found [IP: 185.125.190.88 443]
Reading package lists... Done
E: The repository 'https://ppa.launchpadcontent.net/certbot/certbot/ubuntu jammy Release' does not have a Release file.
N: Updating from such a repository can't be done securely, and is therefore disabled by default.
N: See apt-secure(8) manpage for repository creation and user configuration details.
ubuntu@ip-172-31-44-88:~$ sudo apt-get update
Hit:1 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Ign:4 https://ppa.launchpadcontent.net/certbot/certbot/ubuntu jammy InRelease
Err:5 https://ppa.launchpadcontent.net/certbot/certbot/ubuntu jammy Release
  404 Not Found [IP: 185.125.190.88 443]
Hit:6 http://security.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
E: The repository 'https://ppa.launchpadcontent.net/certbot/certbot/ubuntu jammy Release' does not have a Release file.
N: Updating from such a repository can't be done securely, and is therefore disabled by default.
N: See apt-secure(8) manpage for repository creation and user configuration details.
ubuntu@ip-172-31-44-88:~$ sudo apt-get install certbot python3-certbot-apache
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  auges-lenses libaugeas0@ python3-acme python3-certbot python3-configargparse python3-icu python3-josepy python3-parsedatetime python3-requests-toolbelt python3-rfc3339 python3-zope.component

```

Figure 37 - installing certbot

```

ubuntu@ip-172-31-44-88:~$ sudo certbot --apache
Saving debug log to '/var/log/letsencrypt/letsencrypt.log'
Which names would you like to activate HTTPS for?
-----
1: avictor.cloudns.be
-----
Select the appropriate numbers separated by commas and/or spaces, or leave input
blank to select all options shown (Enter 'c' to cancel): 1
Blank selection: Requesting certificate for avictor.cloudns.be
An unexpected error occurred!
There were too many requests of a given type :: Error creating new order :: too many certificates already issued for "cloudns.be". Retry after 2024-03-11T09:00Z; see https://letsencrypt.org/docs/rate-limits/
Ask for help or search for solutions at https://community.letsencrypt.org. See the logfile /var/log/letsencrypt/letsencrypt.log or re-run Certbot with -v for more details.
ubuntu@ip-172-31-44-88:~$ sudo certbot certificates
Saving debug log to '/var/log/letsencrypt/letsencrypt.log'

No certificates found.
ubuntu@ip-172-31-44-88:~$ 

```

Figure 38 - certbot issue with cert

```
Which names would you like to activate HTTPS for?
-- -- -- -- -
1: kntran.dns-dynamic.net
-- -- -- -- -
Select the appropriate numbers separated by commas and/or spaces, or leave input
blank to select all options shown (Enter 'c' to cancel): 1
Requesting a certificate for kntran.dns-dynamic.net

Successfully received certificate.
Certificate is saved at: /etc/letsencrypt/live/kntran.dns-dynamic.net/fullchain.pem
Key is saved at:          /etc/letsencrypt/live/kntran.dns-dynamic.net/privkey.pem
This certificate expires on 2024-06-11.
These files will be updated when the certificate renews.
Certbot has set up a scheduled task to automatically renew this certificate in the background.

Deploying certificate
Successfully deployed certificate for kntran.dns-dynamic.net to /etc/apache2/sites-enabled/default-ssl.conf
Congratulations! You have successfully enabled HTTPS on https://kntran.dns-dynamic.net

-- -- -- -- -
If you like Certbot, please consider supporting our work by:
 * Donating to ISRG / Let's Encrypt:   https://letsencrypt.org/donate
 * Donating to EFF:                   https://eff.org/donate-le
-- -- -- -- -
```

Figure 39 - certbot cert issued successfully

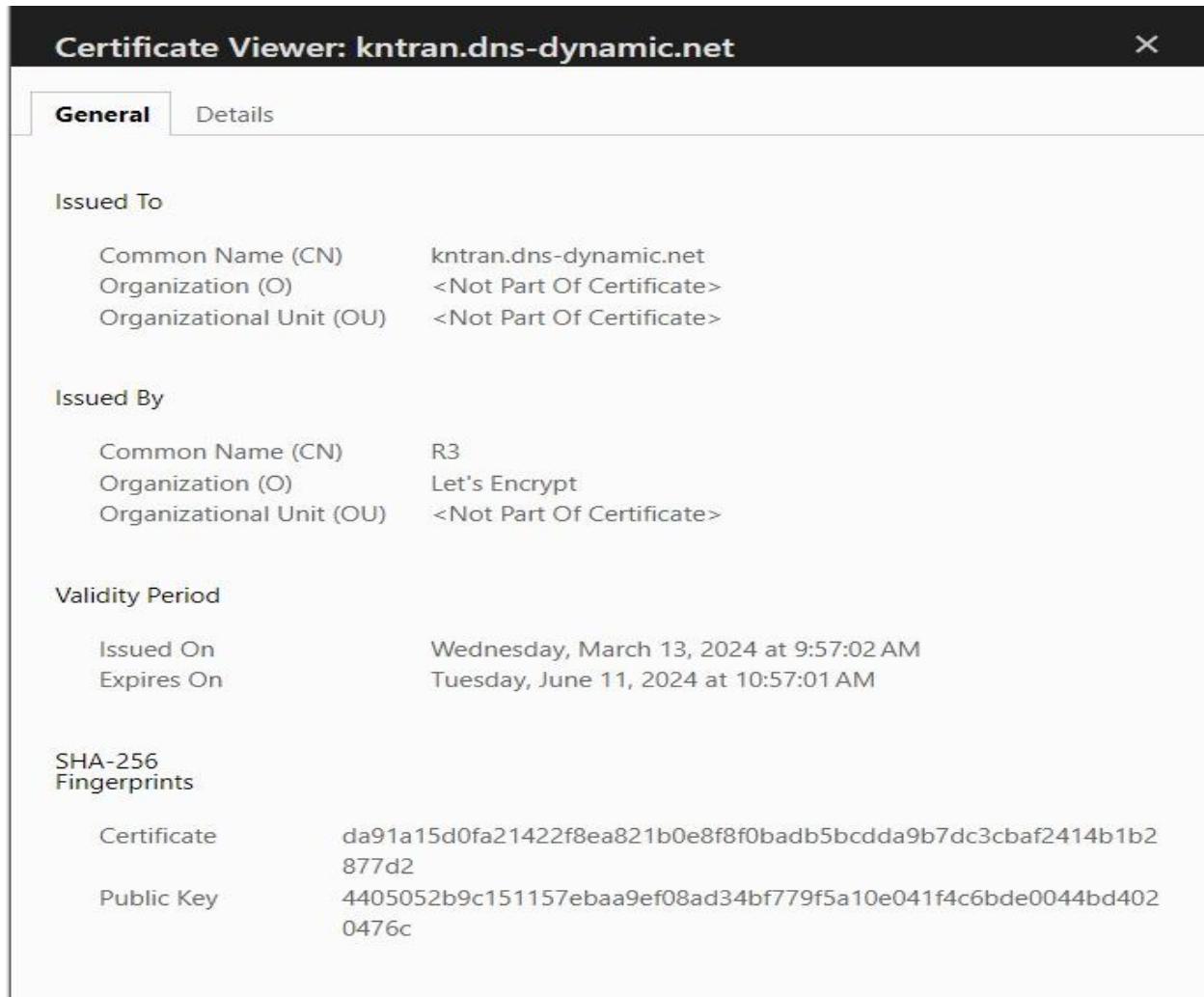


Figure 40 - certbot cert issued

CREATING A PHP APPLICATION

```
ubuntu@ip-172-31-46-88:~$ sudo apt-get install libapache2-mod-php
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libapache2-mod-php8.1 php-common php8.1-cli php8.1-common php8.1-opcache php8.1-readline
Suggested packages:
  php-pear
The following NEW packages will be installed:
  libapache2-mod-php libapache2-mod-php8.1 php-common php8.1-cli php8.1-common php8.1-opcache php8.1-readline
0 upgraded, 7 newly installed, 0 to remove and 0 not upgraded.
Need to get 5121 kB of archives.
```

Figure 41 - installing php

```
ubuntu@ip-172-31-46-88:~$ sudo sh -c 'echo "<?php phpinfo(); ?>" > /var/www/html/phpinfo.php'
ubuntu@ip-172-31-46-88:~$
```

Figure 42 - creating a phpinfo script

The screenshot shows a web browser window with the URL 'avictor.cloudns.be' in the address bar. The page title is 'PHP Version 8.1.2-1ubuntu2.14'. The content of the page is the PHP info output, which includes tables for System, PHP API, and various extension configurations. At the bottom, it mentions the Zend Engine version and provides a copyright notice. The Zend logo is visible in the bottom right corner.

System	Value
Build Date	Aug 18 2023 11:41:11
Build System	Linux
Server API	Apache 2.0 Handler
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php/8.1/apache2/php.ini
Loaded Configuration File	/etc/php/8.1/apache2/php.ini
Scanned this dir for additional .ini files	/etc/php/8.1/apache2/conf.d
Additional .ini files parsed	/etc/php/8.1/apache2/conf.d/10-opcache.ini, /etc/php/8.1/apache2/conf.d/10-pdo.ini, /etc/php/8.1/apache2/conf.d/20-calendar.ini, /etc/php/8.1/apache2/conf.d/20-ctype.ini, /etc/php/8.1/apache2/conf.d/20-exit.ini, /etc/php/8.1/apache2/conf.d/20-fil.ini, /etc/php/8.1/apache2/conf.d/20-finfo.ini, /etc/php/8.1/apache2/conf.d/20-ftp.ini, /etc/php/8.1/apache2/conf.d/20-gettext.ini, /etc/php/8.1/apache2/conf.d/20-gmp.ini, /etc/php/8.1/apache2/conf.d/20-iconv.ini, /etc/php/8.1/apache2/conf.d/20-mbstring.ini, /etc/php/8.1/apache2/conf.d/20-mysqli.ini, /etc/php/8.1/apache2/conf.d/20-pdo_dblib.ini, /etc/php/8.1/apache2/conf.d/20-pdo_firebird.ini, /etc/php/8.1/apache2/conf.d/20-pdo_oci.ini, /etc/php/8.1/apache2/conf.d/20-pdo_odbc.ini, /etc/php/8.1/apache2/conf.d/20-pdo_pgsql.ini, /etc/php/8.1/apache2/conf.d/20-pdo_sqlite.ini, /etc/php/8.1/apache2/conf.d/20-phar.ini, /etc/php/8.1/apache2/conf.d/20-pspell.ini, /etc/php/8.1/apache2/conf.d/20-session.ini, /etc/php/8.1/apache2/conf.d/20-sysvmsg.ini, /etc/php/8.1/apache2/conf.d/20-sysvshm.ini, /etc/php/8.1/apache2/conf.d/20-tokenizer.ini

PHP API	Value
PHP Extension	20210902
Zend Extension	20210902
Zend Extension Build	API20210902.NTS
PHP Extension Build	API20210902.NTS
Debug Build	no
Thread Safety	disabled
Zend Signal Handling	enabled
Zend Memory Manager	enabled
Zend Multibyte Support	disabled
IPv6 Support	enabled
DTrace Support	available, disabled
Registered PHP Streams	https, ftps, compress.zlib, php, file, glob, data, http, ftp, phar
Registered Stream Socket Transports	tcp, udp, unix, udg, ssl, tls, tlsv1.0, tlsv1.1, tlsv1.2, tlsv1.3
Registered Stream Filters	zlib.*, string.rot13, string.toupper, string.tolower, convert.*, consumed, dechunk, convert.iconv,*

This program makes use of the Zend Scripting Language Engine:
Zend Engine v4.1.2, Copyright (c) Zend Technologies
with Zend OPcache v8.1.2-1ubuntu2.14, Copyright (c), by Zend Technologies

zend engine

Figure 43 - phpinfo on viewed on browser

The screenshot shows a web browser window with the URL `avictor.cloudns.be`. The page title is "Configuration apache2handler". The content includes:

- Apache Version**: Apache/2.4.52 (Ubuntu)
- Apache API Version**: 20120211
- Server Administrator**: chiemela-victor.alago@epita.fr
- Hostname:Port**: avictor.cloudns.be:0
- User/Group**: www-data/33/33
- Max Requests**: Per Child: 0 - Keep Alive: on - Max Per Connection: 100
- Timeouts**: Connection: 300 - Keep-Alive: 5
- Virtual Server**: Yes
- Server Root**: /etc/apache2
- Loaded Modules** (partial list):
 - core mod_so mod_watchdog http core mod_log_config mod_logio mod_version mod_unixd mod_access_compat
 - mod_alias mod_authn basic mod_authn_core mod_authn_file mod_authz_core mod_authz_host mod_authz_user
 - mod_autoindex mod_deflate mod_dir mod_env mod_filter mod_mime mod_prefork mod_negotiation mod_php
 - mod_realm mod_setenvif mod_socache_shmcb mod_ssl mod_status
- Directive**, **Local Value**, **Master Value** table:

Directive	Local Value	Master Value
engine	On	On
last_modified	Off	Off
xbitHack	Off	Off
- Apache Environment** table:

Variable	Value
HTTPS	on
SSL_TLS_SNI	avictor.cloudns.be
HTTP_HOST	avictor.cloudns.be
HTTP_SEC_FETCH_SITE	none
HTTP_CONNECTION	keep-alive
HTTP_SEC_FETCH_MODE	navigate
HTTP_ACCEPT	text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
HTTP_USER_AGENT	Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/17.2.1 Safari/605.1.15
HTTP_ACCEPT_LANGUAGE	en-US,en;q=0.9
HTTP_SEC_FETCH_DEST	document
HTTP_ACCEPT_ENCODING	gzip, deflate, br

Figure 44 - phpinfo viewed on browser

```
ubuntu@ip-172-31-46-88:~$ 
[ubuntu@ip-172-31-46-88:~$ cd /var/www/html/
[ubuntu@ip-172-31-46-88:/var/www/html$ nano meteo.php
[ubuntu@ip-172-31-46-88:/var/www/html$ vim meteo.php
[ubuntu@ip-172-31-46-88:/var/www/html$ ls -la
total 16
drwxr-xr-x 2 root root 4096 Mar 12 21:48 .
drwxr-xr-x 3 root root 4096 Mar  9 20:36 ..
-rw-r--r-- 1 root root  113 Mar  9 20:42 index.html
-rw-r--r-- 1 root root    0 Mar 12 21:48 meteo.php
-rw-r--r-- 1 root root   20 Mar 12 04:58 phpinfo.php
[ubuntu@ip-172-31-46-88:/var/www/html$ sudo nano meteo.php
[ubuntu@ip-172-31-46-88:/var/www/html$ sudo nano meteo.php
[ubuntu@ip-172-31-46-88:/var/www/html$ ]
```

Figure 45 - created the meteo.php file

```

GNU nano 6.2
meteo.php
?php
// Set the locale to French
setlocale(LC_ALL, 'fr_FR');

// OpenWeather API endpoint for weather data
$apiUrl = "http://api.openweathermap.org/data/2.5/weather?q=Paris,FR&units=metric&lang=fr&appid=7a6f540ad1215e560210f05b53b0560c";

// Retrieve JSON content from the API
$jsonfile = file_get_contents($apiUrl);

// Decode JSON content
$jsondata = json_decode($jsonfile);

// Display weather information
echo "<h2>Weather Information for Paris, France</h2>";
echo "<p>Current Time: " . date("H:i", $jsondata->dt) . "</p>";
echo "<p>Temperature: " . number_format($jsondata->main->temp, 1) . " °C</p>";

// Create a link for redirecting to the OpenWeather website
$openWeatherLink = "http://www.openweathermap.org";
echo "<p>For more details, visit <a href=\"$openWeatherLink\" target=\"_blank\">OpenWeather</a></p>";

// Optional: Perform an automatic redirection after a few seconds
// $redirectURL = "https://avictor.cloudns.be"; // If I wanted to redirect the page to my server
// echo "<meta http-equiv=\"refresh\" content=\"5;URL=$redirectURL\" />"; // redirects after 5 seconds
?>

```

Figure 46 - meteo.php file content

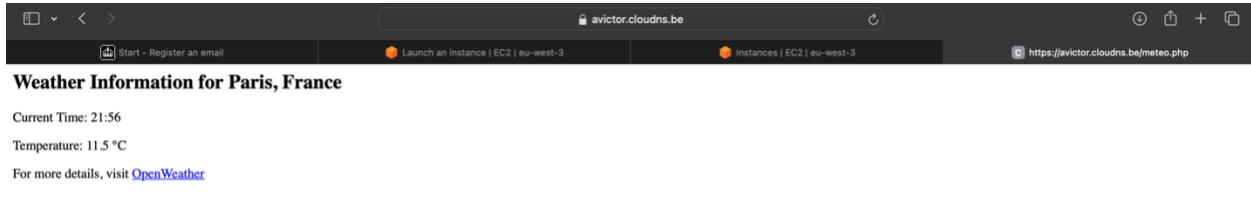


Figure 47 - weather for Paris

```

# /etc/ntp.conf, configuration for ntpd; see ntp.conf(5) for help
driftfile /var/lib/ntp/ntp.drift
# Leap second definition provided by tzdata
leapfile /usr/share/zoneinfo/leap-seconds.list
# Enable this if you want statistics to be logged.
#statadir /var/log/ntpstats/
statistics logstats peerstats clockstats
filgen logstats file logstats type day enable
filgen peerstats file peerstats type day enable
filgen clockstats file clockstats type day enable

# Specify one or more NTP servers.

# Use servers from the NTP Pool Project. Approved by Ubuntu Technical Board
# at 2011-09-06 (LP: #106525). See http://www.pool.ntp.org/join.html for
# more information.
pool 0.ubuntu.pool.ntp.org iburst
pool 1.ubuntu.pool.ntp.org iburst
pool 2.ubuntu.pool.ntp.org iburst
pool 3.ubuntu.pool.ntp.org iburst

# Use Ubuntu's ntp server as a fallback.
pool ntp.ubuntu.com

# Access control configuration; see /usr/share/doc/ntp-doc/html/accept.html for
# details. The web page <http://support.ntp.org/bin/view/Support/AccessRestrictions>
# might also be helpful.
#
# Note that "restrict" applies to both servers and clients, so a configuration
# that restricts one server from blocking requests from certain clients could also end
# up blocking replies from your own upstream servers.

# By default, exchange time with everybody, but don't allow configuration.
restrict -4 default kod notrap nomodify nopeer noquery limited
restrict -6 default kod notrap nomodify nopeer noquery limited

# Local users may interrogate the ntp server more closely.
restrict 127.0.0.1
restrict ::1

# NTP Servers
server 0.fr.pool.ntp.org
server 1.fr.pool.ntp.org
#
# Needed for adding pool entries
restrict source notrap nomodify noquery

# Clients from this (example) subnet have unlimited access, but only if
# cryptographically authenticated.
#restrict 192.168.123.0 mask 255.255.255.0 notrust

# If you want to provide time to your local subnet, change the next line.
# (Again, the address is an example only.)
#broadcast 192.168.123.255

# If you want to listen to time broadcasts on your local subnet, de-comment the
# next lines. Please do this only if you trust everybody on the network!
#disable auth
#broadcastclient
#
-- INSERT --

```

Figure 48 - ntp.conf file

```

ubuntu@ip-172-31-44-88:~$ sudo apt-get install ntp
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
libevent-pthreads-2.1-7 libopts25 ntp
Suggested packages:
  ntp-doc
The following packages will be REMOVED:
  chrony
The following NEW packages will be installed:
  libevent-pthreads-2.1-7 libopts25 ntp
0 upgraded, 4 newly installed, 1 to remove and 2 not upgraded.
Need to get 865 kB of archives.
After this operation, 1933 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 https://eu-west-3.ec2.archive/ubuntu/ jammy/main amd64 libevent-pthreads-2.1-7 amd64 2.1.12-stable-1build3 [7642 B]
Get:2 https://eu-west-3.ec2.archive/ubuntu/ jammy/universe amd64 libopts25 amd64 1:5.18.16-4 [59.8 kB]
Get:3 https://eu-west-3.ec2.archive/ubuntu/ jammy/universe amd64 ntp amd64 14.2.8p15+dfsg-1ubuntu2 [721 kB]
Get:4 https://eu-west-3.ec2.archive/ubuntu/ jammy/universe amd64 ntp amf64 1:4.2.8p15+dfsg-1ubuntu2 [67.1 kB]
Fetched 865 kB in 0s (18.9 MB/s)
(Reading database ... 96911 files and directories currently installed.)
Removing chrony (3.3.1-1ubuntu1) ...
Selecting previously unselected package libevent-pthreads-2.1-7:amd64.
(Reading database ... 96875 files and directories currently installed.)
Preparing to unpack .../libevent-pthreads-2.1-7_2.1.12-stable-1build3_amd64.deb ...
Unpacking libevent-pthreads-2.1-7:amd64 (2.1.12-stable-1build3) ...
Selecting previously unselected package libopts25:amd64.
Preparing to unpack .../libopts25_1:5.18.16-4_amd64.deb ...
Unpacking libopts25:amd64 (1:5.18.16-4) ...
Selecting previously unselected package ntp.
Preparing to unpack .../ntp_14344.2.8p15+dfsg-1ubuntu2_amd64.deb ...
Unpacking ntp (1:4.2.8p15+dfsg-1ubuntu2) ...
Selecting previously unselected package ntp.
Preparing to unpack .../ntp_14344.2.8p15+dfsg-1ubuntu2_amd64.deb ...
Unpacking ntp (1:4.2.8p15+dfsg-1ubuntu2) ...
Setting up libopts25:amd64 (1:5.18.16-4) ...
Setting up ntp (1:4.2.8p15+dfsg-1ubuntu2) ...
Creating symbolic link /etc/systemd/system/network.target.wants/ntp-systemd-netif.path → /lib/systemd/system/ntp-systemd-netif.path.
Creating symbolic link /etc/systemd/system/network.target.wants/ntp.service → /lib/systemd/system/ntp.service.
ntp-systemd-netif.service is a disabled or a static unit, not starting it.
Setting up libevent-pthreads-2.1-7:amd64 (2.1.12-stable-1build3) ...
Setting up ntp (1:4.2.8p15+dfsg-1ubuntu2) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for libc-bin (2.35-ubuntu3.6) ...
Scanning processes...
Scanning candidates...
Scanning linux images...

Restarting services...
Services are not being deferred:
systemctl restart systemd-logind.service
systemctl restart unattended-upgrades.service

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-44-88:~$ sudo vim /etc/ntp.conf
ubuntu@ip-172-31-44-88:~$ sudo service ntp restart
ubuntu@ip-172-31-44-88:~$ sudo timedatectl set-timezone Europe/Paris
ubuntu@ip-172-31-44-88:~$ 

```

Figure 49 - setting up timestamp

```
ubuntu@ip-172-31-46-77:/etc/apache2/ssl$ sudo timedatectl
        Local time: Wed 2024-03-13 11:18:13 CET
        Universal time: Wed 2024-03-13 10:18:13 UTC
                  RTC time: Wed 2024-03-13 10:18:12
                 Time zone: Europe/Paris (CET, +0100)
System clock synchronized: yes
          NTP service: active
    RTC in local TZ: no
```

Figure 50 - ntp service activated

```
[ubuntu@ip-172-31-46-88:~$ 
ubuntu@ip-172-31-46-88:~$ sudo vim /etc/default/locale
ubuntu@ip-172-31-46-88:~$ sudo dpkg-reconfigure locales
Generating locales (this might take a while)...
  en_US.UTF-8... done
Generation complete.
[ubuntu@ip-172-31-46-88:~$ sudo vim /etc/default/locale
[ubuntu@ip-172-31-46-88:~$ sudo dpkg-reconfigure locales
Generating locales (this might take a while)...
  en_US.UTF-8... done
  fr_FR.UTF-8... done
Generation complete.
ubuntu@ip-172-31-46-88:~$ sudo locale-gen
Generating locales (this might take a while)...
  en_US.UTF-8... done
  fr_FR.UTF-8... done
Generation complete.
ubuntu@ip-172-31-46-88:~$ locale -a
C
C.utf8
POSIX
en_US.utf8
fr_FR.utf8
```

Figure 51 - setting up location

```
[ ] fr_CA ISO-8859-1
[ ] fr_CA.UTF-8 UTF-8
[ ] fr_CH ISO-8859-1
[ ] fr_CH.UTF-8 UTF-8
[ ] fr_FR ISO-8859-1
[*] fr_FR.UTF-8 UTF-8
[ ] fr_FR@euro ISO-8859-15
[ ] fr_LU ISO-8859-1
[ ] fr_LU.UTF-8 UTF-8
[ ] fr_LU@euro ISO-8859-15
```

Figure 52 - setting up location 2

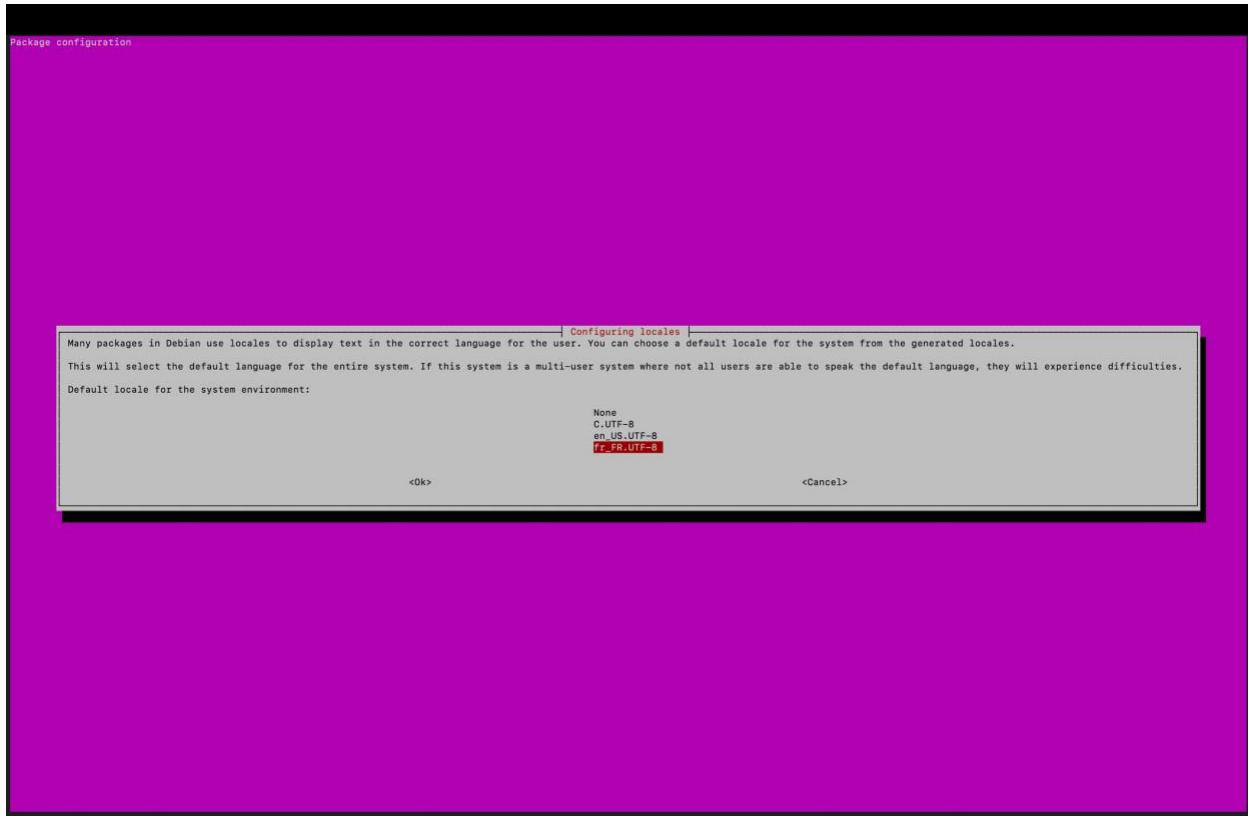


Figure 53 - setting up location 3

SUMMARY:

We started by creating our virtual computer on AWS, choosing its size and setting up security measures to keep it safe. Once our computer was ready, we installed a program called Apache, which is like the engine behind websites. With Apache running, we could host web pages and share information online.

Then, we went a step further and learned how to make our website secure with HTTPS, which is like putting a lock on our web pages to keep them safe from prying eyes. We even got to create our own security certificates to make it happen!

After that, we got creative and learned how to add more functionality to our website by installing PHP, a programming language. With PHP, we could make our website more interactive and dynamic, like showing real-time weather information from the internet.

Overall, our journey through setting up a virtual computer, securing it, and adding cool features to our website has been an exciting introduction to cloud computing and web server management. It's just the beginning of what we can do in the world of technology!