



## **Lab 02: Amazon AWS**

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### **Team Member**

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To use it with an SSH client (Mac or Linux), you will need to define the following authorizations:

**\$chmod** 400 tvaira-key-pair-euwest3.pem

```
(base) chriskayomb@Chriss-MacBook-Air Lab 2 % ls
Chris Kayomb - Lab2 - EC2.docx ~$ris Kayomb - Lab2 - EC2.docx
kayomb-key-pair-euwest3.pem
(base) chriskayomb@Chriss-MacBook-Air Lab 2 % chmod 400 kayomb-key-pair-euwest3.
pem
(base) chriskayomb@Chriss-MacBook-Air Lab 2 %
```

## Creating a security group (or do it in step 3)

*Note: Security Groups act as a firewall for instances by controlling inbound traffic and outbound traffic by enforcing rules.*

In the menu **NETWORK AND SECURITY**, select **Security Groups**:



Then **Create a security group**:



Add rules for HTTP, HTTPS and SSH:

EC2 > Groupes de sécurité > Créer un groupe de sécurité

### Créer un groupe de sécurité Informations

Un groupe de sécurité agit comme un pare-feu virtuel pour votre instance afin de contrôler le trafic entrant et sortant. Pour créer un groupe de sécurité, complétez les champs ci-dessous.

#### Détails de base

Nom du groupe de sécurité <small>Informations</small>	<input type="text" value="tvaira-sg-euwest3"/>
Le nom ne peut pas être modifié après sa création.	
Description <small>Informations</small>	<input type="text" value="Autorise SSH et HTTP"/>
VPC <small>Informations</small>	<input type="text" value="vpc-a50734cc"/>

#### Règles entrantes Informations

Type <small>Informations</small>	Protocole <small>Informations</small>	Plage de ports <small>Informations</small>	Source <small>Informations</small>	Description - facultatif <small>Informations</small>
HTTP	TCP	80	N'importe... ▾	<input type="text" value="0.0.0.0"/> X <input type="text" value="::/0"/> X
HTTPS	TCP	443	N'importe... ▾	<input type="text" value="0.0.0.0"/> X <input type="text" value="::/0"/> X
SSH	TCP	22	N'importe... ▾	<input type="text" value="0.0.0.0"/> X <input type="text" value="::/0"/> X

[Ajouter une règle](#)

Le groupe de sécurité (sg-0c7510b090b638c9b | tvaira-sg-euwest3) a été créé avec succès.

▶ Détails

EC2 > Groupes de sécurité > sg-0c7510b090b638c9b - tvaira-sg-euwest3

[Supprimer le groupe de sécurité](#)
[Copier vers un nouveau groupe de sécurité](#)

#### Détails

Nom du groupe de sécurité tvaira-sg-euwest3	ID du groupe de sécurité sg-0c7510b090b638c9b	Description Autorise SSH et HTTP	ID de VPC <a href="#">vpc-a50734cc</a>
Propriétaire 494915339550	Nombre de règles entrantes 6 Entrées d'autorisation	Nombre de règles sortantes 1 Entrée d'autorisation	

- [Règles entrantes](#)
- [Règles sortantes](#)
- [Balises](#)

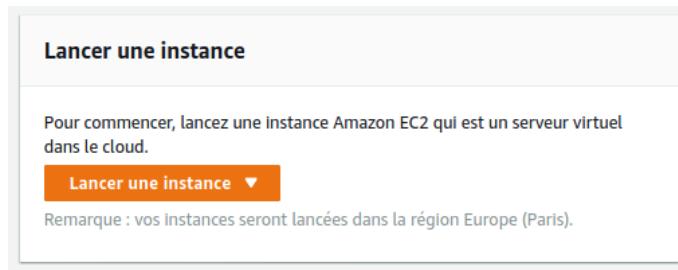
Règles entrantes					<a href="#">Modifier les règles entrantes</a>
Type	Protocole	Plage de ports	Source	Description - facultatif	
HTTP	TCP	80	0.0.0.0/0	-	
HTTP	TCP	80	::/0	-	
SSH	TCP	22	0.0.0.0/0	-	
SSH	TCP	22	::/0	-	
HTTPS	TCP	443	0.0.0.0/0	-	
HTTPS	TCP	443	::/0	-	



For security reasons, it is not recommended to allow SSH to access your instance from all Pv4 addresses (0.0.0.0/0), except as a test and for a very short time .

## 2nd step. Launching an Amazon EC2 instance (to create the virtual machine)

In the menu **PROCEEDINGS**, select **Instances** and click on **Launch an instance**:



### Step 3. Instance configuration

#### Choose an Amazon Machine Image (AMI): Ubuntu 18.04 LTS

AMI Name	Description	Type de stockage	Type de virtualisation	ENA activée	Action
Amazon Linux 2 AMI (HVM), SSD Volume Type - ami-00077e3fed5089981	Amazon Linux 2 est accompagné de cinq ans de support. Ce service fournit un noyau Linux 4.14 pour des performances optimales sur Amazon EC2, systemd 219, GCC 7.3, Glibc 2.26, Binutils 2.29.1 et les derniers packages logiciels via des extras.	EBS	HVM	Oui	<button>Sélectionner</button>
Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type - ami-06cba15121418bcdcb	L'AMI Amazon Linux est une image basée sur EBS et prise en charge par AWS. L'image par défaut comprend des outils de ligne de commande AWS, Python, Ruby, Perl et Java. Les référentiels incluent Docker, PHP, MySQL, PostgreSQL, ainsi que d'autres packages.	EBS	HVM	Oui	<button>Sélectionner</button>
SUSE Linux Enterprise Server 15 SP1 (HVM), SSD Volume Type - ami-0fd378c51c99847e9	SUSE Linux Enterprise Server 15 Service Pack 1 (HVM), EBS General Purpose (SSD) Volume Type. Public Cloud, Advanced Systems Management, Web and Scripting, and Legacy modules enabled.	EBS	HVM	Oui	<button>Sélectionner</button>
<b>Ubuntu Server 18.04 LTS (HVM), SSD Volume Type - ami-08c757228751c5335</b>	Ubuntu Server 18.04 LTS (HVM), EBS General Purpose (SSD) Volume Type. Support available from Canonical ( <a href="http://www.ubuntu.com/cloud/services">http://www.ubuntu.com/cloud/services</a> ).	EBS	HVM	Oui	<b><button>Sélectionner</button></b>
Ubuntu Server 16.04 LTS (HVM), SSD Volume Type - ami-0b92a0ac418c64fb1	Ubuntu Server 16.04 LTS (HVM), EBS General Purpose (SSD) Volume Type. Support available from Canonical ( <a href="http://www.ubuntu.com/cloud/services">http://www.ubuntu.com/cloud/services</a> ).	EBS	HVM	Oui	<button>Sélectionner</button>

#### Choose an instance type: t2.micro (eligible for the free tier)

Famille	Type	vCPU	Mémoire (Go)	Stockage d'instance (Go)	Disponible en version optimisée pour EBS	Performances réseau	Prise en charge IPv6
Usage général	t2.nano	1	0.5	EBS uniquement	-	Faibles à modérées	Oui
<b>Usage général</b>	<b>t2.micro</b>	<b>1</b>	<b>1</b>	<b>EBS uniquement</b>	<b>-</b>	<b>Faibles à modérées</b>	<b>Oui</b>
Usage général	t2.small	1	2	EBS uniquement	-	Faibles à modérées	Oui

#### Associate a security group (firewall)

ID de groupe de sécurité	Nom	Description	Actions
sg-ab661dc1	default	default VPC security group	Copier vers le nouveau
<b>sg-0c7510b090b638c9b</b>	<b>lvala-sg-euwest3</b>	<b>Autorise SSH et HTTP</b>	<b>Copier vers le nouveau</b>

## Associate a pair of keys

1. Choisir l'AMI    2. Choisir un type d'instance    3. Configurer l'instance    4. Ajouter le stockage    5. Ajouter des balises    6. Configurer le groupe de sécurité    7. Vérification

**Étape 7 : Examiner le lancement de l'instance**

Veuillez vérifier les détails de votre lancement d'instance. Vous pouvez revenir en arrière pour modifier les changements pour chaque section. Cliquez sur **Lancer** pour affecter une paire de clés à votre instance et terminer la procédure de lancement.

**Améliorez la sécurité de votre instance. Votre groupe de sécurité, tvaira-sg-euwest3, est accessible publiquement.**  
Votre instance peut être accessible depuis n'importe quelle adresse IP. Nous vous recommandons de mettre à jour les règles de votre groupe de sécurité afin de permettre l'accès uniquement depuis des adresses IP connues.  
Vous pouvez également ouvrir des ports supplémentaires dans votre groupe de sécurité afin de faciliter l'accès à l'application ou au service en cours d'exécution, par exemple, HTTP (80) pour les serveurs Web. [Modifier les groupes de sécurité](#)

**Détails de l'AMI** [Modifier l'AMI](#)

	Ubuntu Server 18.04 LTS (HVM), SSD Volume Type - ami-08c757228751c5335
	Ubuntu Server 18.04 LTS (HVM), EBS General Purpose (SSD) Volume Type. Support available from Canonical ( <a href="http://www.ubuntu.com/cloud/services">http://www.ubuntu.com/cloud/services</a> ).
	Type de périphérique racine: ebs    Type de virtualisation: hvm

**Type d'instance** [Modifier le type d'instance](#)

Type d'instance	ECU	vCPU	Mémoire (Go)	Stockage d'instance (Go)	Disponible en version optimisée pour EBS	Performances réseau
t2.micro	Variable	1	1	EBS uniquement	-	Low to Moderate

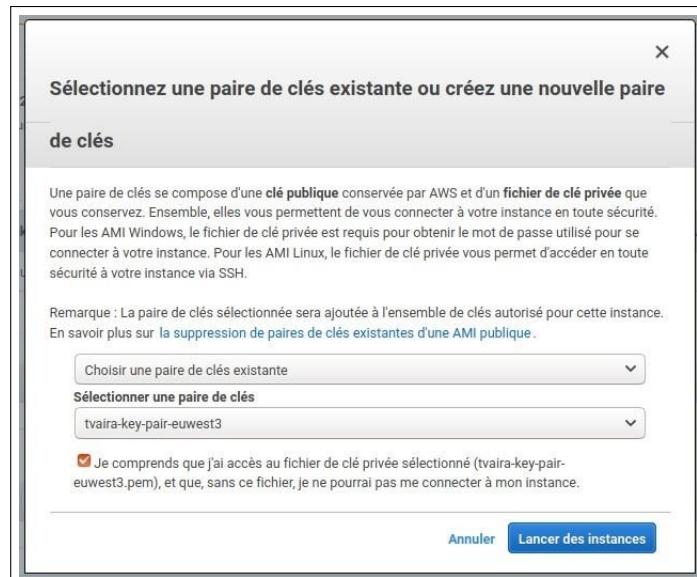
**Groupes de sécurité** [Modifier les groupes de sécurité](#)

ID de groupe de sécurité	Nom	Description
sg-0c7510b090b638c9b	tvalira-sg-euwest3	Autorise SSH et HTTP

Toutes les règles de trafic entrant sélectionnées des groupes de sécurité

Type	Protocole	Plage de ports	Source	Description
HTTP	TCP	80	0.0.0.0/0	
HTTP	TCP	80	::/0	
SSH	TCP	22	0.0.0.0/0	
SSH	TCP	22	::/0	
HTTPS	TCP	443	0.0.0.0/0	
HTTPS	TCP	443	::/0	

[Annuler](#) [Précédent](#) [Lancer](#)



**Statut de lancement**

Votre instance est en cours de lancement  
Le lancement d'instance suivant a été initié : i-08162c34aeade37d1 [Afficher le journal de lancement](#)

Étre informé des frais estimés  
Créer des alertes de facturation pour obtenir une notification par e-mail lorsque les frais estimés imputés sur votre facture AWS dépassent un montant que vous définissez (par exemple, si vous dépassez le niveau d'offre gratuite).

Comment vous connecter à votre instance  
Votre instance est en cours de lancement et quelques minutes pourraient être nécessaires avant qu'elle ne soit en état d'**exécution**, lorsqu'elle sera prête à être utilisée. Les heures d'utilisation de votre nouvelle instance commenceront immédiatement et continueront d'augmenter jusqu'à ce que vous arrêtez votre instance ou vous la mettiez hors service.  
Cliquez sur **View instances** (Afficher les instances) pour contrôler le statut de votre instance. Une fois que votre instance est en cours d'**exécution**, vous pouvez vous y connecter depuis l'écran Instances. Découvrez comment vous connecter à votre instance.

Voici quelques ressources utiles pour débuter

- Comment vous connecter à votre instance Linux
- En savoir plus sur le niveau d'offre gratuite d'AWS
- Amazon EC2 : Guide de l'utilisateur
- Amazon EC2 : Forum de discussion

Pendant le lancement de vos instances, vous pouvez également

- Créer des alarmes de contrôle de statut pour être informé des échecs des contrôles de statut de ces instances. (des frais supplémentaires peuvent être facturés)
- Créer et attacher des volumes EBS supplémentaires (des frais supplémentaires peuvent être facturés)
- Gérer les groupes de sécurité

[Afficher les instances](#)

The instance is now launched (running):

Lancer une instance Se connecter Actions ▾

Filtrer par balises et attributs ou rechercher par mot clé

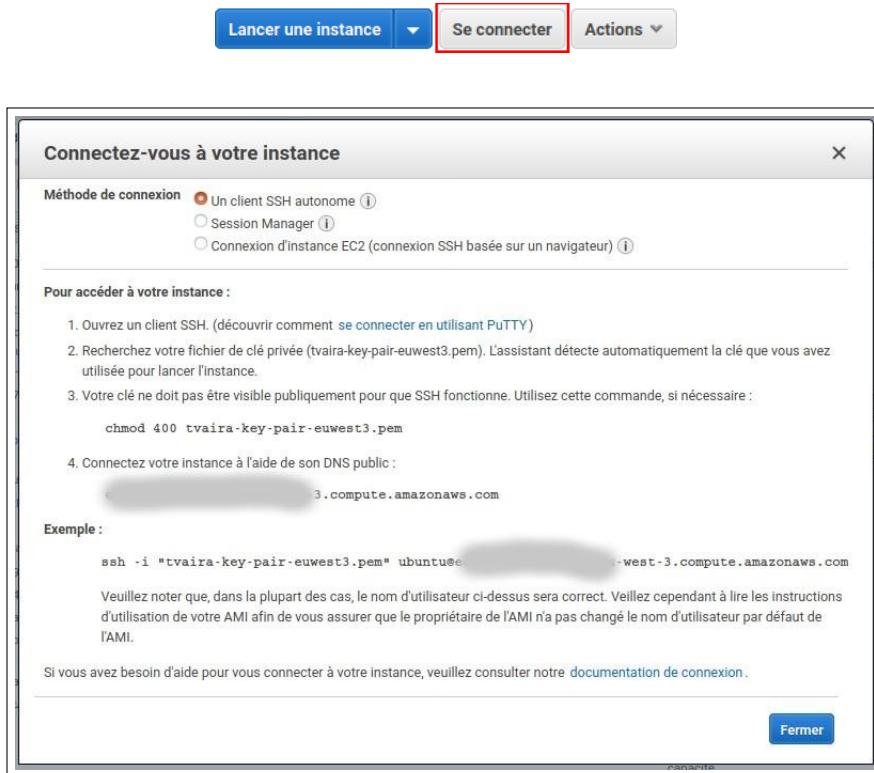
Name	ID d'instance	Type d'instance	Zone de disponibilité	État de l'instance	Contrôle des statuts	Statut des alarmes	DNS public (IPv4)	IP publique IPv4	Adresses IP IPv6	Nom de clé	Surveillance
i-08162c34aeade37d1	i-08162c34aeade37d1	t2.micro	eu-west-3b	running	2/2 contrôlés	Aucun(e)	ec2-172-31-22-224.eu-west-3.compute.internal	172.31.22.224	-	tvalra-key-pair-euwest3	disabled

Instance: i-08162c34aeade37d1 DNS public: ec2-172-31-22-224.eu-west-3.compute.amazonaws.com

Description Contrôles des statuts Surveillance Balises

ID d'instance	i-08162c34aeade37d1	DNS public	ec2-172-31-22-224.eu-west-3.compute.amazonaws.com
État de l'instance	running	IP publique IPv4	172.31.22.224
Type d'instance	t2.micro	Adresses IP IPv6	-
Résultat	Acceptez AWS Compute Optimizer pour obtenir des recommandations. En savoir plus	Adresses IP Elastic	-
Private DNS	ip-172-31-22-224.eu-west-3.compute.internal	Zone de disponibilité	eu-west-3b
IP privées	172.31.22.224	Groupes de sécurité	tvalra-sp-euwest3, afficher les règles entrantes, afficher les règles sortantes
IP privées secondaires	-	Événements planifiés	Aucun événement planifié
ID de VPC	vpc-a50734cc	ID d'AMI	ubuntu/images/hvm-ssd/ubuntu-bionic-18.04-amd64-server-20200408 (ami-08c757228751c5335)
ID de sous-réseau	subnet-f2e59489	Platform details	Linux/UNIX
Interfaces réseau	eth0	Usage operation	RunInstances
Rôle IAM	-	Vérification source/destination	Vrai
Nom de la paire de clés	tvalra-key-pair-euwest3	T2/T3 illimité	Désactivé
Propriétaire	494915339550	Optimisé pour EBS	Faux
Heure de lancement	14 mai 2020 11:27:17 UTC+2 (moins d'une heure)	Type de périphérique racine	ebs
Protection de la résiliation	Faux	Périphérique racine	/dev/sda1
Cycle de vie	normal	Périphériques de stockage en mode bloc	/dev/sda1
Surveillance	basique	Réservation de capacité	-
Statut des alarmes	Aucun(e)	Paramètres de réservation de capacité	Ouvrir
ID du noyau	-	ARN d'Outpost	-
ID de disque RAM	-		
Groupe de placement	-		
Numéro de partition	-		
Virtualisation	hvm		
Réservation	r-021c62a71a0c447e2		
Index de lancement de l'AMI	0		

## Step 4. Connecting to the instance via SSH



In a Terminal, we will use the ssh command to connect to the instance. You must specify the path and the file name of the private key (.pem), the user name (ubuntu here) of the AMI and the public DNSname or IP address of the instance. :

```
$ chmod 400 tvalira-key-pair-euwest3.pem
```

```
[(base) chriskayomb@Chriss-MacBook-Air Lab 2 % ls
Chris Kayomb - Lab2 - EC2.docx ~$ris Kayomb - Lab2 - EC2.docx
kayomb-key-pair-euwest3.pem
[(base) chriskayomb@Chriss-MacBook-Air Lab 2 % chmod 400 kayomb-key-pair-euwest3.
pem]
```

The chmod command is often used on private key files such as .pem files. It ensures that only the owner has read access, and no one else has any access to the file, hence the 400.

```
$ ssh -I "tvalira-key-pair-euwest3.pem" ubuntu@ec2-35-180-191-119.eu-west-3.compute.amazonaws
.com
```

Welcome to Ubuntu 18.04.4 LTS (GNU/Linux 4.15.0-1065-aws x86\_64)

- \* Documentation: <https://help.ubuntu.com>
- \* Management: <https://landscape.canonical.com>
- \* Support: <https://ubuntu.com/advantage>

System information as of Thu May 14 09:39:33 UTC 2020

System load: 0.18	Processes: 89
Usage of /: 13.8% of 7.69GB	Users logged in: 0
Memory usage: 15%	IP address for eth0: 172.31.28.130
Swap usage: 0%	

0 packages can be updated.

0 updates are security updates.

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.

```
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-172-31-39-76:~$ █
```

*The command above connect to an EC2 instance on AWS using SSH.*

**Question 2.** Update the system.

```
$sudo apt-get update
```

```
Get:38 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en  
[147 kB]  
Get:39 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Metadatas [16.8 kB]  
Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [36.5 kB]  
Get:41 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-en [7060 B]  
Get:42 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f Metadata [260 B]  
Fetched 28.3 MB in 5s (5300 kB/s)  
Reading package lists... Done  
ubuntu@ip-172-31-39-76:~$ █
```

*The command above update the local package database with the latest information about available packages.*

```
$sudo apt-get upgrade
```

```
Running kernel seems to be up-to-date.
```

```
Restarting services...
systemctl restart chrony.service cron.service packagekit.service polkit.service
serial-getty@ttyS0.service snapd.service ssh.service
Service restarts being deferred:
/etc/needrestart/restart.d/dbus.service
systemctl restart getty@tty1.service
systemctl restart networkd-dispatcher.service
systemctl restart unattended-upgrades.service
systemctl restart user@1000.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-172-31-39-76:~\$**

*The command above upgrades the installed packages to the latest versions.*

See Appendix for **adjusting system parameters (time stamp and location)**.

**Question 3.** Find the main characteristics of your instance from the commands below.

```
$ uname -a
```

```
[ubuntu@ip-172-31-39-76:~$] uname -a
Linux ip-172-31-39-76 6.2.0-1012-aws #12~22.04.1-Ubuntu SMP Thu Sep 7 14:01:24
UTC 2023 x86_64 x86_64 x86_64 GNU/Linux
```

```
$ uname -r
```

```
[ubuntu@ip-172-31-39-76:~$] uname -r
6.2.0-1012-aws
[bash]
```

```
$ cat /etc/lsb-release
```

```
[ubuntu@ip-172-31-39-76:~$] cat /etc/lsb-release
DISTRIB_ID=Ubuntu
DISTRIB_RELEASE=22.04
DISTRIB_CODENAME=jammy
DISTRIB_DESCRIPTION="Ubuntu 22.04.3 LTS"
[bash]
```

```
$ dpkg -l | sed "1,5d" | wc -l
```

```
[ubuntu@ip-172-31-39-76:~$] dpkg -l | sed "1,5d" | wc -l
600
[bash]
```

```
$ df -l -si
```

```
[ubuntu@ip-172-31-39-76:~$] df -l --si
Filesystem      Size  Used Avail Use% Mounted on
/dev/root       8.2G  2.0G  6.2G  25% /
tmpfs           498M    0  498M   0% /dev/shm
tmpfs           200M  873k  199M   1% /run
tmpfs            5.3M    0   5.3M   0% /run/lock
/dev/xvda15     110M  6.4M  104M   6% /boot/efi
tmpfs           100M  4.1k  100M   1% /run/user/1000
[bash]
```

```
$ ifconfig
```

```
ubuntu@ip-172-31-39-76:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 9001
    inet 172.31.39.76 netmask 255.255.240.0 broadcast 172.31.47.255
    inet6 fe80::c6a:a3ff:fe22:5f58 prefixlen 64 scopeid 0x20<link>
        ether 0e:6a:a3:22:5f:58 txqueuelen 1000 (Ethernet)
            RX packets 54431 bytes 78435406 (78.4 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 4359 bytes 546126 (546.1 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
        loop txqueuelen 1000 (Local Loopback)
            RX packets 208 bytes 22426 (22.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 208 bytes 22426 (22.4 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
ubuntu@ip-172-31-39-76:~$ 
```

```
$ runlevel
```

```
[ubuntu@ip-172-31-39-76:~$ runlevel
N 5
ubuntu@ip-172-31-39-76:~$ 
```

```
$ journalctl -u ssh
```

```
Nov 17 22:42:08 ip-172-31-39-76 systemd[1]: Starting OpenBSD Secure Shell server...
Nov 17 22:42:08 ip-172-31-39-76 sshd[591]: Server listening on 0.0.0.0 port 22.
Nov 17 22:42:08 ip-172-31-39-76 sshd[591]: Server listening on :: port 22.
Nov 17 22:42:08 ip-172-31-39-76 systemd[1]: Started OpenBSD Secure Shell server.
Nov 17 22:46:48 ip-172-31-39-76 sshd[1141]: Accepted publickey for ubuntu from ...
Nov 17 22:46:48 ip-172-31-39-76 sshd[1141]: pam_unix(sshd:session): session ope...
Nov 17 22:50:59 ip-172-31-39-76 sshd[591]: Received signal 15; terminating.
Nov 17 22:50:59 ip-172-31-39-76 systemd[1]: Stopping OpenBSD Secure Shell server...
Nov 17 22:50:59 ip-172-31-39-76 systemd[1]: ssh.service: Deactivated successfully.
Nov 17 22:50:59 ip-172-31-39-76 systemd[1]: Stopped OpenBSD Secure Shell server.
Nov 17 22:50:59 ip-172-31-39-76 systemd[1]: Starting OpenBSD Secure Shell server...
Nov 17 22:50:59 ip-172-31-39-76 sshd[8735]: Server listening on 0.0.0.0 port 22.
Nov 17 22:50:59 ip-172-31-39-76 sshd[8735]: Server listening on :: port 22.
Nov 17 22:50:59 ip-172-31-39-76 systemd[1]: Started OpenBSD Secure Shell server.
```

```
$ journalctl -p err
```

```
[ubuntu@ip-172-31-39-76:~$ journalctl -p err
Nov 17 22:41:57 ubuntu kernel: Cannot get hvm parameter CONSOLE_EVTCHN (18): -2>
Nov 17 22:41:57 ubuntu kernel: Cannot get hvm parameter CONSOLE_EVTCHN (18): -2>
Nov 17 22:42:01 ubuntu dhclient[279]: execve (/bin/true, ...): Permission denied
Nov 17 22:42:01 ubuntu dhclient[280]: execve (/bin/true, ...): Permission denied
Nov 17 22:50:05 ip-172-31-39-76 systemd[1]: multipathd.socket: Socket service m...
Nov 17 22:50:05 ip-172-31-39-76 systemd[1]: Failed to listen on multipathd cont...
lines 1-6/6 (END) ]
```

```
$ w
```

```
ubuntu@ip-172-31-39-76:~$ w
22:59:57 up 18 min, 1 user, load average: 0.00, 0.03, 0.05
USER      TTY      FROM          LOGIN@    IDLE    JCPU   PCPU WHAT
ubuntu    pts/0    46.193.69.68    22:46     4.00s  0.03s  0.00s w
ubuntu@ip-172-31-39-76:~$ 
```

---

```
$ last
[ubuntu@ip-172-31-39-76:~$ last
ubuntu  pts/0      46.193.69.68      Fri Nov 17 22:46      still logged in
reboot  system boot  6.2.0-1012-aws   Fri Nov 17 22:41      still running

wtmp begins Fri Nov 17 22:41:56 2023
ubuntu@ip-172-31-39-76:~$ 
```

---

```
$ uptime
[ubuntu@ip-172-31-39-76:~$ uptime
23:00:53 up 19 min, 1 user, load average: 0.00, 0.02, 0.04
ubuntu@ip-172-31-39-76:~$ 
```

---

```
$ cat /proc/cpuinfo
[ubuntu@ip-172-31-39-76:~$ cat /proc/cpuinfo
processor       : 0
vendor_id       : GenuineIntel
cpu family     : 6
model          : 63
model name     : Intel(R) Xeon(R) CPU E5-2676 v3 @ 2.40GHz
stepping        : 2
microcode       : 0x49
cpu MHz         : 2399.914
cache size      : 30720 KB
physical id     : 0
siblings         : 1
core id         : 0
cpu cores       : 1
apicid          : 0
initial apicid  : 0
fpu              : yes
fpu_exception   : yes
cpuid level    : 13
wp               : yes
flags            : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush mmx fxsr sse sse2 ht syscall nx rdtscp lm constant_tsc rep_good
nopl xtopology cpuid tsc_known_freq pni pclmulqdq ssse3 fma cx16 pcid sse4_1 s
se4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand hypervisor
lahf_lm abm cpuid_fault invpcid_single pti fsgsbase bmi1 avx2 smep bmi2 erms i
nvpcid xsaveopt
bugs             : cpu_meltdown spectre_v1 spectre_v2 spec_store_bypass l1tf mds
swapgs itlb_multihit mmio_stale_data
bogomips        : 4800.00
clflush size    : 64
cache_alignment : 64
address sizes   : 46 bits physical, 48 bits virtual
power management:
```

---

```
ubuntu@ip-172-31-39-76:~$ 
```

---

```
$ free -h
```

```
[ubuntu@ip-172-31-39-76:~$ free -h
total        used        free      shared  buff/cache   available
Mem:       949Mi       151Mi      264Mi      0.0Ki      533Mi      630Mi
Swap:          0B         0B         0B
ubuntu@ip-172-31-39-76:~$ ]
```

\$ lsusb

\$ lspci

```
[ubuntu@ip-172-31-39-76:~$ lsusb
[ubuntu@ip-172-31-39-76:~$ lspci
00:00.0 Host bridge: Intel Corporation 440FX - 82441FX PMC [Natoma] (rev 02)
00:01.0 ISA bridge: Intel Corporation 82371SB PII3 ISA [Natoma/Triton II]
00:01.1 IDE interface: Intel Corporation 82371SB PII3 IDE [Natoma/Triton II]
00:01.3 Bridge: Intel Corporation 82371AB/EB/MB PII4 ACPI (rev 01)
00:02.0 VGA compatible controller: Cirrus Logic GD 5446
00:03.0 Unassigned class [ff80]: XenSource, Inc. Xen Platform Device (rev 01)
ubuntu@ip-172-31-39-76:~$ ]
```

\$ sudo ufw status verbose

```
[ubuntu@ip-172-31-39-76:~$ sudo ufw status verbose
```

Status: inactive

ubuntu@ip-172-31-39-76:~\$ ]

\$ ps x

```
[ubuntu@ip-172-31-39-76:~$ ps x
  PID TTY      STAT      TIME COMMAND
 1144 ?        Ss      0:00 /lib/systemd/systemd --user
 1145 ?        S      0:00 (sd-pam)
 1223 ?        S      0:00 sshd: ubuntu@pts/0
 1225 pts/0    Ss      0:00 -bash
 9065 pts/0    R+      0:00 ps x
ubuntu@ip-172-31-39-76:~$ ]
```

\$ top

ubuntu@ip-172-31-39-76:~\$ top

```
top - 23:05:33 up 23 min,  1 user,  load average: 0.00, 0.00, 0.02
Tasks: 97 total,  1 running, 96 sleeping,  0 stopped,  0 zombie
%Cpu(s): 0.3 us, 0.0 sy, 0.0 ni, 99.7 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem : 949.7 total, 250.7 free, 160.8 used, 538.2 buff/cache
MiB Swap: 0.0 total, 0.0 free, 0.0 used. 620.8 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
1	root	20	0	167484	13056	8448	S	0.0	1.3	0:07.50	systemd
2	root	20	0	0	0	0	S	0.0	0.0	0:00.00	kthreadd
3	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	rcu_gp
4	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	rcu_par+
5	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	slub_fl+
6	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	netns
7	root	20	0	0	0	0	I	0.0	0.0	0:00.07	kworker+
8	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	kworker+
10	root	0	-20	0	0	0	I	0.0	0.0	0:00.00	mm_perc+
11	root	20	0	0	0	0	I	0.0	0.0	0:00.00	rcu_tas+
12	root	20	0	0	0	0	I	0.0	0.0	0:00.00	rcu_tas+
13	root	20	0	0	0	0	S	0.0	0.0	0:00.24	ksoftir+

```
$ cat /etc/passwd
[ubuntu@ip-172-31-39-76:~$ cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/sync
games:x:5:60:games:/usr/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/spool/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
backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
list:x:38:38:Mailing 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:65534:65534:nobody:/nonexistent:/usr/sbin/nologin
systemd-network:x:100:102:systemd Network Management,,,:/run/systemd:/usr/sbin/nologin
```

```
$ cat /etc/group
```

```
[ubuntu@ip-172-31-39-76:~$ 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:20:ubuntu
fax:x:21:
voice: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:
operator:x:37:
list:x:38:
```

```
$ dmesg
```

```
[ubuntu@ip-172-31-39-76:~$ dmesg  
dmesg: read kernel buffer failed: Operation not permitted  
ubuntu@ip-172-31-39-76:~$ ]
```

```
$ tail /var/log/syslog
```

```
[ubuntu@ip-172-31-39-76:~$ tail /var/log/syslog  
Nov 17 23:00:59 ip-172-31-39-76 amazon-ssm-agent.amazon-ssm-agent[1072]: </head  
>  
Nov 17 23:00:59 ip-172-31-39-76 amazon-ssm-agent.amazon-ssm-agent[1072]: <body>  
Nov 17 23:00:59 ip-172-31-39-76 amazon-ssm-agent.amazon-ssm-agent[1072]: <h1>4  
04 - Not Found</h1>  
Nov 17 23:00:59 ip-172-31-39-76 amazon-ssm-agent.amazon-ssm-agent[1072]: </body>  
>  
Nov 17 23:00:59 ip-172-31-39-76 amazon-ssm-agent.amazon-ssm-agent[1072]: </html>  
Nov 17 23:00:59 ip-172-31-39-76 amazon-ssm-agent.amazon-ssm-agent[1072]: #011sta  
tus code: 404, request id:  
Nov 17 23:00:59 ip-172-31-39-76 amazon-ssm-agent.amazon-ssm-agent[1072]: 2023-11  
-17 23:00:59 ERROR EC2RoleProvider Failed to connect to Systems Manager with SSM  
role credentials. error calling RequestManagedInstanceRoleToken: AccessDeniedEx  
ception: Systems Manager's instance management role is not configured for accoun  
t: 509034105175  
Nov 17 23:00:59 ip-172-31-39-76 amazon-ssm-agent.amazon-ssm-agent[1072]: #011sta  
tus code: 400, request id: 43b17aad-91a9-47f6-b8b8-8f4b2122b077  
Nov 17 23:00:59 ip-172-31-39-76 amazon-ssm-agent.amazon-ssm-agent[1072]: 2023-11  
-17 23:00:59 ERROR [CredentialRefresher] Retrieve credentials produced error: no  
valid credentials could be retrieved for ec2 identity  
Nov 17 23:00:59 ip-172-31-39-76 amazon-ssm-agent.amazon-ssm-agent[1072]: 2023-11  
-17 23:00:59 INFO [CredentialRefresher] Sleeping for 18m35s before retrying retr  
ieve credentials  
ubuntu@ip-172-31-39-76:~$ ]
```

```
$ pwd
```

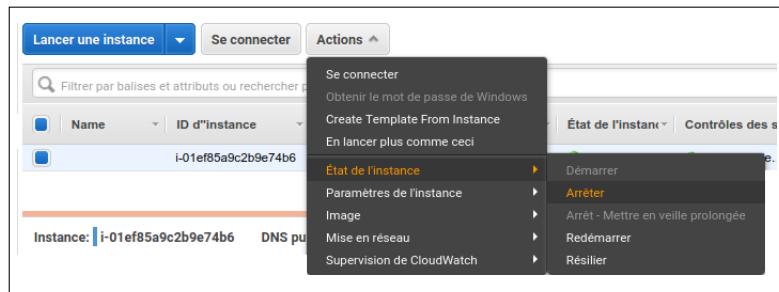
```
[ubuntu@ip-172-31-39-76:~$ pwd  
/home/ubuntu  
ubuntu@ip-172-31-39-76:~$ ]
```

```
$ alias
```

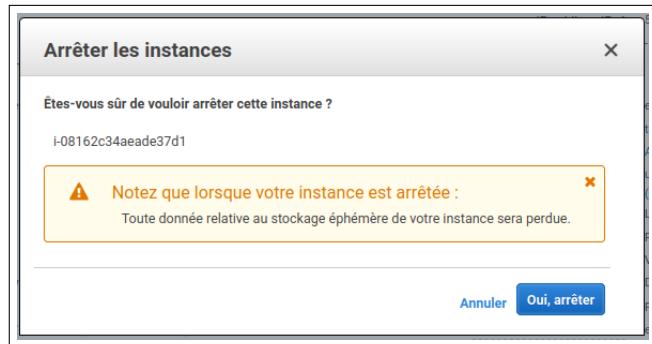
```
[ubuntu@ip-172-31-39-76:~$ alias  
alias alert='notify-send --urgency=low -i "$(([ $? = 0 ] && echo terminal || echo  
error)" "$(history|tail -n1|sed -e '\''s/^\\s*[0-9]\\+\\s*//;s/[;&|]\\s*alert$/'\\'  
'')'"  
alias egrep='egrep --color=auto'  
alias fgrep='fgrep --color=auto'  
alias grep='grep --color=auto'  
alias l='ls -CF'  
alias la='ls -A'  
alias ll='ls -alF'  
alias ls='ls --color=auto'  
ubuntu@ip-172-31-39-76:~$ ]
```



You can stop, restart or terminate the instance by doing the following:



For example, to stop the instance:



## Exercise 2: installing the Apache web server

**Question 4.** Install the Apache 2 HTTP server.

```
[ubuntu@ip-172-31-39-76:~$ sudo apt 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 liblua5.3-0 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 liblua5.3-0 mailcap mime-support
  ssl-cert
0 upgraded, 13 newly installed, 0 to remove and 4 not upgraded.
Need to get 2137 kB of archives.
After this operation, 8505 kB of additional disk space will be used.
[Do you want to continue? [Y/n] y
```

**Question 5.** Check the status of the Apache 2 HTTP server. And give its version.

```
[ubuntu@ip-172-31-39-76:/var/www/html$ sudo service apache2 status
● apache2.service - The Apache HTTP Server
  Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor presen...
  Active: active (running) since Sat 2023-11-18 09:02:26 UTC; 2min 43s ago
    Docs: https://httpd.apache.org/docs/2.4/
   Main PID: 1336 (apache2)
      Tasks: 55 (limit: 1121)
     Memory: 4.8M
        CPU: 39ms
       CGroup: /system.slice/apache2.service
           └─1336 /usr/sbin/apache2 -k start
             ├─1338 /usr/sbin/apache2 -k start
             ├─1339 /usr/sbin/apache2 -k start

Nov 18 09:02:26 ip-172-31-39-76 systemd[1]: Starting The Apache HTTP Server...
Nov 18 09:02:26 ip-172-31-39-76 systemd[1]: Started The Apache HTTP Server.
lines 1-15/15 (END)
```

## Create an HTTP server

**Question 6.** Create a home page and test with a web browser.

We modify the existing home page of the web server:

```
$sudo sh -c 'echo "<html><head><title>Mon serveur</title></head><body>Bienvenue sur mon
serveur !</body></html>" > /var/www/html/index.html'
```

```
[ubuntu@ip-172-31-39-76:/var/www/html$ sudo sh -c 'echo "<html><head><title>Mon
serveur</title></head><body>Kayomb, Bienvenue sur mon serveur !</body></html>"'
/var/www/html/index.html'
ubuntu@ip-172-31-39-76:/var/www/html$ ]
```

Simply enter your public DNS address in the browser address bar:



Kayomb, Bienvenue sur mon serveur !

**Question 7.** Create a DNS zone with **ClouDNS** (see Appendix). Give the CNAME and ALIAS created.

<input type="checkbox"/> Host <input type="text"/>	Type	Points to <input type="text"/>	TTL	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>
<input type="checkbox"/> kayomb.cloudns.eu	ALIAS	ec2-13-38-251-93.eu-west-3.compute.amazonaws.com	1h	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>
<input type="checkbox"/> kayomb.cloudns.eu	NS	ns1.cloudns.net	1h	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>
<input type="checkbox"/> kayomb.cloudns.eu	NS	ns2.cloudns.net	1h	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>
<input type="checkbox"/> kayomb.cloudns.eu	NS	ns3.cloudns.net	1h	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>
<input type="checkbox"/> kayomb.cloudns.eu	NS	ns4.cloudns.net	1h	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>
<input type="checkbox"/> www.kayomb.cloudns.eu	CNAME	ec2-13-38-251-93.eu-west-3.compute.amazonaws.com	1h	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>

Copy  the selected records to   + Add new record

**Question 8.** Check DNS resolution with the dig command.

```
[ubuntu@ip-172-31-39-76:/var/www/html$ dig +short ec2-13-38-251-93.eu-west-3.compute.amazonaws.com
172.31.39.76
[ubuntu@ip-172-31-39-76:/var/www/html$ dig +short www.kayomb.cloudns.eu
ec2-13-38-251-93.eu-west-3.compute.amazonaws.com.
172.31.39.76
[ubuntu@ip-172-31-39-76:/var/www/html$ ]
```

```
[ubuntu@ip-172-31-39-76:/var/www/html$ dig www.kayomb.cloudns.eu

; <>> DiG 9.18.18-0ubuntu0.22.04.1-Ubuntu <>> www.kayomb.cloudns.eu
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 14709
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;www.kayomb.cloudns.eu.           IN      A

;; ANSWER SECTION:
www.kayomb.cloudns.eu. 168      IN      CNAME    ec2-13-38-251-93.eu-west-3.compute.amazonaws.com.
ec2-13-38-251-93.eu-west-3.compute.amazonaws.com. 20 IN A 172.31.39.76

;; Query time: 0 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Sat Nov 18 10:10:38 UTC 2023
;; MSG SIZE  rcvd: 128

[ubuntu@ip-172-31-39-76:/var/www/html$ dig +short kayomb.cloudns.eu
13.38.251.93
. . . . .
```

```
[ubuntu@ip-172-31-39-76:/var/www/html$ dig kayomb.cloudns.eu

; <>> DiG 9.18.18-0ubuntu0.22.04.1-Ubuntu <>> kayomb.cloudns.eu
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 12996
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;kayomb.cloudns.eu.           IN      A

;; ANSWER SECTION:
kayomb.cloudns.eu.     176      IN      A      13.38.251.93

;; Query time: 0 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Sat Nov 18 10:13:57 UTC 2023
;; MSG SIZE  rcvd: 62
```

```
ubuntu@ip-172-31-39-76:/var/www/html$ █
```

**Question 9.** Test with a web browser.



Kayomb, Bienvenue sur mon serveur !



## Create an HTTPS server

**Question 10.** Create and install a self-signed certificate. Test with a web browser.

We start by creating an ssl directory in /etc/apache2:

```
$sudo mkdir /etc/apache2/ssl  
$CD /etc/apache2/ssl
```

We create the self-signed certificate:

```
$sudo openssl req -x509 -newkey rsa:4096 -keyout apache2.key -out apache2.crt -days 365 -  
nodes
```

Generating an RSA private key

```
..... +++
```

```
...++++
```

```
writing new private key to 'apache2.key'
```

```
-----  
You are about to be asked to enter information that will be incorporated into  
your certificate request.
```

What you are about to enter is what is called a Distinguished Name or a DN. There are quite  
a few fields but you can leave some blank

For some fields there will be a default value,  
If you enter '.', the field will be left blank.

```
-----  
Country Name (2 letter code) [AU]:FR
```

```
State or Province Name (full name) [Some-State]:Vaucluse
```

```
Locality Name (eg, city) []:Avignon
```

```
Organization Name (eg, company) [Internet Widgits Pty Ltd]:LaSalle Avignon
```

```
Organizational Unit Name (eg, section) []:BTS SN
```

```
Common Name (eg server FQDN or YOUR name) []:ec2-35-180-191-119.eu-west-3.compute.amazonaws.com
```

```
Email Address[]: tvaira@free.fr
```

We edit the VirtualHost for HTTPS:

```
$ sudo vim /etc/apache2/sites-available/default-ssl.conf
```

```
<VirtualHost _default_:443>
    ServerAdmin tvaира@free.fr
    DocumentRoot /var/www/html
    ErrorLog ${APACHE_LOG_DIR}/error.log
    CustomLog ${APACHE_LOG_DIR}/access.log combined
```

```

SSLEngine on
SSLCertificateFile /etc/apache2/ssl/apache2.crt
SSLCertificateKeyFile /etc/apache2/ssl/apache2.key
</VirtualHost>

<IfModule mod_ssl.c>
    <VirtualHost _default_:443>
        # ServerAdmin webmaster@localhost

        DocumentRoot /var/www/html
        ErrorLog ${APACHE_LOG_DIR}/error.log
        CustomLog ${APACHE_LOG_DIR}/access.log combined

        SSLEngine on
        SSLCertificateFile      /etc/apache2/ssl/apache2.crt
        SSLCertificateKeyFile  /etc/apache2/ssl/apache2.key

    </VirtualHost>
</IfModule>

# vim: syntax=apache ts=4 sw=4 sts=4 sr noet

```

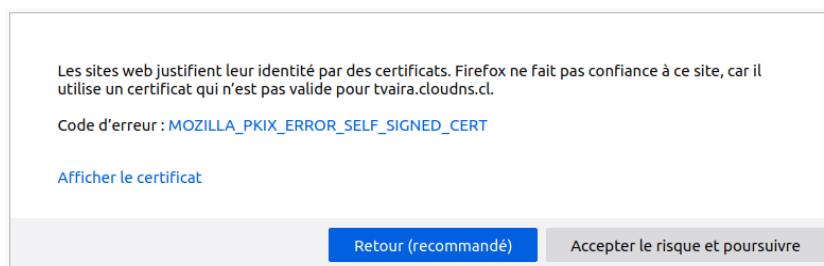
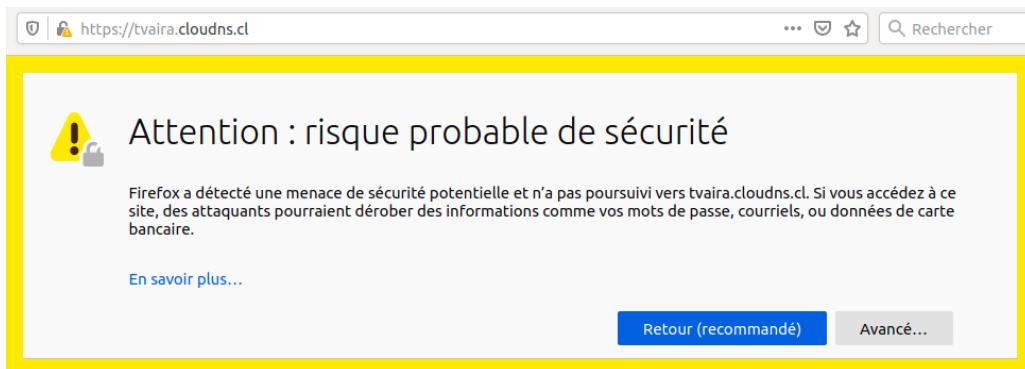
We enable Apache SSL support:

```
$sudo a2enmod ssl
[ubuntu@ip-172-31-39-76:/$ 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-172-31-39-76:/$
$sudo a2ensite default-ssl.conf
[ubuntu@ip-172-31-39-76:/$ sudo a2ensite default-ssl.conf
Enabling site default-ssl.
To activate the new configuration, you need to run:
    systemctl reload apache2
```

We restart the Apache server:

```
$sudo systemctl restart apache2
```

Currently, a self-signed SSL certificate triggers an alert message in the web browser, for example with Firefox:



Or with Chromium:



### Votre connexion n'est pas privée

Des individus malveillants tentent peut-être de subtiliser vos informations personnelles sur le site **tvaira.cloudns.cl** (mots de passe, messages ou numéros de carte de crédit, par exemple). [En savoir plus](#)

NET::ERR\_CERT\_AUTHORITY\_INVALID

Contribuez à améliorer la sécurité de Chrome en envoyant à Google les [URL de certaines pages que vous consultez, ainsi que des informations système limitées et une partie du contenu de certaines pages. Règles de confidentialité](#)

[Masquer les paramètres avancés](#)

[Revenir en lieu sûr](#)

Impossible de vérifier sur le serveur qu'il s'agit bien du domaine **tvaira.cloudns.cl**, car son certificat de sécurité n'est pas considéré comme fiable par le système d'exploitation de votre ordinateur. Cela peut être dû à une mauvaise configuration ou bien à l'interception de votre connexion par un pirate informatique.

[Continuer vers le site tvaira.cloudns.cl \(dangereux\)](#)

← → C Not Secure | <https://kayomb.cloudns.eu>↑ ☆

Update



## Your connection is not private

Attackers might be trying to steal your information from **kayomb.cloudns.eu** (for example, passwords, messages or credit cards). [Learn more](#)

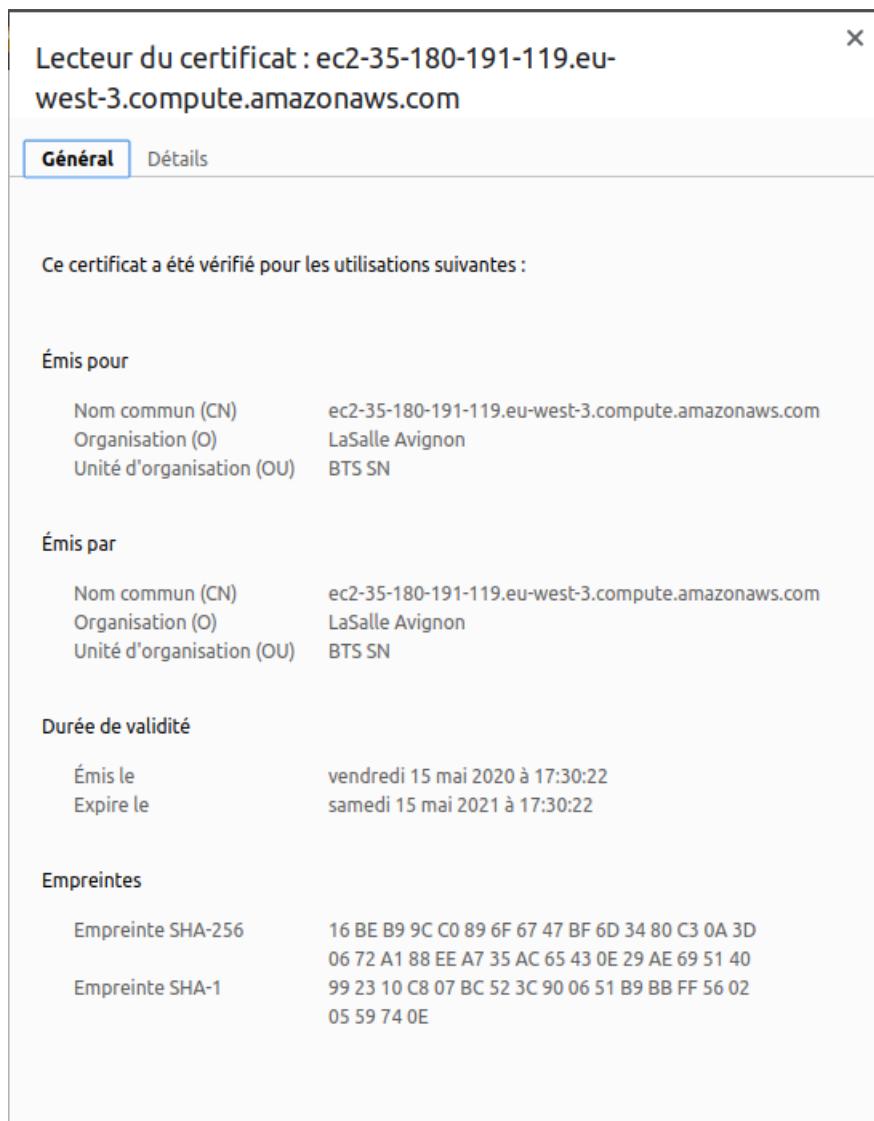
NET::ERR\_CERT\_AUTHORITY\_INVALID



To get Chrome's highest level of security, [turn on enhanced protection](#)

[Advanced](#)[Back to safety](#)

In both cases, you can view the certificate and accept the risks:



The screenshot shows a browser window with the URL <https://kayomb.cloudns.eu>. The page title is "Certificate Viewer: ec2-13-38-251-93.eu-west-3.compute.amazonaws.com". There are two tabs: "General" (selected) and "Details".

**Issued To**

Common Name (CN)	ec2-13-38-251-93.eu-west-3.compute.amazonaws.com
Organisation (O)	<Not part of certificate>
Organisational Unit (OU)	<Not part of certificate>

**Issued By**

Common Name (CN)	ec2-13-38-251-93.eu-west-3.compute.amazonaws.com
Organisation (O)	<Not part of certificate>
Organisational Unit (OU)	<Not part of certificate>

**Validity Period**

Issued On	Saturday, 18 November 2023 at 12:14:31
Expires On	Sunday, 17 November 2024 at 12:14:31

**SHA-256 Fingerprints**

Certificate	443fe289303973f3d7a84ea993e97e977186ce235fc309ed2fd1 63c85ce17dd9
Public key	e5175cde16cde7b1c24d6f1030ad3d331b68b373842a03f10477 efef79f8ff09

**Question 11.** Create and install a certified certificate with ZeroSSL (see Appendix). Test with a web browser.

DNS (CNAME)

Follow the steps below

To verify your domain using a **CNAME record**, please follow the steps below:

- 1 Sign in to your DNS provider, typically the registrar of your domain.
- 2 Navigate to the section where DNS records are managed.
- 3 Add the following CNAME record:

**Name**

\_A1338095039FB3C91FE46DEA21AAA697.www.kayomb.cloudns.eu

**Point To**

98B417C590EC13DE0A334F7F416BFA79.730862A3A50EE5C1176F5FD52F4AD0BD.cfeb79  
36453dbca.comodoca.com

**TTL**

3600 (or lower)

4 Save your CNAME record and click "Next Step" to continue.

Kayomb, Bienvenue sur kayomb.cloudns.eu

Connection is secure

Cookies and site data

Site settings

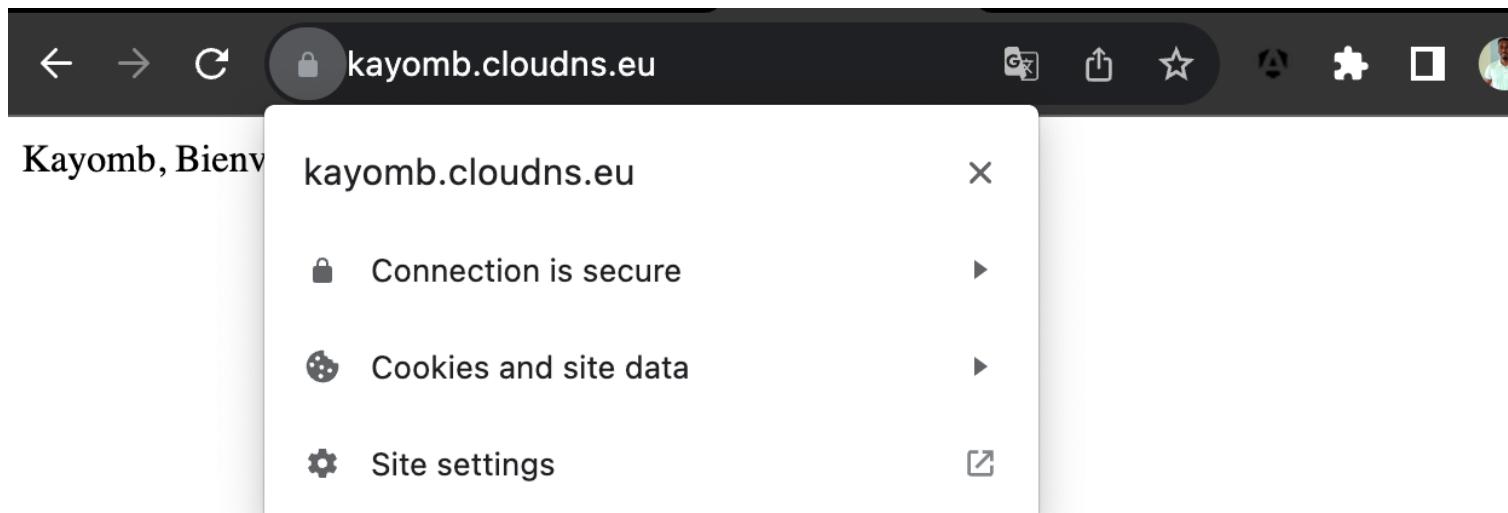
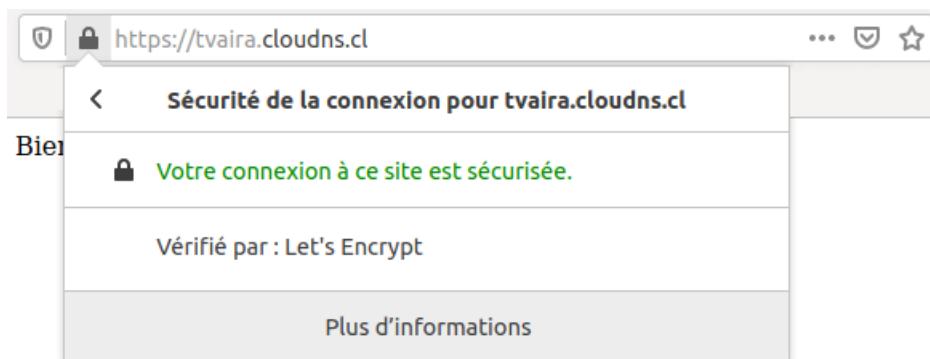
Sécurité de la connexion pour tvaira.cloudns.cl

Votre connexion à ce site est sécurisée.

Vérifié par : ZeroSSL

Plus d'informations

**Question 12.** Create and install a certified certificate with **Let's Encrypt** And **Certbot** (see Appendix). Test with a web browser.



```

Lab 2 — ubuntu@ip-172-31-39-76: /etc/apache2/sites-available — ssh -i...

<IfModule mod_ssl.c>
  <VirtualHost _default_:443>
    #       ServerAdmin webmaster@localhost
    ServerName www.kayomb.cloudns.eu
    DocumentRoot /var/www/html
    ErrorLog ${APACHE_LOG_DIR}/error.log
    CustomLog ${APACHE_LOG_DIR}/access.log combined

    #       SSLEngine on
    #       SSLCertificateFile      /etc/apache2/ssl/certificate.crt
    #       SSLCertificateKeyFile   /etc/apache2/ssl/private.key
    #       SSLCertificateChainFile /etc/apache2/ssl/ca_bundle.crt

    SSLCertificateFile /etc/letsencrypt/live/www.kayomb.cloudns.eu/fullchain.pem
    SSLCertificateKeyFile /etc/letsencrypt/live/www.kayomb.cloudns.eu/privkey.pem
    Include /etc/letsencrypt/options-ssl-apache.conf
  </VirtualHost>
</IfModule>

# vim: syntax=apache ts=4 sw=4 sts=4 sr noet
~

```

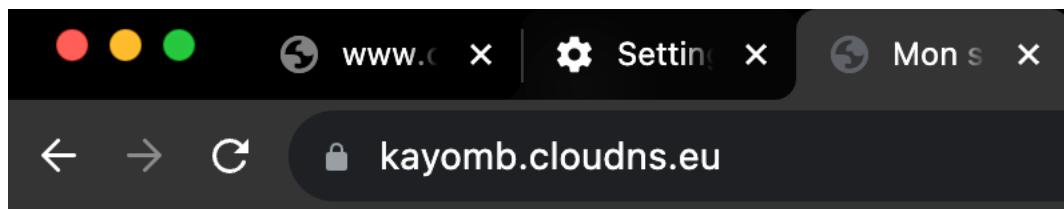
**Question 13.** Enable the Apache rewrite engine and create the rule that ensures http redirection in https. Test with a web browser.

You must start by activating the mod\_rewrite module and restarting the Apache server:

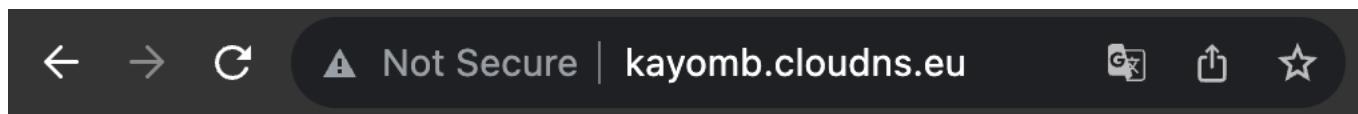
```
$sudo a2enmod rewrite
```

```
$sudo systemctl restart apache2
[ubuntu@ip-172-31-39-76:/$ sudo a2enmod rewrite
Module rewrite already enabled
[ubuntu@ip-172-31-39-76:/$ sudo systemctl restart apache2
[ubuntu@ip-172-31-39-76:/$ ]
```

*Notes: You will find a configuration generator for SSL on the Mozilla site: <https://ssl-config.mozilla.org/>. On the other hand, **ClouDNS** allows you to configure a Web Redirect recording with a redirection of type 301 (Moved permanently) or 302 (Temporary redirect).*



Kayomb, Bienvenue sur mon serveur !



Kayomb, Bienvenue sur mon serveur !

### Sequence #3: creating a PHP application

**Question 14.** Install the PHP module.

You need to install the libapache2-mod-php5 package to enable PHP support in Apache.

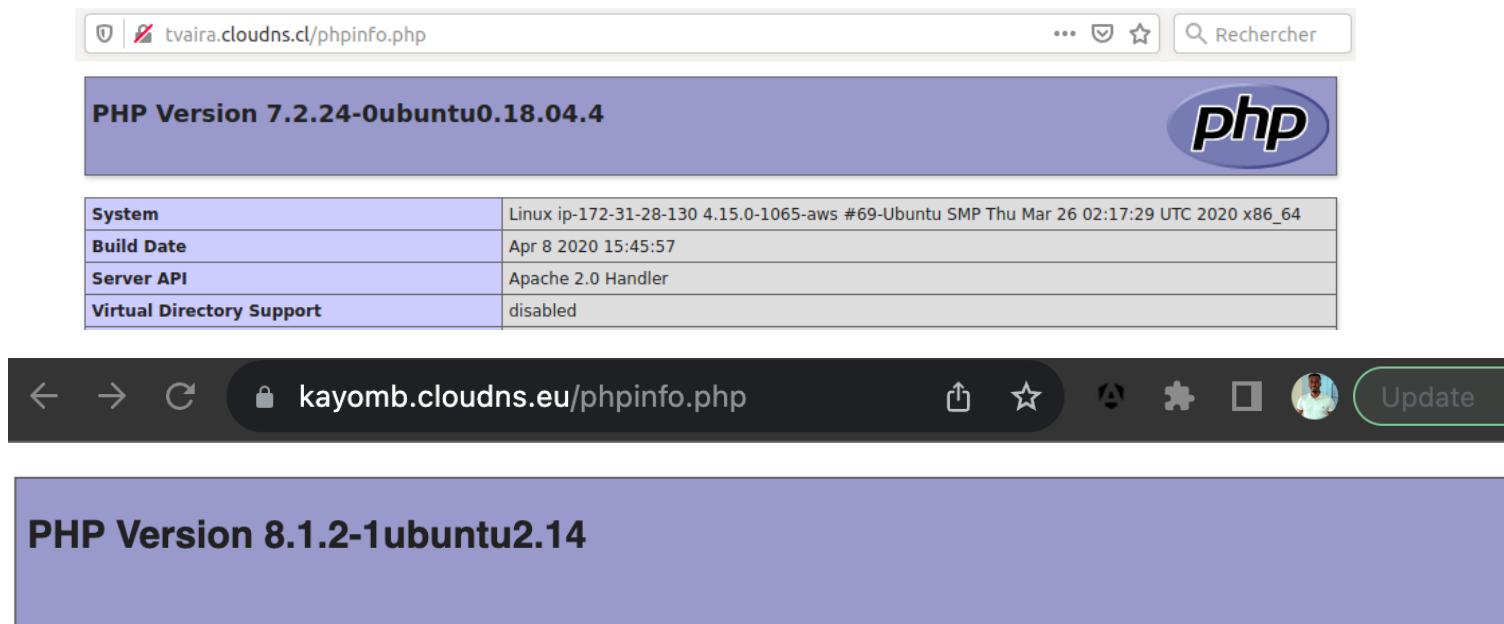
```
$sudo apt-get install libapache2-mod-php
Reading package lists... Done
Building dependency tree
Reading status information...
Done
The following additional packages will be installed:
  libapache2-mod-php7.2 libsodium23 php-common php7.2-cli php7.2-common php7.2-json php7.2-
    apache php7.2-readline
Suggested
  packages: php-
  pear
The following NEW packages will be installed:
  libapache2-mod-php libapache2-mod-php7.2 libsodium23 php-common php7.2-cli php7.2-common
    php7.2-json php7.2-opcache php7.2-readline
0 updated, 9 newly installed, 0 to remove and 8 not updated. It is necessary
to take 3998 KB from the archives.
After this operation, an additional 17.5 MB of disk space will be used.
---
```

```
[ubuntu@ip-172-31-39-76:/$ 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 1 not upgraded.
Need to get 5121 kB of archives.
```

**Question 15.** Create a phpinfo.php script and identify the version of PHP currently installed.

To check that the PHP engine is functional, we will create a phpinfo.php script at the root of the server:

```
$sudo sh -c 'echo "<?php phpinfo(); ?>" > /var/www/html/phpinfo.php'
```



**PHP Version 7.2.24-0ubuntu0.18.04.4**

<b>System</b>	Linux ip-172-31-28-130 4.15.0-1065-aws #69-Ubuntu SMP Thu Mar 26 02:17:29 UTC 2020 x86_64
<b>Build Date</b>	Apr 8 2020 15:45:57
<b>Server API</b>	Apache 2.0 Handler
<b>Virtual Directory Support</b>	disabled


**PHP Version 8.1.2-1ubuntu2.14**

<b>System</b>	Linux ip-172-31-39-76 6.2.0-1012-aws #12~22.04.1-Ubuntu SMP Thu Sep 17 10:40:00 UTC 2020 x86_64
<b>Build Date</b>	Aug 18 2023 11:41:11
<b>Build System</b>	Linux
<b>Server API</b>	Apache 2.0 Handler
<b>Virtual Directory Support</b>	disabled
<b>Configuration File (php.ini) Path</b>	/etc/php/8.1/apache2
<b>Loaded Configuration File</b>	/etc/php/8.1/apache2/php.ini
<b>Scan this dir for additional .ini files</b>	/etc/php/8.1/apache2/conf.d
<b>Additional .ini files parsed</b>	/etc/php/8.1/apache2/conf.d/10-opcache.ini, /etc/php/8.1/apache2/conf.d/20-calendar.ini, /etc/php/8.1/apache2/conf.d/20-exif.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-mbstring.ini, /etc/php/8.1/apache2/conf.d/20-pdo.ini, /etc/php/8.1/apache2/conf.d/20-readline.ini, /etc/php/8.1/apache2/conf.d/20-zip.ini

**Question 16.** Create a meteo.php script that displays weather information for a city. You will use the Openweather service (see Appendix).

Example :



Time: 23:40

Temperature: 4.7 °C

**See as well :** here we use AWS as IaaS. If you want to explore PaaS, you need to use AWS Elastic Beanstalk (or App Engine at Google) and follow for example this tutorial:<https://openclassrooms.com/fr/courses/4810836-decouvrez-le-cloud-avec-amazon-web-services/4821981-create-a-server-easily-with-elastic-beanstalk>



This Lab is . You absolutely need **resolve your instance and close your AWS account**.

The establishment and I cannot be held responsible for non-compliance with these instructions.

#### ▼ Clôturer le compte

Je comprends qu'en cochant cette case, je ferme mon compte AWS. La clôture de mon compte AWS fait office de préavis indiquant à AWS que je souhaite résilier mon contrat client AWS, ou tout autre contrat avec AWS gérissant mon compte AWS, mais uniquement concernant ce compte AWS.

L'utilisation mensuelle de certains services AWS est calculée et facturée au début du mois suivant. Si j'ai utilisé ces types de services ce mois-ci, au début du mois prochain, je recevrai une facture correspondant à l'utilisation enregistrée avant la résiliation de mon compte. De plus, si j'ai des abonnements actifs (par exemple, une instance réservée pour laquelle j'ai choisi une facturation mensuelle), même après la clôture de mon compte je peux continuer à être facturé pour l'abonnement jusqu'à ce que celui-ci expire ou soit vendu conformément aux conditions relatives à l'abonnement.

Je comprends que je ne peux rouvrir mon compte AWS que dans les 90 jours suivant la clôture de mon compte (la « Période post-clôture »). Si je rouvre mon compte au cours de la période post-clôture, je pourrai être facturée pour tous les services AWS qui n'ont pas été interrompus avant la clôture de mon compte. Si je rouvre mon compte AWS, les mêmes conditions régiront mes accès et utilisation des services AWS par le biais de mon nouveau compte AWS.

Si je décide de ne pas rouvrir mon compte après la période post-clôture, tout le contenu restant dans mon compte AWS sera supprimé. Pour plus d'informations, consultez le [Clôture d'un compte AWS](#).

Je comprends qu'après la période post-clôture, je ne serai plus en mesure de rouvrir un compte clos.

Je comprends qu'après la période post-clôture, je ne serai plus en mesure d'accéder à la console de facturation pour télécharger les factures antérieures et les factures fiscales. *Si vous souhaitez télécharger n'importe quel relevé, vous pouvez le faire ici. Sélectionnez le mois et développez la section récapitulative pour télécharger les factures ou les documents fiscaux.*

Je comprends qu'après la période post-clôture, je ne serai pas en mesure de créer un nouveau compte AWS à l'aide de l'adresse e-mail actuellement associée à ce compte. *Si vous souhaitez mettre à jour votre adresse e-mail, suivez les instructions ici.*

[Clôturer le compte](#)

## Appendices

### DNS

Domain Name System (DNS) is the distributed computing service used to translate Internet domain names into IP addresses or other records. Read :[https://fr.wikipedia.org/wiki/Domain\\_Name\\_System](https://fr.wikipedia.org/wiki/Domain_Name_System)

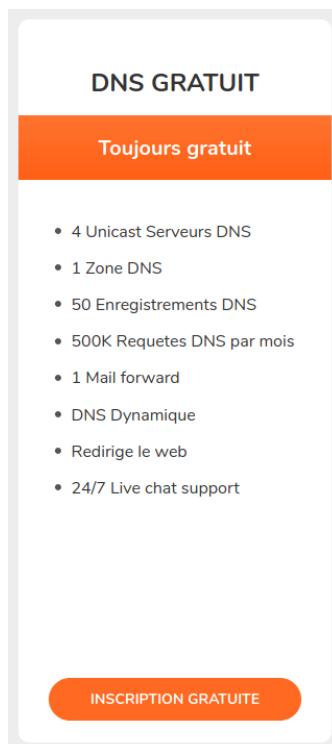
The main Resource Records (RR) are:

- A (address record or host record) which corresponds a host name or a domain name or a subdomain to a 32-bit IPv4 address distributed over four bytes ex: 123.234.1.2;
- AAAA (IPv6 address record) which matches a host name to a 128-bit IPv6 address distributed over sixteen bytes;
- CNAME (canonical name record) which allows you to make one domain an alias to another. This alias inherits all subdomains from the original;
- MX (mail exchange record) which defines the email servers for this domain;
- PTR (pointer record) which associates an IP address with a domain name registration, also called “reverse” since it does the exact opposite of A;
- NS (name server record) which defines the DNS servers for this domain;
- SOA (Start Of Authority record) which gives general information about the zone: main server, contact email, different durations including expiration, serial number of the zone;

### ClouDNS

**ClouDNS** is a managed DNS provider since 2010. It offers a free plan for a DNS zone with 50 records (A, CNAME, MX, etc.).

Link :[www.cloudns.net](http://www.cloudns.net)



Create a DNS zone:

The screenshot shows the 'Zones DNS' section of a web-based DNS management interface. A search bar at the top contains the text 'tvaira.cloudns.cl'. Below it, a list of zones includes 'tvaira.cloudns.cl' with a red box around it. To the right of the zone names are icons for SOA, SPF, SRV, Web Redirect, ALIAS, RP, SSHFP, NAPTR, CAA, and TLSA.

Then add the CNAME and ALIAS records for your zone:

Hôte	Type	Indique vers	TTL
tvaira.cloudns.cl	ALIAS	ec2-35-180-191-119.eu-west-3.compute.amazonaws.com	1h
www.tvaira.cloudns.cl	CNAME	ec2-35-180-191-119.eu-west-3.compute.amazonaws.com	1h

The screenshot displays the DNS records for the 'tvaira.cloudns.cl' zone. It lists various records including ALIAS, MX, NS, and CNAME types. Two specific records are highlighted with red boxes: one for 'tvaira.cloudns.cl' which points to an AWS instance, and another for 'www.tvaira.cloudns.cl' which also points to the same instance. Both records have a TTL of 1 hour.

*Note: recordings MX are useful in the case of an email transfer.*

Email	Rediriger vers
admin@tvaira.cloudns.cl	tvaira@free.fr

The screenshot shows the 'Transfer e-mails de tvaira.cloudns.cl' section. It lists a single email redirection rule where 'admin@tvaira.cloudns.cl' is redirected to 'tvaira@free.fr'. There is a button to add a new transfer.

*Note: Some operations may take several minutes to take effect.*

Verifications:

```
$ dig +short ec2-35-180-191-119.eu-west-3.compute.amazonaws.com
35.180.191.119
$ dig +short www.tvaira.cloudns.cl
ec2-35-180-191-119.eu-west-3.compute.amazonaws.com.
35.180.191.119
$ dig www.tvaira.cloudns.cl
; <>>> DiG 9.11.3-1ubuntu1.11-Ubuntu <>> www.tvaira.cloudns.cl
;; global options: +cmd
;; Got answer:
```

```

;; ->>HEADER<<- opcode: QUERY, status: NOERROR,id: 4791
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;www.cloudcourse.com IN A

;; ANSWER SECTION:
www.cloudcourse.com 60 IN CNAME ec2-35-180-191-119.eu-west-3.compute.amazonaws.com.
ec2-35-180-191-119.eu-west-3.compute.amazonaws.com. 19 IN A 172.31.28.130

;; Query time: 45 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Sat May 16 14:44:36 UTC 2020
;;MSG SIZE rcvd: 130

$dig +short tvaira.cloudns.cl
35.180.191.119

$dig tvaira.cloudns.cl
; <>> DiG 9.11.3-1ubuntu1.11-Ubuntu <>> tvaira.cloudns.cl
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR,id: 43328
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;tvaira.cloudns.cl. IN A

;; ANSWER SECTION:
tvaira.cloudns.cl. 60 IN A 35.180.191.119

;; Query time: 89 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Sat May 16 14:44:46 UTC 2020
;;MSG SIZE rcvd: 62

```

Then test access with a web browser:



## TLS/SSL

*Transport Layer Security*(TLS) is the successor to the Secure Sockets Layer (SSL) protocol which are protocols for securing exchanges on the Internet.

TLS (or SSL) works in client/server mode. It essentially meets the following security objectives:

- server authentication;
- confidentiality data exchanged (or encrypted session);
- the integrity of the data exchanged;

Server authentication is carried out using an X.509 digital certificate issued by a certification authority (CA).

### Digital certificate

An electronic certificate or digital certificate or public key certificate can be seen as a digital identity card. It is used mainly to identify and authenticate a natural or legal person, but also to encrypt exchanges.  
[HTTPs://fr.wikipedia.org/wiki/Electronic\\_certificate](HTTPs://fr.wikipedia.org/wiki/Electronic_certificate)

It is signed by a trusted third party who attests to the link between the physical identity and the digital (virtual) entity. Its characteristics are:

- tamper-proof: it is encrypted to prevent any modification.
- nominative: it is issued to an entity (like the identity card is issued to one person and only one).
- certified: there is the “stamp” of the authority which issued it

The most used standard for creating digital certificates is X.509 (<https://fr.wikipedia.org/wiki/X.509>).

It is often referred to as SSL certificate (TLS). **Implementing a TLS/SSL certificate will allow the transition from HTTP to HTTPS protocol.**

### Free SSL certificate

The free SSL certificate has existed for a long time with OpenSSL which allows, for example, the creation of self-signed SSL certificates.

Creating a self-signed certificate may be suitable for personal use. But it can trigger an alert message in web browsers.

To completely secure exchanges via a website, you need an SSL certificate issued by a CA certification authority (Certificate Authority). An SSL certificate (X.509 type) issued by a certification authority will provide a “green padlock” for the entire domain.

Let's Encrypt is a free certification authority created at the initiative of the Electronic Frontier Foundation. It is supported by donors such as OVH, Cisco, Mozilla, Chrome, Facebook, etc.

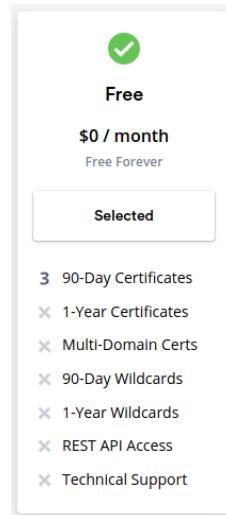
Let's Encrypt has been issuing free SSL certificates (DV type, domain validation) since December 2015. They are X.509 type and use the SHA-2 hash function.

Installing a certificate requires having control over the server.

## ZeroSSL

**ZeroSSL** is a solution for creating and managing SSL certificates. ZeroSSL supports single-domain, multi-domain, and wildcard certificates with the option to choose between 90-day and 1-year certificate validity. It offers a free offer allowing you to create 3 90-day SSL certificates at no cost.

Link :[zerossl.com](https://zerossl.com)



Create a certificate for your DNS zone and request validation by CNAME:

Verification Method for tvaira.cloudns.cl

We need you to verify ownership of each domain in your certificate. Please select your preferred verification method and click "Next Step".

Email Verification  
 DNS (CNAME)

Follow the steps below

To verify your domain using a CNAME record, please follow the steps below:

- 1 Sign in to your DNS provider, typically the registrar of your domain.
- 2 Navigate to the section where DNS records are managed.
- 3 Add the following CNAME record:

Name: \_485F72AC388FB587BBC5DF69DE4E40BD.tvaira.cloudns.cl

Point To: 7627CF65469C8FD3C14744D1D2E1646E.D751632D340F1C1BF4CAFCE39A689F95.493ec7465ac6291.comodoca.com

TTL: 3600 (or lower)

- 4 Save your CNAME record and click "Next Step" to continue.

HTTP File Upload

Next Step →

DNS (CNAME)

Follow the steps below

To verify your domain using a **CNAME record**, please follow the steps below:

- 1 Sign in to your DNS provider, typically the registrar of your domain.
- 2 Navigate to the section where DNS records are managed.
- 3 Add the following CNAME record:

**Name**

\_A1338095039FB3C91FE46DEA21AAA697.www.kayomb.cloudns.eu

**Point To**

98B417C590EC13DE0A334F7F416BFA79.730862A3A50EE5C1176F5FD52F4AD0BD.cfeb79  
36453dbca.comodoca.com

**TTL**

3600 (or lower)

- 4 Save your CNAME record and click "**Next Step**" to continue.

Add the CNAME record to your DNS zone:

\_485f72ac38bfb587bbc5df69de4e40bd.tvaira.cloudn CNAME 7627cf65469c8fd3c14744d1d2e1646e.d751632d34 1h



< All A AAAA MX CNAME TXT SPF NS Web Redire

Host

Type

Points to

+

kayomb.cloudns.eu ALIAS ec2-13-38-251-93.eu-w

kayomb.cloudns.eu NS ns1.cloudns.net

kayomb.cloudns.eu NS ns2.cloudns.net

kayomb.cloudns.eu NS ns3.cloudns.net

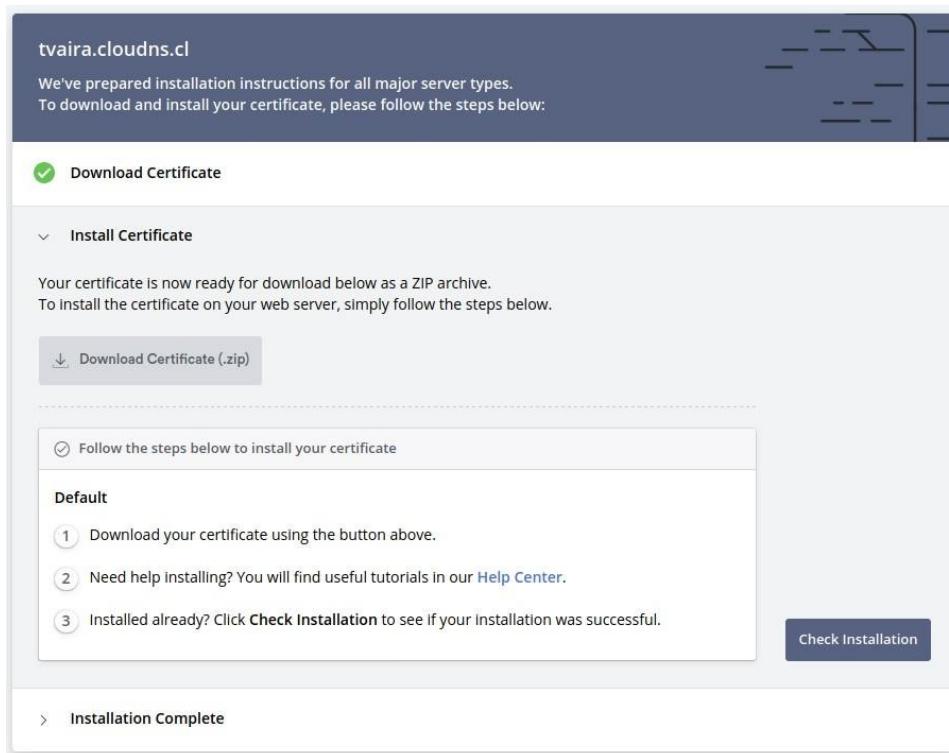
kayomb.cloudns.eu NS ns4.cloudns.net

www.kayomb.cloudns.eu CNAME ec2-13-38-251-93.eu-w

\_a1338095039fb3c91fe4 CNAME 98b417c590ec13de0a33



Then complete the installation :



The operations to be carried out on the Apache server are provided on this link <https://zerossl.com/help/installation/apache/> :

- Download your certificate
- Transfer it to your Amazon EC2 instance

```
$scp -i "~/tvaira-key-pair-euwes3.pem" tvaira.cloudns.cl.zip ubuntu@ec2-XX-YY-WW-ZZ.eu-west-3.compute.amazonaws.com:/home/ubuntu
[(base) chriskayomb@Chriss-MacBook-Air Lab 2 % scp -i "kayomb-key-pair-euwes3.pem" www.kayomb.cloudns.eu.zip ubuntu@ec2-13-38-251-93.eu-west-3.compute.amazonaws.com:/home/ubuntu
www.kayomb.cloudns.eu.zip 100% 6770 880.0KB/s 00:00
(base) chriskayomb@Chriss-MacBook-Air Lab 2 % ]
```

- Install unzip

```
$sudo apt-get install unzip
[ubuntu@ip-172-31-39-76:/$ sudo apt-get install unzip
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Suggested packages:
  zip
The following NEW packages will be installed:
  unzip
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.
Need to get 174 kB of archives.
After this operation, 385 kB of additional disk space will be used.
Get:1 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 zip amd64 6.0-26ubuntu3.1 [174 kB]
```

- Create a directory to store your certificate files

```
$sudo mkdir/etc/apache2/ssl
```

\$CD/etc/apache2/ssl

- Unzip the archive containing your certificate files

```
$sudo mv/home/ubuntu/tvaira.cloudns.cl.zip /etc/apache2/ssl
```

```
$sudo unzip tvaira.cloudns.cl.zip
```

```
$sudo rm tvaira.cloudns.cl.zip
```

```
[ubuntu@ip-172-31-39-76:/etc/apache2/ssl]$ ls
```

```
apache2.crt apache2.key www.kayomb.cloudns.eu.zip
```

```
[ubuntu@ip-172-31-39-76:/etc/apache2/ssl]$ sudo unzip www.kayomb.cloudns.eu.zi
```

```
Archive: www.kayomb.cloudns.eu.zip
```

```
extracting: certificate.crt
```

```
extracting: ca_bundle.crt
```

```
extracting: private.key
```

```
[ubuntu@ip-172-31-39-76:/etc/apache2/ssl]$ sudo rm www.kayomb.cloudns.eu.zip
```

```
[ubuntu@ip-172-31-39-76:/etc/apache2/ssl]$ ls
```

```
apache2.crt apache2.key ca_bundle.crt certificate.crt private.key
```

```
[ubuntu@ip-172-31-39-76:/etc/apache2/ssl$ ]
```

- Edit the Apache configuration file for the VirtualHost in HTTPS

```
$sudo vim/etc/apache2/sites-available/default-ssl.conf
```

```
<VirtualHost _default_:443>
```

```
    ServerAdmin tvaira@free.fr
```

```
    ServerName tvaira.cloudns.cl
```

```
    DocumentRoot /var/www/html
```

```
    ErrorLog ${APACHE_LOG_DIR}/error.log
```

```
    CustomLog ${APACHE_LOG_DIR}/access.log combined
```

```
    SSLEngine on
```

```
    SSLCertificateFile /etc/apache2/ssl/certificate.crt
```

```
    SSLCertificateKeyFile /etc/apache2/ssl/private.key
```

```
SSLCertificateChainFile /etc/apache2/ssl/ca_bundle.crt  
</VirtualHost>
```

- Enable SSL support (if not already done)

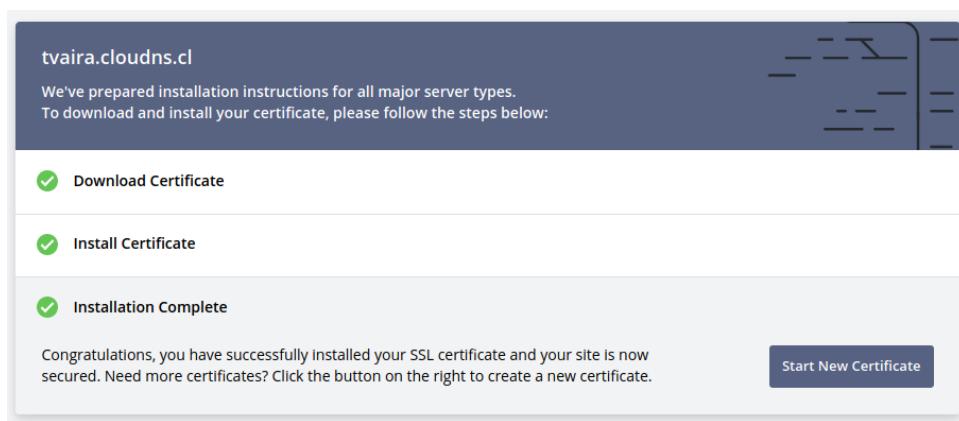
```
$sudo a2enmod ssl
```

```
[ubuntu@ip-172-31-39-76:/etc/apache2$ 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:  
Module socache_shmcb already enabled  
Module ssl already enabled  
.
```

- Restart Apache server

```
$sudo systemctl restart apache2
```

You can check your installation:



Certificates					
Draft	Expiring Soon	<u>Issued</u>	Pending Validation	Expired	Cancelled
Type	Domains	Status	Expires		
90-Day SSL	tvaira.cloudns.cl	Issued	Aug 14, 2020	Install	▼

# Install Certificate

www.kayomb.cloudns.eu

We've prepared installation instructions for all major server types.  
To download and install your certificate, please follow the steps below:

 Download Certificate

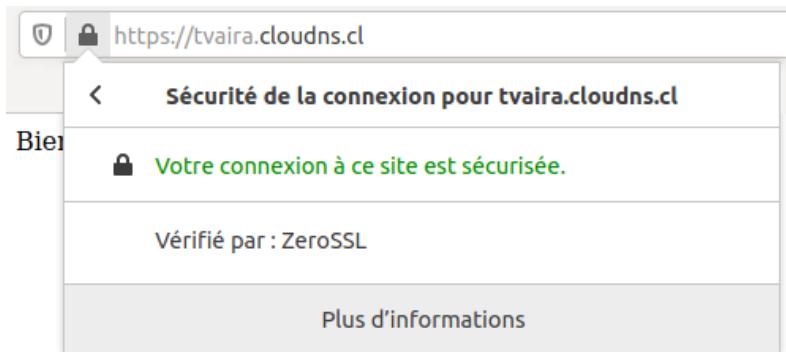
 Install Certificate

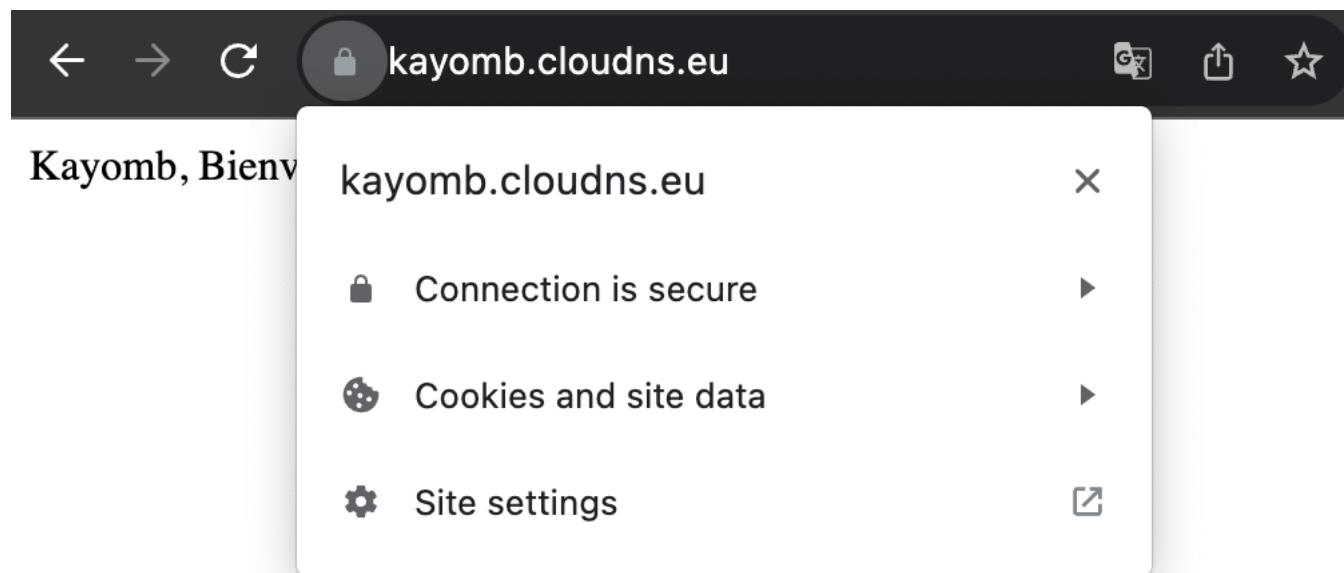
 Installation Complete

Congratulations, you have successfully installed your SSL certificate and your site is now secured. Need more certificates? Click the button on the right to create a new certificate.

Start New Certificate

Then test access with a web browser:





## Let's Encrypt

**Let's Encrypt** (<https://letsencrypt.org/fr/getting-started/>) and its tool **Certbot**(<https://certbot.eff.org/>).

Let's Encrypt is a certificate authority that provides free X.509 certificates for the TLS cryptographic protocol.  
Read :[https://fr.wikipedia.org/wiki/Let's\\_Encrypt](https://fr.wikipedia.org/wiki/Let's_Encrypt)

*Note: In our case, Let's Encrypt does not allow creating certificates to Amazon EC2 instances considered ephemeral. You must use DNS.*

### Install Certbot:

```
$sudo apt-get install software-properties-common
```

```
[ubuntu@ip-172-31-39-76:/$ 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 (0.99.22.7).
software-properties-common set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 1 not upgraded.
ubuntu@ip-172-31-39-76:/$ ]
```

```
$sudo add-apt-repository universe
```

```
[ubuntu@ip-172-31-39-76:/$ sudo add-apt-repository universe
Adding component(s) '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
Hit:4 http://security.ubuntu.com/ubuntu jammy-security InRelease
Get:5 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [1162 kB]
Get:6 http://eu-west-3.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 4 Packages [998 kB]
Fetched 2279 kB in 1s (1830 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-39-76:/$ ]
```

```
$sudo add-apt-repository ppa:certbot/certbot
```

```
[ubuntu@ip-172-31-39-76:/$ sudo add-apt-repository ppa:certbot/certbot
PPA publishes dbgsym, 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 deb 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.d/certbot-ubuntu-certbot.gpg with fingerprint
7BF576066ADA65728FC7E70A8C47BE8E75BCA694
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: 185.125.190.80 443]
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-172-31-39-76:/$ 
$sudo apt-get update
[ubuntu@ip-172-31-39-76:/$ 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
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: 185.125.190.80 443]
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-172-31-39-76:/$ 
$sudo apt-get install certbot python3-certbot-apache
```

```
[ubuntu@ip-172-31-39-76:/$ 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:
  augeas-lenses libaugeas0 python3-acme python3-augeas python3-certbot
  python3-configargparse python3-icu python3-josepy python3-parsedatetime
  python3-requests-toolbelt python3-rfc3339 python3-zope.component
  python3-zope.event python3-zope.hookable
Suggested packages:
  augeas-doc python-certbot-doc python3-certbot-nginx augeas-tools
  python-acme-doc python-certbot-apache-doc
The following NEW packages will be installed:
  augeas-lenses certbot libaugeas0 python3-acme python3-augeas python3-certbot
  python3-certbot-apache python3-configargparse python3-icu python3-josepy
  python3-parsedatetime python3-requests-toolbelt python3-rfc3339
  python3-zope.component python3-zope.event python3-zope.hookable
```

Edit the Apache configuration file for the VirtualHost in HTTPS to fill in the ServerName:

```
$sudo vim /etc/apache2/sites-available/default-ssl.conf
```

```
<VirtualHost _default_:443>
  ServerAdmin tvaира@free.fr
  ServerName tvaира.cloudns.cl
  DocumentRoot
  /var/www/html
  ErrorLog ${APACHE_LOG_DIR}/error.log
  CustomLog ${APACHE_LOG_DIR}/access.log combined
</VirtualHost>
```

Then run the certbot script:

```
$sudo certbot --apache
```

```
Saving debug log to /var/log/letsencrypt/letsencrypt.log Plugins
selected: Authenticator apache, Installer apache
```

Which names would you like to activate HTTPS for?

```
-- 
1: tvaира.cloudns.cl
--
```

```
Select the appropriate numbers separated by commas and/or spaces, or leave input
blank to select all options shown (Enter 'c' to cancel): 1
```

Obtaining a new certificate Performing  
the following challenges:

http-01 challenge for tvaира.cloudns.cl Enabled

Apache rewrite module

Waiting for

verification...Cleaning up

challenges

Deploying Certificate to VirtualHost /etc/apache2/sites-enabled/default-ssl.conf

Please choose whether or not to redirect HTTP traffic to HTTPS, removing HTTP access.

- 1: No redirect - Make no further changes to the webserver configuration.
- 2: Redirect - Make all requests redirect to secure HTTPS access. Choose this for new sites, or if you're confident your site works on HTTPS.

You can undo the change by editing your web server's configuration.

```
--  
Select the appropriate number [1-2] then [enter] (press 'c' to cancel): 2  
Enabled Apache rewrite module  
Created redirectfile: le-redirect-tvaira.cloudns.cl.conf  
Rollback checkpoint is empty (no changes made?)
```

```
--  
Congratulations! You have successfully enabled https://tvaira.cloudns.cl
```

You should test your configuration at:

<https://www.ssllabs.com/ssltest/analyze.html?d=tvaira.cloudns.cl>

#### IMPORTANT NOTES:

- Congratulations! Your certificate and chain have been saved at:  
`/etc/letsencrypt/live/tvaira.cloudns.cl/fullchain.pem`  
Your key **file** has been saved at:  
`/etc/letsencrypt/live/tvaira.cloudns.cl/privkey.pem`  
Your cert will expire on 2023-08-14. To obtain a new or tweaked version of this certificate in the future, simply run certbot again with the "certainly" option. To non-interactively renew \*all\* of your certificates, run "certbot renew"
- 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-it>

```
Which names would you like to activate HTTPS for?  
-----  
1: www.kayomb.cloudns.eu  
-----  
Select the appropriate numbers separated by commas and/or spaces, or leave in  
[blank] to select all options shown (Enter 'c' to cancel): 1  
Requesting a certificate for www.kayomb.cloudns.eu  
  
Successfully received certificate.  
Certificate is saved at: /etc/letsencrypt/live/www.kayomb.cloudns.eu/fullchain  
em  
Key is saved at:          /etc/letsencrypt/live/www.kayomb.cloudns.eu/privkey.p  
This certificate expires on 2024-02-16.  
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 www.kayomb.cloudns.eu to /etc/apache2/si  
s-enabled/default-ssl.conf  
Congratulations! You have successfully enabled HTTPS on https://www.kayomb.cl  
ns.eu
```

```
-----  
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
```

```
[ubuntu@ip-172-31-39-76:/$]
```

Enable SSL support (if not already done):

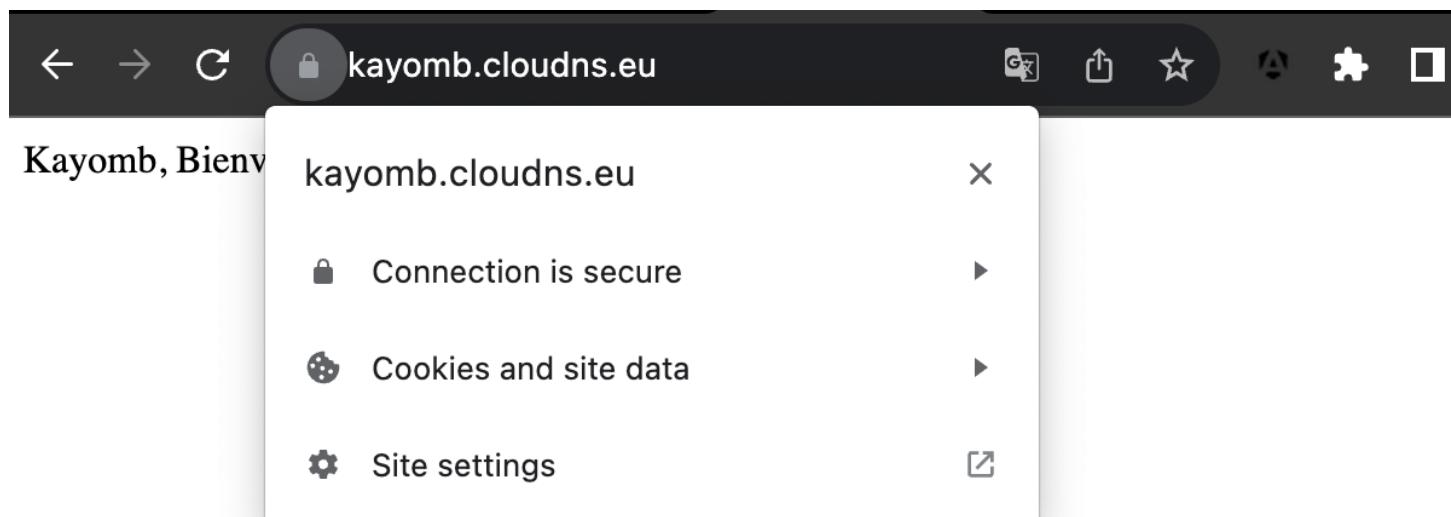
```
$sudo a2enmod ssl
```

```
[ubuntu@ip-172-31-39-76:/$ 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:  
Module socache_shmcb already enabled  
Module ssl already enabled  
ubuntu@ip-172-31-39-76:/$]
```

Finally, restart the Apache server

```
$sudo systemctl restart apache2
```

Then test access with a web browser:



The certificate seen by Chrome:





## Certificate Viewer: www.kayomb.cloudns.eu

**General** Details

### Issued To

Common Name (CN) www.kayomb.cloudns.eu  
Organisation (O) <Not part of certificate>  
Organisational Unit (OU) <Not part of certificate>

### Issued By

Common Name (CN) R3  
Organisation (O) Let's Encrypt  
Organisational Unit (OU) <Not part of certificate>

### Validity Period

Issued On Saturday, 18 November 2023 at 14:33:35  
Expires On Friday, 16 February 2024 at 14:33:34

### SHA-256 Fingerprints

Certificate 2ffff21a17d85c3d10736134e589ce3f98418c328bb58f09162a20  
603d284fb2  
Public key 85f7a817b0c09413cd104c460f3687db9cd70a82a04231c94acd  
e4b767401a0b

## Openweathermap

**Openweathermap** is an IT company created in 2014 by a group of engineers and experts in Big Data, data processing and satellite imagery processing.

Openweathermap provides quick and easy APIs for working with their database of weather data, satellite images and other environmental data. There are 3 products: Weather Data API, Satellite Imagery API, and Machine Learning API (R&D).



Go to the site: <https://openweathermap.org/api>.

### Current weather data

[API doc](#) [Subscribe](#)

- Access current weather data for any location including over 200,000 cities
- Current weather is frequently updated based on global models and data from more than 40,000 weather stations
- Data is available in JSON, XML, or HTML format
- Available for Free and all other paid accounts

	<b>Free</b>
<b>Price per month</b> Price is fixed, no other hidden costs (VAT is not included)	<b>Free</b>
<b>Subscribe</b>	<b>Get API key and Start</b>
Calls per minute (no more than)	60
Current weather API	✓
4 days/hourly forecast API NEW	-
5 days/3 hour forecast API	✓
16 days/daily forecast API	-
Climate forecast for 30 days NEW	-
Weather maps 2.0: Current, Forecast, Historical layers	-
Relief maps	-
Weather maps 1.0	✓
Bulk download	-
UV index	✓
Weather alerts	✓

## How to start in 3 simple steps

1 **Sign up** and get an API key (APPID) on your account page.

After registration, we will send you a welcome email that contain your API key and additional information on how to get started with our weather APIs. Within the next couple of hours, it will be activated and ready to use.

2 **Start using API for free.**

Find the complete description of API calls with a list of parameters and examples of responses in [API documentation](#).

Please, use API key in each API call.

3 **If you need more features than Free account can give you, look at the options of our monthly subscriptions [here](#).**

Choose your subscription depending on a number of calls per sec, API availability, service provided, and other features.

Contact us via [Support Center](#).

*Follow the procedure to create an account*

Using the API requires an APPID key:

## Example of using API key in API call

**Description:**  
Please, use your API key in each API call.  
We do not process API requests without the API key.

**API call:**  
`http://api.openweathermap.org/data/2.5/forecast?id=524901&APPID={APIKEY}`

**Parameters:**  
`APPID {APIKEY} is your unique API key`

**Example of API call:**  
`api.openweathermap.org/data/2.5/forecast?id=524901&APPID=1111111111`

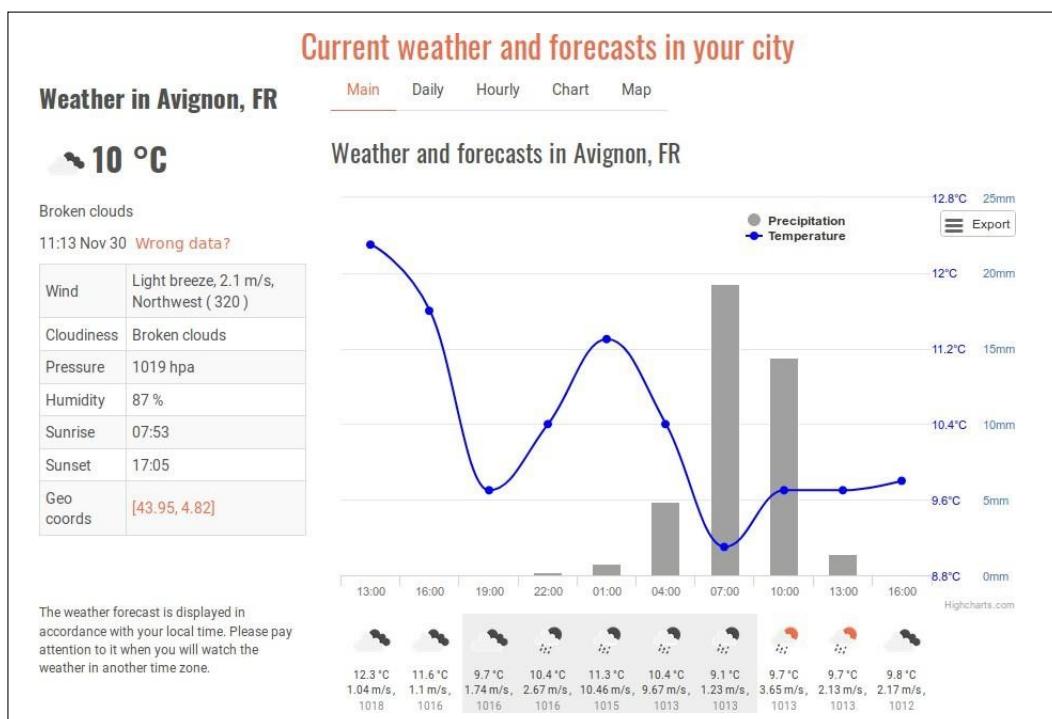
New Products   Setup   **API keys**   Services   Payments   Billing plans   Block logs   History bulk   [Logout](#)

You can generate as many API keys as needed for your subscription. We accumulate the total load from all of them.

Key	Name	Create key
<input style="width: 100%; height: 30px; border: 2px solid red;" type="text" value="XXXXXXXXXXXXXX"/>	Default <input checked="" type="checkbox"/> <input type="button" value="X"/>	* Name <input type="text"/> <input type="button" value="Generate"/>

*Access your account to recover*

Find the weather forecast in Avignon: <https://openweathermap.org/city/6455379>



Obtain Avignon weather data in JSON format: <http://api.openweathermap.org/data/2.5/forecast?id=6455379&APPID=xxxx>

The screenshot shows a JSON viewer interface with three tabs at the top: "JSON", "Données brutes" (Raw Data), and "En-têtes" (Headers). The "JSON" tab is selected. Below the tabs is a toolbar with buttons: "Enregistrer" (Save), "Copier" (Copy), "Tout réduire" (Minimize), "Tout développer" (Expand All), and "Filtrer le JSON" (Filter JSON). The main area displays a nested JSON object representing weather data. The structure is as follows:

```

{
  "cod": "200",
  "message": 0,
  "cnt": 40,
  "list": [
    {
      "dt": 1575115200,
      "main": {
        "temp": 285.49,
        "temp_min": 283.52,
        "temp_max": 285.49,
        "pressure": 1018,
        "sea_level": 1018,
        "grnd_level": 1006,
        "humidity": 69,
        "temp_kf": 1.97
      }
    }
  ]
}

```

## API documentation:

### Parameters:

- `coord`
  - `coord.lon` City geo location, longitude
  - `coord.lat` City geo location, latitude
- `weather` (more info Weather condition codes)
  - `weather.id` Weather condition id
  - `weather.main` Group of weather parameters (Rain, Snow, Extreme etc.)
  - `weather.description` Weather condition within the group
  - `weather.icon` Weather icon id
- `base` Internal parameter
- `main`
  - `main.temp` Temperature. Unit Default: Kelvin, Metric: Celsius, Imperial: Fahrenheit.
  - `main.pressure` Atmospheric pressure (on the sea level, if there is no `sea_level` or `grnd_level` data), hPa
  - `main.humidity` Humidity, %
  - `main.temp_min` Minimum temperature at the moment. This is deviation from current temp that is possible for large cities and megalopolises geographically expanded (use these parameter optionally). Unit Default: Kelvin, Metric: Celsius, Imperial: Fahrenheit.
  - `main.temp_max` Maximum temperature at the moment. This is deviation from current temp that is possible for large cities and megalopolises geographically expanded (use these parameter optionally). Unit Default: Kelvin, Metric: Celsius, Imperial: Fahrenheit.
  - `main.sea_level` Atmospheric pressure on the sea level, hPa
  - `main.grnd_level` Atmospheric pressure on the ground level, hPa

## Units format

Description:

Standard, metric, and imperial units are available.

Parameters:

**units** metric, imperial. When you do not use units parameter, format is Standard by default.

Temperature is available in Fahrenheit, Celsius and Kelvin units.

- For temperature in Fahrenheit use units=imperial
- For temperature in Celsius use units=metric
- Temperature in Kelvin is used by default, no need to use units parameter in API call

List of all API parameters with units [openweathermap.org/weather-data](http://openweathermap.org/weather-data)

Examples of API calls:

standard [api.openweathermap.org/data/2.5/find?q=London](http://api.openweathermap.org/data/2.5/find?q=London)

metric [api.openweathermap.org/data/2.5/find?q=London&units=metric](http://api.openweathermap.org/data/2.5/find?q=London&units=metric)

imperial [api.openweathermap.org/data/2.5/find?q=London&units=imperial](http://api.openweathermap.org/data/2.5/find?q=London&units=imperial)

## Format

Description:

**JSON format is used by default.** To get data in XML or HTML formats just set up mode = xml or html.

Parameters:

mode - possible values are xml and html. If mode parameter is empty the format is JSON by default.

Examples of API calls:

JSON [api.openweathermap.org/data/2.5/weather?q=London](http://api.openweathermap.org/data/2.5/weather?q=London)

XML [api.openweathermap.org/data/2.5/weather?q=London&mode=xml](http://api.openweathermap.org/data/2.5/weather?q=London&mode=xml)

HTML [api.openweathermap.org/data/2.5/weather?q=London&mode=html](http://api.openweathermap.org/data/2.5/weather?q=London&mode=html)

Use of specific parameters: <http://api.openweathermap.org/data/2.5/forecast?id=6455379&units=metric&lang=fr&APPID=xxxx>

JSON	Données brutes	En-têtes
Enregistrer	Copier	Tout réduire
<code>cod: "200"</code>		
<code>message: 0</code>		
<code>cnt: 40</code>		
<code>list:</code>		
<code>  ▼ 0:</code>		
<code>    dt: 1575115200</code>		
<code>    ▼ main:</code>		
<code>      temp: 12.43</code>		
<code>      temp_min: 10.37</code>		
<code>      temp_max: 12.43</code>		
<code>      pressure: 1018</code>		
<code>      sea_level: 1018</code>		
<code>      grnd_level: 1006</code>		
<code>      humidity: 69</code>		
<code>      temp_kf: 2.06</code>		

To use Openweather in PHP, you can use the following functions:

- file\_get\_contents() to retrieve JSON content from a URL (for example: <http://api.openweathermap.org/data/2.5/weather?q=Avignon,FR&units=metric&lang=fr&appid=xxxx>)  
→php

Documentation:<https://www.php.net/manual/fr/function.file-get-contents>.

```
<?php
```

```
setlocale(LC_ALL, 'fr_FR');
$jsonfile =file_get_contents("http://api.openweathermap.org/data/2.5/weather?q=
    Avignon,FR&units=metric&lang=fr&appid=xxxx");
// ...
?>
```

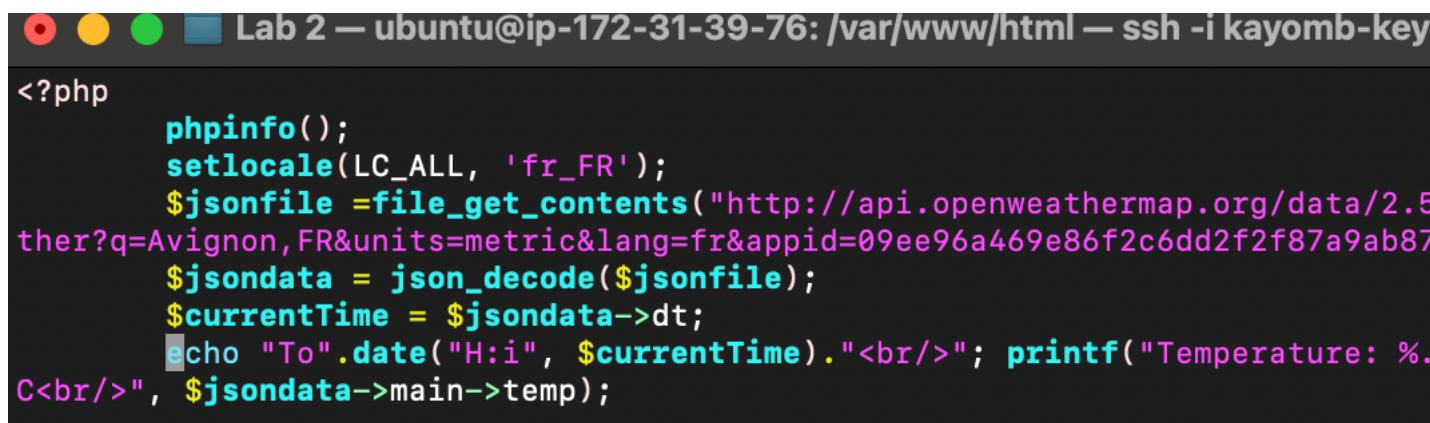
- json\_decode() to decode JSON content (for example \$jsondata->main->temp to retrieve the temperature) Documentation:<https://www.php.net/manual/fr/function.json-decode>.

```
→
```

```
php
```

```
<?php
// ...
```

```
$jsondata = json_decode($jsonfile);
$currentTime = $jsondata->dt;
echo "To".date("H:i", $currentTime)."<br/>";
printf("Temperature: %.1f °C<br/>", $jsondata->main->temp);
?>
```



```
Lab 2 — ubuntu@ip-172-31-39-76: /var/www/html — ssh -i kayomb-key
<?php
    phpinfo();
    setlocale(LC_ALL, 'fr_FR');
    $jsonfile =file_get_contents("http://api.openweathermap.org/data/2.5/weat
ther?q=Avignon,FR&units=metric&lang=fr&appid=09ee96a469e86f2c6dd2f2f87a9ab87
    $jsondata = json_decode($jsonfile);
    $currentTime = $jsondata->dt;
    echo "To".date("H:i", $currentTime)."<br/>"; printf("Temperature: %.1f °C<br/>", $jsondata->main->temp);
```

*Remarks :*In HTML, it is possible to make HTTP redirections with a <meta> element and its http-equiv attribute with the refresh value, positioned in the <head> of the page. The content attribute starts with a number indicating how many seconds the browser should wait before redirecting to the provided URL. Link :<https://developer.mozilla.org/fr/docs/Web/HTTP/Redirects>

```
<head>
    <meta http-equiv="refresh" content="0;URL=http://www.example.com//>
</head>
```

```
Lab 2 — ubuntu@ip-172-31-39-76: /var/www/html — ssh -i kayomb-key-p...  
  
<html>  
  <head>  
    <title>Mon serveur</title>  
    <meta http-equiv="refresh" content="0;URL=http://www.example.com/" />  
  </head>  
  <body>Kayomb, Bienvenue sur mon serveur !  
  </body>  
</html>  
~
```

In PHP, we will use the header() function Documentation:<https://www.php.net/manual/fr/function.header.php>

If you want to update only part of the content of the page, you must use Ajax technology. Link: [https://fr.wikipedia.org/wiki/Ajax\\_\(computer\\_science\)](https://fr.wikipedia.org/wiki/Ajax_(computer_science))

## Setting system parameters (time stamp and location)

### Setting the timestamp:

The timedatectl tool can be used to query and modify the system clock and its settings.

**NTP** is a service protocol for synchronizing a computer's clock with that of a reference server. It is based on UDP and uses port 123.

\$sudo apt-get install ntp

```
ubuntu@ip-172-31-39-76:/$ 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 sntp
Suggested packages:
  ntp-doc
The following packages will be REMOVED:
  chrony
The following NEW packages will be installed:
$sudo vim /etc/ntp.conf
server 0.fr.pool.ntp.org
server 1.fr.pool.ntp.org
```

\$sudo service ntp restart

\$sudo timedatectl set-timezone Europe/Paris

\$sudo timedatectl

```
Local time: Mon 2020-05-18 12:48:22 CEST
Universal time: Mon 2020-05-18 10:48:22 UTC
  RTC time: Mon 2020-05-18 10:48:23
  Time zone: Europe/Paris (CEST, +0200)
```

System clock synchronized: yes

systemd-timesyncd.service active: yes

RTC in local TZ: no

```
[ubuntu@ip-172-31-39-76:/$ sudo timedatectl
  Local time: Sat 2023-11-18 22:41:20 CET
  Universal time: Sat 2023-11-18 21:41:20 UTC
    RTC time: Sat 2023-11-18 21:41:20
    Time zone: Europe/Paris (CET, +0100)
System clock synchronized: no
      NTP service: n/a
    RTC in local TZ: no
ubuntu@ip-172-31-39-76:/$ ]
```

\$sudo timedatectl set-ntp true

```
$systemctl status systemd-timesyncd.service
systemd-timesyncd.service - Network Time Synchronization
  Loaded: loaded (/lib/systemd/system/systemd-timesyncd.service; enabled; vendor
            preset:enabled)
  Active: active (running) since Tue 2020-05-19 17:56:27 CEST; 15min ago Docs:
            man:systemd-timesyncd.service(8)
```

Main PID: 578 (systemd-timesyn)

Status: "Synchronized to time server 91.189.91.157:123 (ntp.ubuntu.com)."

Tasks: 2 (limit: 1121)

CGroup: /system.slice/systemd-timesyncd.service

578 /lib/systemd/systemd-timesyncd

Location setting:

\$ sudo vim /etc/default/locale

LANG="fr\_FR.UTF-8"



```
LANG=fr_FR.UTF-8
```

\$ sudo dpkg-reconfigure locales [\*]

fr\_FR.UTF-8 UTF-8

\$ sudo locale-gen

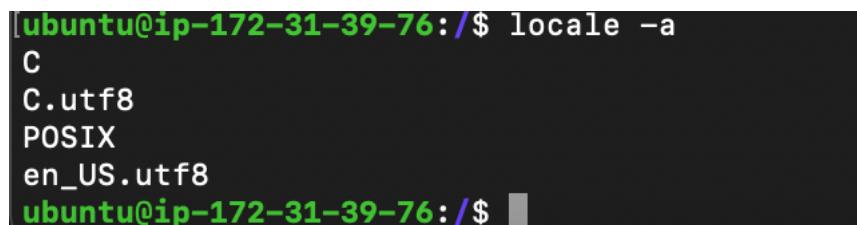
Generating locales (this might take a while)...

en\_US.UTF-8... done

fr\_FR.UTF-8... done

Generation complete.

\$ locale -a



```
C
C.utf8
POSIX
en_US.utf8
```

VS  
C.UTF-8  
en\_US.utf8  
fr\_FR.utf8  
POSIX

Test :

# Before  
\$date  
Tue May 19 17:57:07 CEST 2020

# After  
\$date  
Tuesday May 19, 2020, 6:10:34 PM (UTC+0200)