

Ecole d'Ingénieurs
Génie Informatique : «2éme année cycle ingénieur »
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Rapport

Mise en œuvre d'une infrastructure cloud de supervision centralisée sous AWS : Déploiement de Zabbix conteneurisé pour le monitoring d'un parc hybride (Linux & Windows)

Réalisé par :

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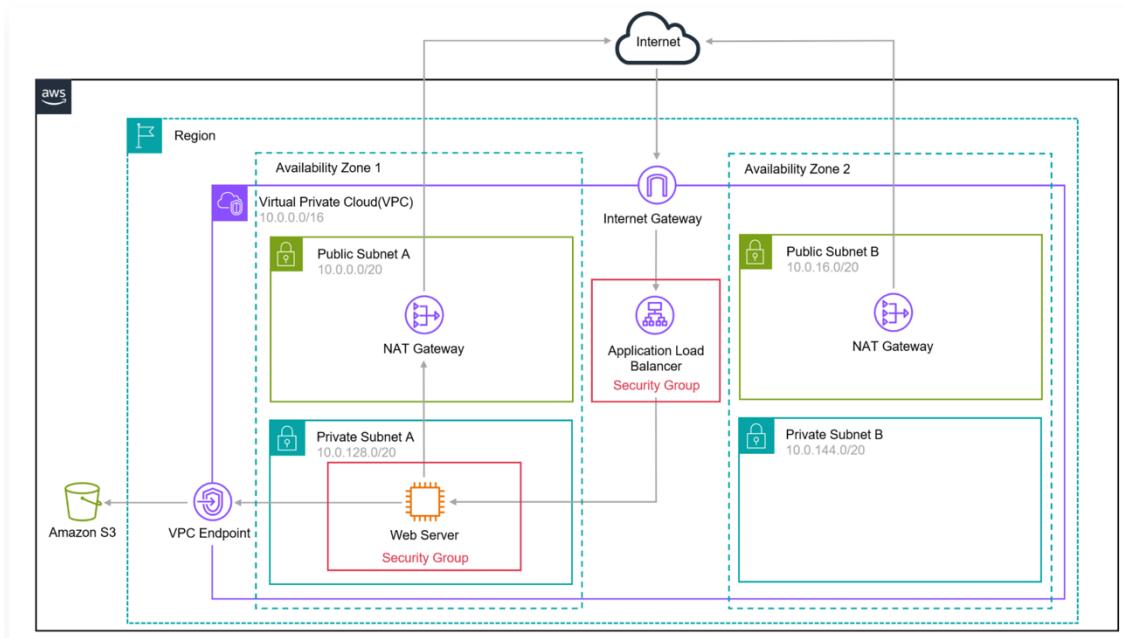
Encadré par :

Prof. Azeddine KHIAT

I. Architecture générale du projet :

- Ce projet consiste à déployer une solution de supervision centralisée basée sur **Zabbix** dans un environnement cloud et virtualisé. Il permet de surveiller en temps réel l'état et les performances des serveurs à l'aide d'agents installés sur chaque machine. Grâce à une architecture basée sur Docker, la plateforme offre une gestion efficace des ressources, la détection proactive des incidents et une visualisation claire des métriques via une interface Web. Ce projet vise à renforcer la fiabilité et la disponibilité des infrastructures informatiques.

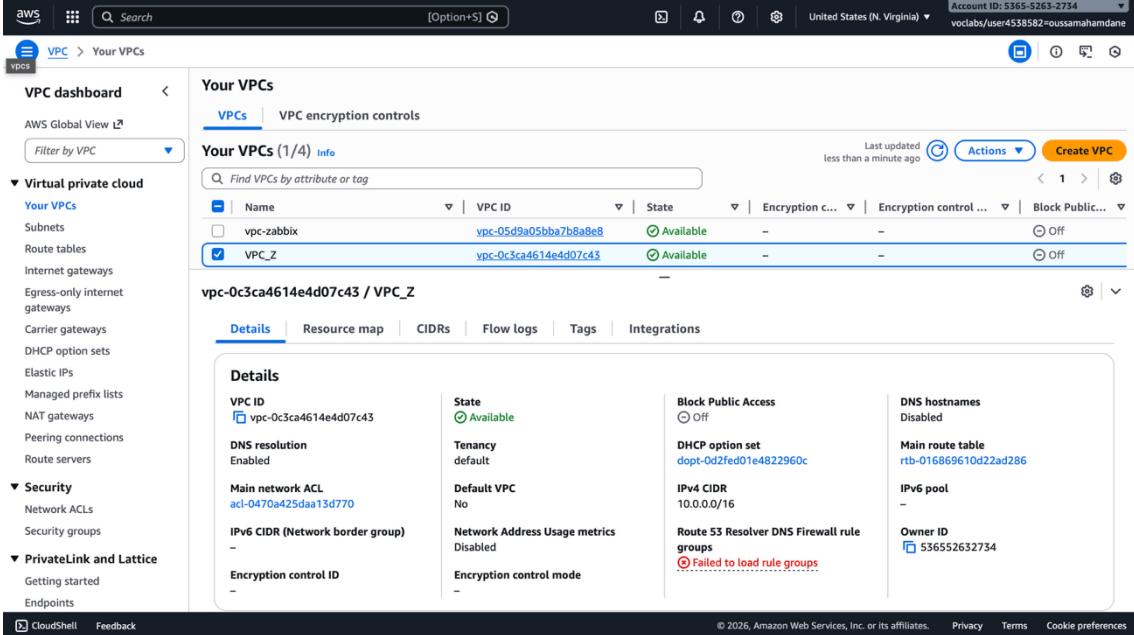
L'architecture suivante montre bien notre projet :



II . Étapes de réalisation du projet :

1. Crédit du Virtual Private Cloud (VPC)

La première étape du projet a consisté à créer un **Virtual Private Cloud (VPC)** afin d'isoler logiquement l'infrastructure de supervision. Le VPC permet de définir un réseau privé sécurisé dans lequel seront déployées les ressources cloud. Un plan d'adressage IP privé a été défini afin d'assurer une communication claire et maîtrisée entre les différents composants.



The screenshot shows the AWS VPC dashboard with the following details:

- VPCs** tab is selected.
- Your VPCs (1/4) Info**: Shows two VPCs:
 - vpc-zabbix (vpc-05d9a05bba7b8a8e8) - Available, Block Public Access: Off
 - VPC_Z (vpc-0c3ca4614e4d07c43) - Available, Block Public Access: Off
- Details** tab is selected for VPC_Z.
- Details** section for VPC_Z:

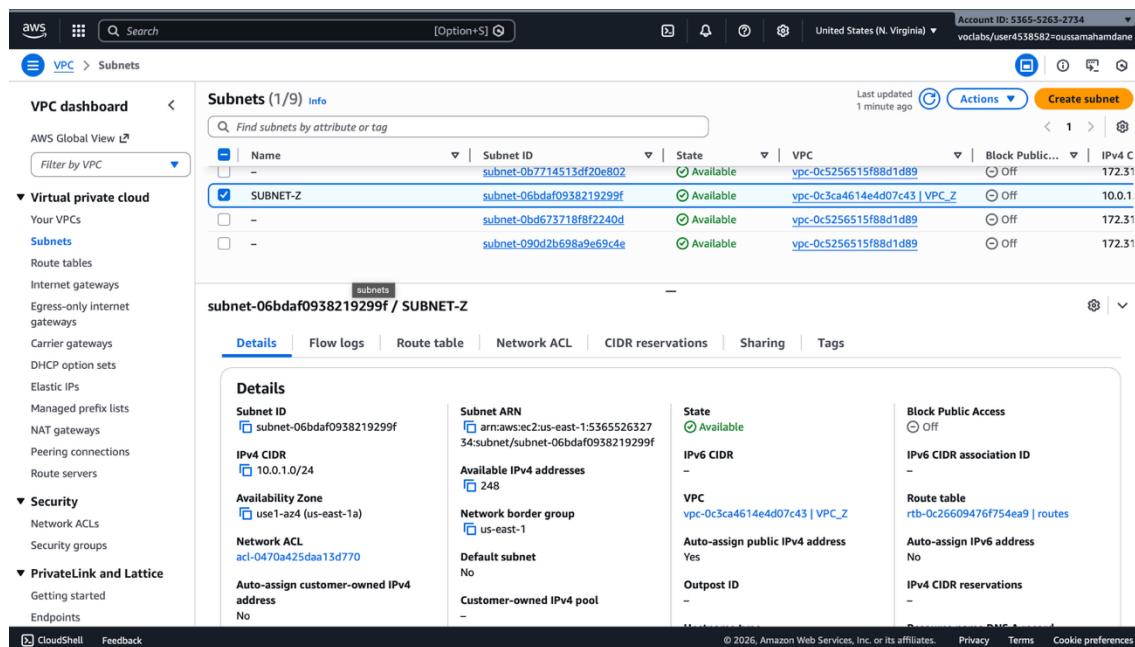
VPC ID : vpc-0c3ca4614e4d07c43	State : Available	Block Public Access : Off	DNS hostnames : Disabled
DNS resolution : Enabled	Tenancy : default	DHCP option set : dopt-0d2fed01e4822960c	Main route table : rtb-016869610d22ad286
Main network ACL : acl-0470a425daa13d770	Default VPC : No	IPv4 CIDR : 10.0.0.0/16	IPv6 pool : -
IPv6 CIDR (Network border group) : -	Network Address Usage metrics : Disabled	Route 53 Resolver DNS Firewall rule groups : Failed to load rule groups	Owner ID : 536552632754
Encryption control ID : -	Encryption control mode : -		

2. Création des sous-réseaux (Subnets)

A l'intérieur du VPC, un **subnet privé** a été créé pour héberger les machines virtuelles :

- Subnet pour le serveur Zabbix
- Subnet pour les machines supervisées

Chaque subnet a été associé à une plage d'adresses IP spécifique, garantissant une segmentation logique du réseau.



The screenshot shows the AWS VPC Subnets page. On the left, there's a navigation sidebar with options like VPC dashboard, AWS Global View, Your VPCs, Subnets, Route tables, Internet gateways, Egress-only internet gateways, Carrier gateways, DHCP option sets, Elastic IPs, Managed prefix lists, NAT gateways, Peering connections, and Route servers. Under Security, it lists Network ACLs and Security groups. Under PrivateLink and Lattice, it lists Getting started and Endpoints. At the bottom of the sidebar are CloudShell and Feedback links.

The main content area has a header "Subnets (1/9) Info" with a search bar and filters. It shows a table of subnets:

Name	Subnet ID	State	VPC	Block Public...	IPv4 C...
-	subnet-0b7714513df20e802	Available	vpc-0c5256515f88d1d89	Off	172.31
SUBNET-Z	subnet-06bdaf0938219299f	Available	vpc-0c3ca461464d07c43 VPC_Z	Off	10.0.1
-	subnet-0bd673718f8f2240d	Available	vpc-0c5256515f88d1d89	Off	172.31
-	subnet-090d2b698a9e69c4e	Available	vpc-0c5256515f88d1d89	Off	172.31

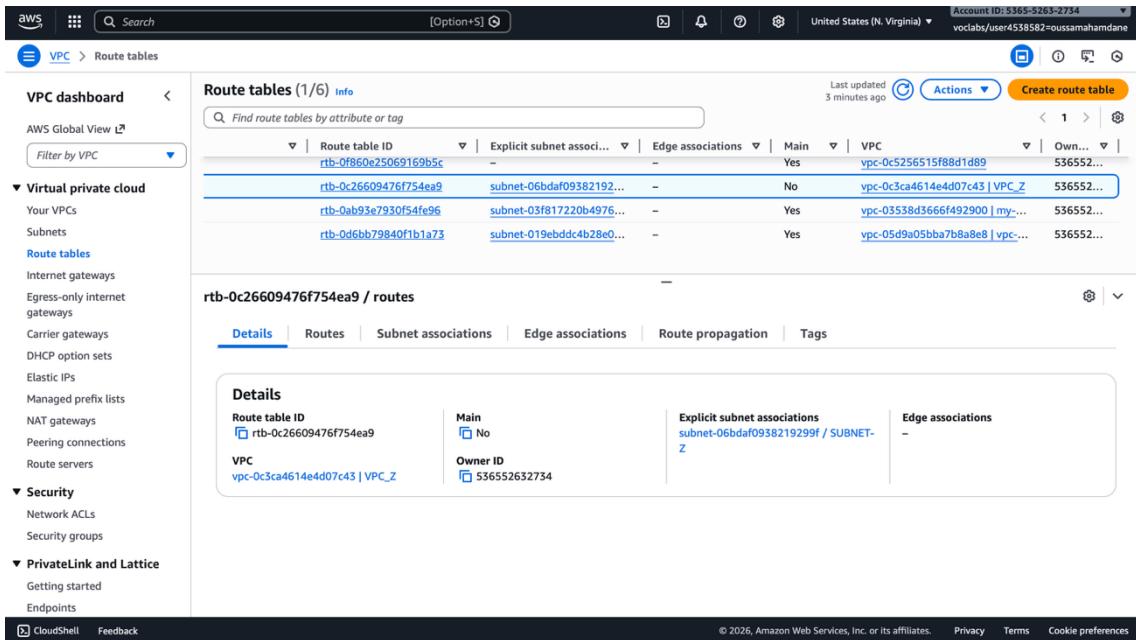
Below the table, a specific subnet is selected: **subnet-06bdaf0938219299f / SUBNET-Z**. A detailed view of this subnet is shown in a modal window:

Details	Subnet ID	Subnet ARN	State	Block Public Access
IPv4 CIDR	10.0.1.0/24	arn:aws:ec2:us-east-1:536552632734:subnet/subnet-06bdaf0938219299f	Available	Off
Availability Zone	use1-az4 (us-east-1a)		IPv6 CIDR	-
Network ACL	acl-0470a425daa13d770		VPC	vpc-0c3ca461464d07c43 VPC_Z
Auto-assign customer-owned IPv4 address	No		Auto-assign public IPv4 address	Yes
Customer-owned IPv4 pool	-		Outpost ID	-

3. Configuration des tables de routage

Les **tables de routage** ont été configurées afin de permettre la communication entre les ressources internes du VPC et l'accès à Internet lorsque nécessaire.

- Routage interne entre les subnets
- Accès sortant pour l'installation des paquets
- Restriction des flux inutiles



The screenshot shows the AWS VPC Route tables page. On the left, there's a navigation sidebar with sections like VPC dashboard, Virtual private cloud, Route tables, Security, and PrivateLink and Lattice. The main area displays a table titled "Route tables (1/6) Info" with columns for Route table ID, Explicit subnet associations, Edge associations, Main, VPC, and Own... (with a dropdown for filters). There are four route tables listed:

Route table ID	Explicit subnet associations	Edge associations	Main	VPC	Own...
rtb-0f860e250691695c	-	-	Yes	vpc-0c5256515f88d1b89	536552...
rtb-0c26609476f754ea9	subnet-06bdaf09382192...	-	No	vpc-0c3ca4614e4d07c43 VPC_Z	536552...
rtb-0ab95e7930f54fe96	subnet-03f817220b4976...	-	Yes	vpc-03538d3666f492900 my...	536552...
rtb-0d6bb79840f1b1a73	subnet-019ebddc4b28e0...	-	Yes	vpc-05d9a05bba7b8a8e8 vpc...	536552...

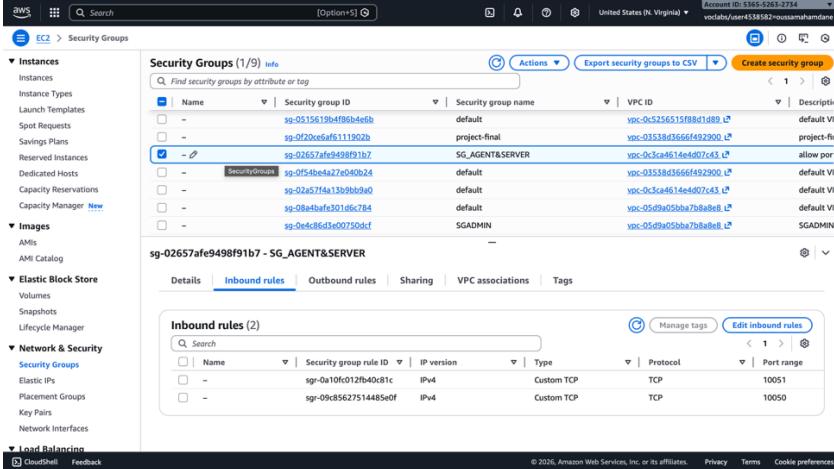
Below the table, a specific route table (rtb-0c26609476f754ea9) is selected, showing its details. The "Details" tab is active, displaying information such as Route table ID, Main (set to No), VPC (vpc-0c3ca4614e4d07c43 | VPC_Z), Owner ID (536552632734), Explicit subnet associations (subnet-06bdaf0938219299f / SUBNET-Z), and Edge associations (-).

4. Configuration des règles de sécurité (Security Groups / Firewall)

Des règles de sécurité ont été mises en place afin de contrôler les flux réseau :

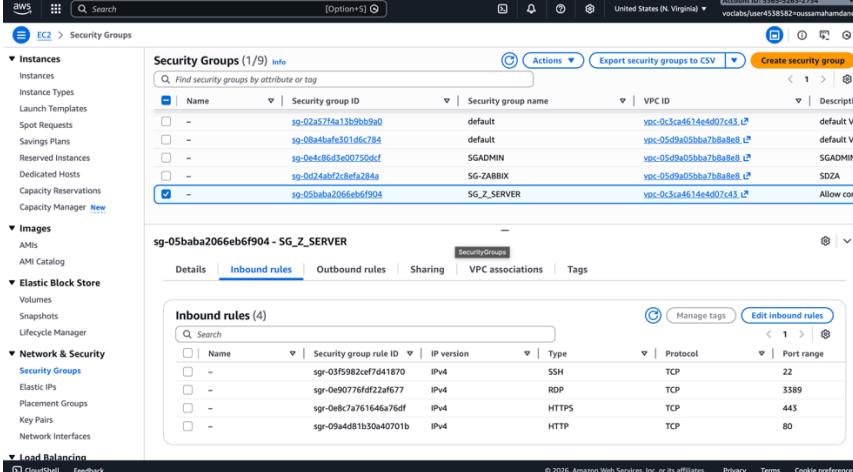
- Autorisation du port **10051** pour le serveur Zabbix
- Autorisation du port **10050** pour les agents Zabbix
- Autorisation du port **80** pour HTTP
- Autorisation du port 22 pour SSH
- Autorisation du port 443 pour HTTPS
- Autorisation du port 3389 pour RDP
- Restriction des accès aux seules adresses autorisées

Cette configuration permet de sécuriser l'infrastructure tout en assurant son bon fonctionnement



Inbound rules (2)

Name	Security group rule ID	IP version	Type	Protocol	Port range
sgr-0a10fc0f2b40c81c	IPv4	Custom TCP	TCP	10051	
sgr-08a4bafef301d6c784	IPv4	Custom TCP	TCP	10050	



Inbound rules (4)

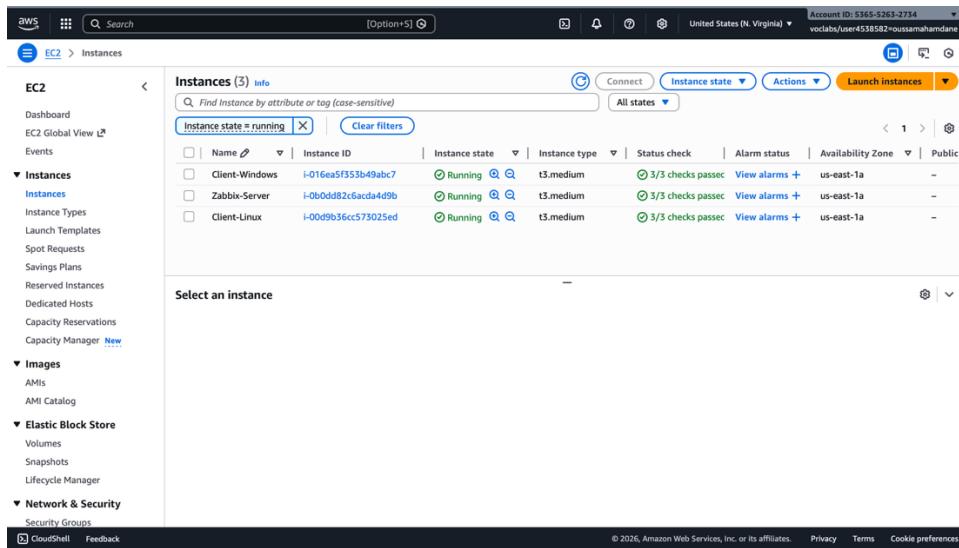
Name	Security group rule ID	IP version	Type	Protocol	Port range
sgr-03f5982cef7d41870	IPv4	SSH	TCP	22	
sgr-0e907f6df22af677	IPv4	RDP	TCP	3389	
sgr-0e8c7a761646a76df	IPv4	HTTPS	TCP	443	
sgr-09a4d81b30a40701b	IPv4	HTTP	TCP	80	

5. Création des machines virtuelles

Des machines virtuelles ont été déployées dans le VPC :

- Une machine virtuelle dédiée au **serveur Zabbix**
- Une ou plusieurs machines virtuelles à superviser

Chaque machine a été associée à son subnet et configurée avec une adresse IP privée.



The screenshot shows the AWS EC2 Instances page. On the left, there's a sidebar with navigation links like Dashboard, EC2 Global View, Events, Instances (selected), Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, Capacity Manager, Images, AMIs, AMI Catalog, Elastic Block Store, Volumes, Snapshots, Lifecycle Manager, Network & Security, Security Groups, CloudShell, and Feedback. The main area is titled 'Instances (3) Info' and shows a table of three instances:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public
Client-Windows	i-016ea5f353b49abc7	Running	t3.medium	3/3 checks pass	View alarms +	us-east-1a	-
Zabbix-Server	i-0b0dd82c6acd4d9b	Running	t3.medium	3/3 checks pass	View alarms +	us-east-1a	-
Client-Linux	i-00d9b36cc573025ed	Running	t3.medium	3/3 checks pass	View alarms +	us-east-1a	-

6. Déploiement de la plateforme Zabbix via Docker Compose

La plateforme Zabbix a été déployée à l'aide d'un fichier docker-compose.yml contenant :

- Zabbix Server
- Base de données MySQL
- Interface Web Zabbix

Les conteneurs ont été lancés et leur bon fonctionnement a été vérifié.

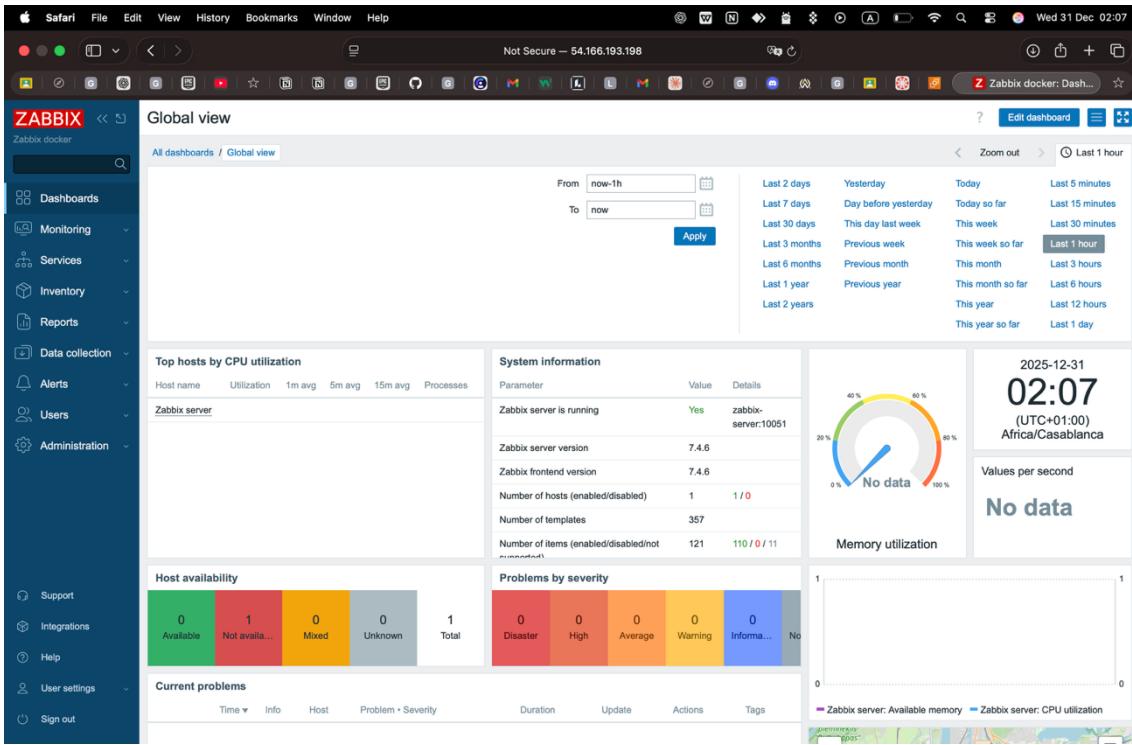
```
Ubuntu-18-0-1-# $ sudo docker ps -a
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS              PORTS                 NAMES
3af4a0132ae9        zabbix/zabbix-server-mysql:latest   "/usr/bin/docker-ent..."   5 days ago         Exited (137) 5 days ago           8443/tcp, 0.0.0.0:80->8080/tcp, [::]:80->8080/tcp   zabbix-server
9b55ae681035        zabbix/zabbix-web-apache-mysql:latest   "docker-entrypoint.sh"    5 days ago         Up 39 minutes (healthy)          80/tcp, 3306/tcp, 33060/tcp   zabbix-web
6968f2d8f294        mysql:8.0                           "docker-entrypoint.s..."  5 days ago         Up 39 minutes                  3306/tcp, 33060/tcp   zabbix-mysql
Ubuntu-18-0-1-#
```

7. Accès et configuration initiale de l'interface Zabbix

L'interface Web Zabbix a été accessible via un navigateur Web.

La configuration initiale a permis :

- La validation de la base de données
- La configuration du fuseau horaire
- La connexion à l'interface d'administration



The screenshot shows the Zabbix Global view dashboard. On the left, a dark sidebar menu includes options like Dashboards, Monitoring, Services, Inventory, Reports, Data collection, Alerts, Users, Administration, Support, Integrations, Help, User settings, and Sign out. The main content area displays several key metrics:

- Top hosts by CPU utilization:** Shows utilization over 1m avg, 5m avg, 15m avg, and Processes. The Zabbix server is listed with utilization at 0%.
- System information:** Includes parameters like "Zabbix server is running" (Value: Yes), "Zabbix server version" (7.4.6), and "Number of hosts (enabled/disabled)" (1).
- Host availability:** A summary table showing counts for Available (0), Not available (1), Mixed (0), Unknown (0), and Total (1).
- Problems by severity:** A summary table showing counts for Disaster (0), High (0), Average (0), Warning (0), Information (0), and No problem (No).
- Current problems:** A table with columns for Time, Info, Host, Problem + Severity, Duration, Update, Actions, and Tags. It currently shows 0 problems.
- System status:** A circular gauge chart titled "Memory utilization" showing 0% usage. It also displays the date (2025-12-31), time (02:07 UTC+01:00), and location (Africa/Casablanca).
- Metrics graph:** A line graph showing values per second for "Available memory" (purple line) and "CPU utilization" (blue line) over a 1-hour period. The graph shows a sharp peak in CPU utilization around 02:00 UTC+01:00.

8. Installation de Zabbix Agent sur les machines supervisées

Sur chaque machine cible, **Zabbix Agent 2** a été installé. Le fichier de configuration de l'agent a été modifié afin d'indiquer l'adresse IP du serveur Zabbix. Les services ont ensuite été démarrés et activés au démarrage.

Pour la machine Linux :

```
((base) macOSAAQIL Desktop % ssh -i "zabbix-key.pem" ubuntu@54.80.35.8
The authenticity of host '54.80.35.8 (54.80.35.8)' can't be established.
ED25519 key fingerprint is SHA256:GukKejdBEniRLMZr7SWK7yq0VtJ4zRnev/Wt0cJPS7k.
This host key is known by the following other names/addresses:
  ~/.ssh/known_hosts:20: 18.215.254.73
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '54.80.35.8' (ED25519) to the list of known hosts.
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-1015-aws x86_64)

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

System information as of Mon Jan  5 15:09:04 UTC 2026

System load:  0.08           Temperature:      -273.1 °C
Usage of /:   35.7% of 6.71GB  Processes:        112
Memory usage: 8%
Swap usage:   0%           Users logged in:    0
                           IPv4 address for ens5: 10.0.1.88

Expanded Security Maintenance for Applications is not enabled.

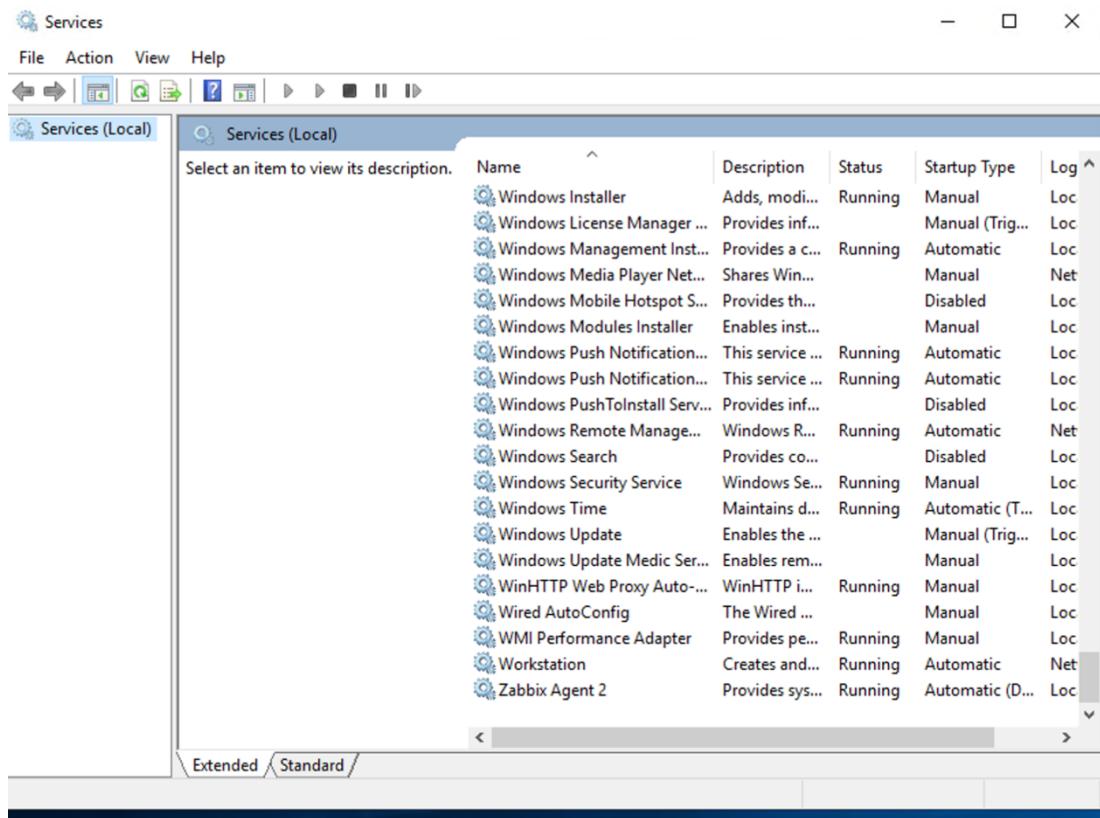
46 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

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

*** System restart required ***
Last login: Wed Dec 31 11:20:19 2025 from 105.66.135.42
[ubuntu@ip-10-0-1-88:~$ sudo systemctl status zabbix-agent2
● zabbix-agent2.service - Zabbix Agent 2
  Loaded: loaded (/usr/lib/systemd/system/zabbix-agent2.service; enabled; preset: enabled)
  Active: active (running) since Mon 2026-01-05 14:34:20 UTC; 35min ago
    Main PID: 587 (zabbix_agent2)
       Tasks: 7 (limit: 4525)
      Memory: 18.0M (peak: 18.5M)
        CPU: 552ms
      CGroup: /system.slice/zabbix-agent2.service
              └─587 /usr/sbin/zabbix_agent2 -c /etc/zabbix/zabbix_agent2.conf

Jan 05 14:34:20 ip-10-0-1-88 systemd[1]: Started zabbix-agent2.service - Zabbix Agent 2.
Jan 05 14:34:20 ip-10-0-1-88 zabbix_agent2[587]: Starting Zabbix Agent 2 (7.4.6)
Jan 05 14:34:20 ip-10-0-1-88 zabbix_agent2[587]: Zabbix Agent2 hostname: [Client-Linux]
Jan 05 14:34:20 ip-10-0-1-88 zabbix_agent2[587]: Press Ctrl+C to exit.
ubuntu@ip-10-0-1-88:~$ ]
```

Pour la machine Windows :



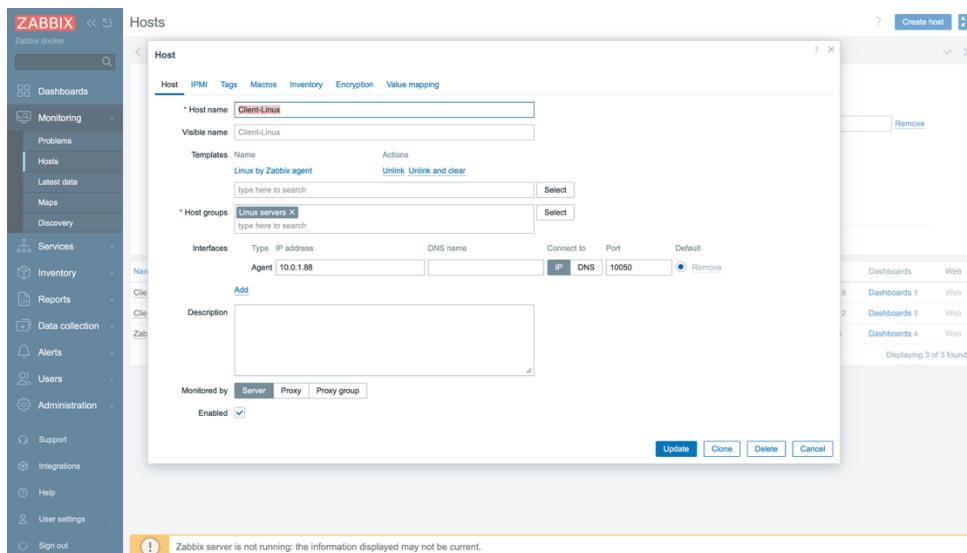
The screenshot shows the Windows Services (Local) window. The title bar reads "Services" and the main window title is "Services (Local)". The left pane shows a tree view with "Services (Local)" selected. The right pane displays a table of system services with the following columns: Name, Description, Status, Startup Type, and Log. The table lists 24 services, including Windows Installer, Windows License Manager, Windows Management Inst..., Windows Media Player Net..., Windows Mobile Hotspot S..., Windows Modules Installer, Windows Push Notification..., Windows Push Notification..., Windows PushToInstall Serv..., Windows Remote Manage..., Windows Search, Windows Security Service, Windows Time, Windows Update, Windows Update Medic Ser..., WinHTTP Web Proxy Auto..., Wired AutoConfig, WMI Performance Adapter, Workstation, and Zabbix Agent 2. Most services are running, except for some that are disabled or manual.

Name	Description	Status	Startup Type	Log
Windows Installer	Adds, modi...	Running	Manual	Loc
Windows License Manager ...	Provides inf...		Manual (Trig...	Loc
Windows Management Inst...	Provides a c...	Running	Automatic	Loc
Windows Media Player Net...	Shares Win...		Manual	Net
Windows Mobile Hotspot S...	Provides th...		Disabled	Loc
Windows Modules Installer	Enables inst...		Manual	Loc
Windows Push Notification...	This service ...	Running	Automatic	Loc
Windows Push Notification...	This service ...	Running	Automatic	Loc
Windows PushToInstall Serv...	Provides inf...		Disabled	Loc
Windows Remote Manage...	Windows R...	Running	Automatic	Net
Windows Search	Provides co...		Disabled	Loc
Windows Security Service	Windows Se...	Running	Manual	Loc
Windows Time	Maintains d...	Running	Automatic (T...	Loc
Windows Update	Enables the ...		Manual (Trig...	Loc
Windows Update Medic Ser...	Enables rem...		Manual	Loc
WinHTTP Web Proxy Auto...	WinHTTP i...	Running	Manual	Loc
Wired AutoConfig	The Wired ...		Manual	Loc
WMI Performance Adapter	Provides pe...	Running	Manual	Loc
Workstation	Creates and...	Running	Automatic	Net
Zabbix Agent 2	Provides sys...	Running	Automatic (D...	Loc

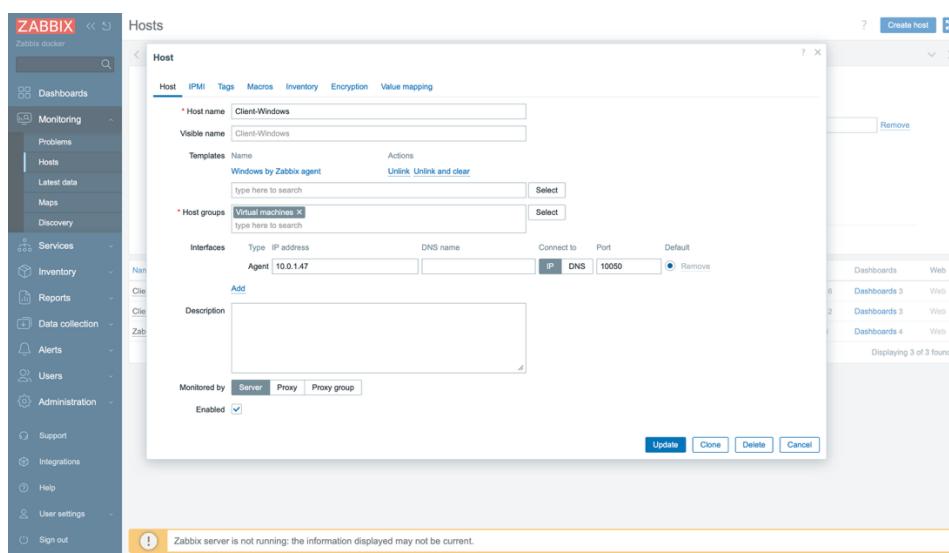
9. Ajout des hôtes dans l'interface Zabbix

Les machines supervisées ont été ajoutées dans l'interface Zabbix :

- Définition du nom d'hôte
- Configuration de l'interface agent
- Association aux groupes d'hôtes



The screenshot shows the 'Hosts' creation form in the Zabbix interface. The host name is 'Client-Linux', visible name is 'Client-Linux', and the template is 'Linux by Zabbix agent'. The host group is 'Linux servers'. An interface is defined with IP address 10.0.1.88, type Agent, and port 10050. The 'Enabled' checkbox is checked. The status bar at the bottom indicates: 'Zabbix server is not running: the information displayed may not be current.'



The screenshot shows the 'Hosts' creation form in the Zabbix interface. The host name is 'Client-Windows', visible name is 'Client-Windows', and the template is 'Windows by Zabbix agent'. The host group is 'Virtual machines'. An interface is defined with IP address 10.0.1.47, type Agent, and port 10050. The 'Enabled' checkbox is checked. The status bar at the bottom indicates: 'Zabbix server is not running: the information displayed may not be current.'

10. Crédit, affichage du dashboard et validation de la solution

La dernière étape du projet a consisté à créer et configurer des **dashboards personnalisés** dans l'interface Zabbix afin de visualiser efficacement l'état de l'infrastructure supervisée. Ces tableaux de bord regroupent les informations essentielles, notamment :

- Les graphiques de performance des ressources système (CPU, mémoire, disque et réseau)
- L'état des hôtes supervisés
- Les alertes actives générées par les déclencheurs
- L'historique des événements et des incidents

L'affichage en temps réel de ces données a permis de vérifier la bonne collecte des métriques par les agents Zabbix et leur traitement par le serveur.

