

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 :

SAAD AAQIL

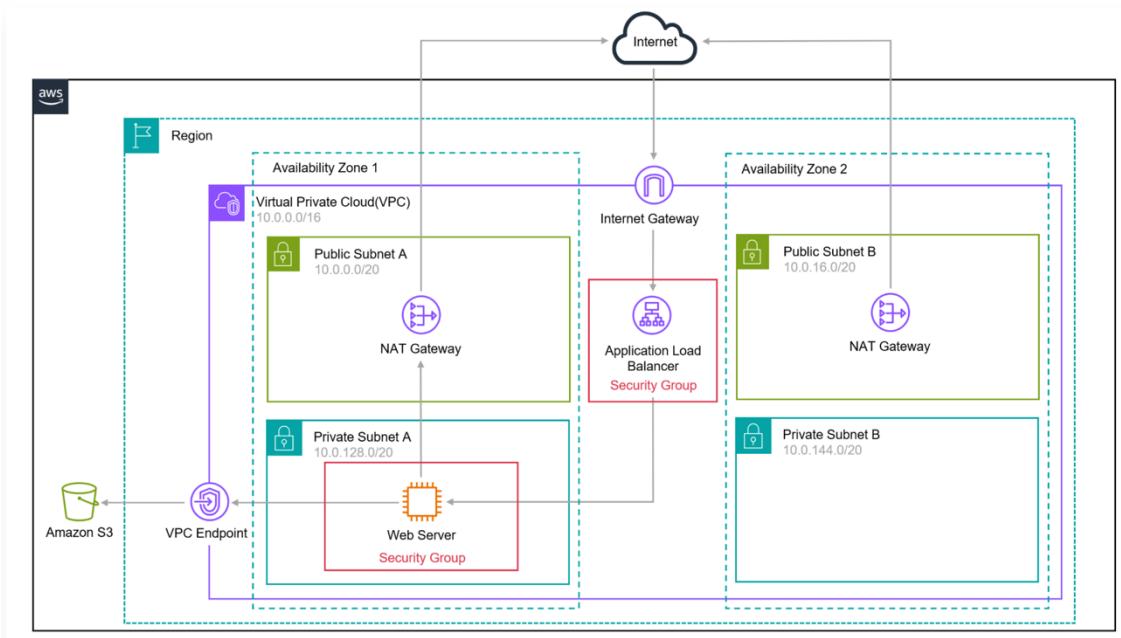
Encadré par :

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.

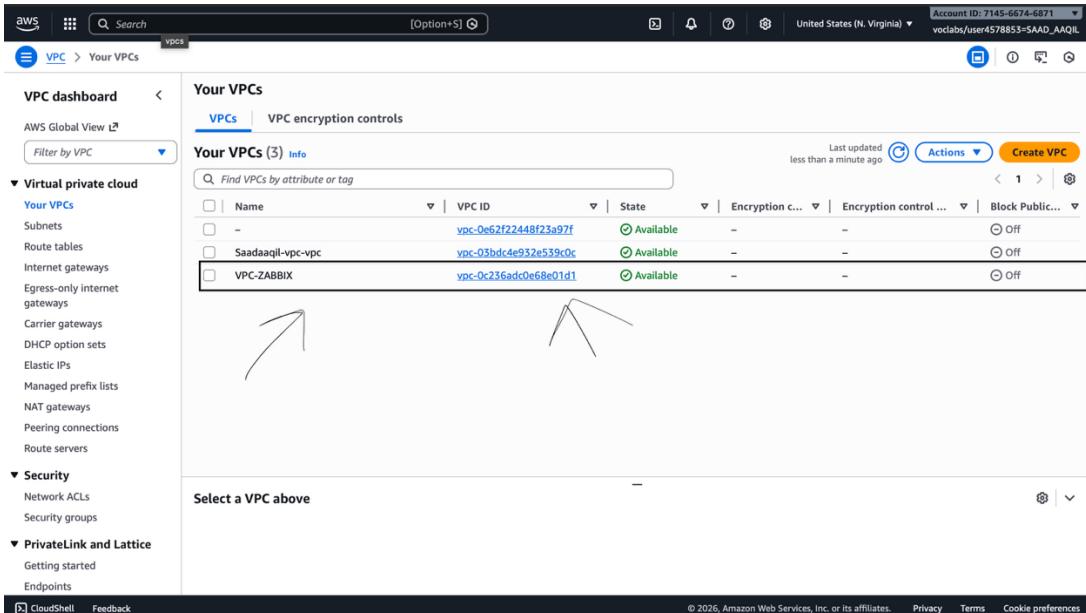
L'architecture suivante montre bien notre projet :



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:** Your VPCs (3)
- Actions:** Create VPC
- Filters:** Filter by VPC
- Search:** Find VPCs by attribute or tag
- Table Headers:** Name, VPC ID, State, Encryption controls, Encryption control ... (disabled), Block Public...
- Table Data:**

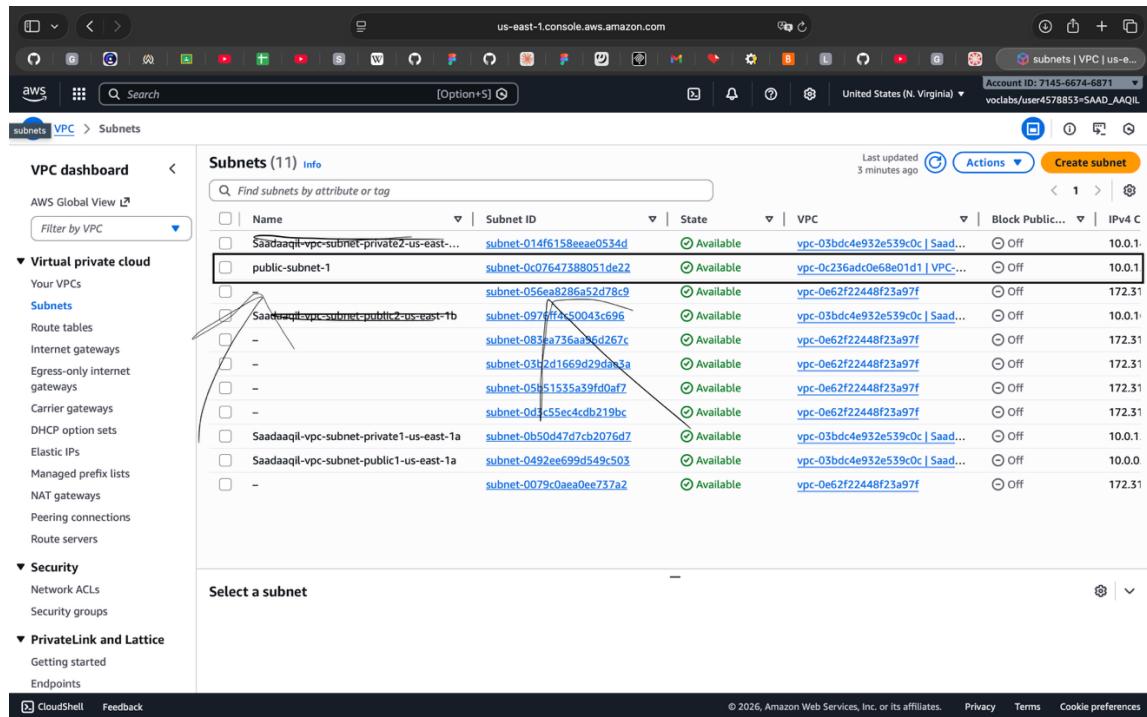
Name	VPC ID	State	Encryption controls	Encryption control ...	Block Public...
-	vpc-0e62f2244bf23a97f	Available	-	-	Off
Saadaaqil-vpc-vpc	vpc-03bdcc4e932e539c0c	Available	-	-	Off
VPC-ZABBIX	vpc-0c236adc0e68e01d1	Available	-	-	Off
- Left Sidebar:**
 - Virtual private cloud:** Your VPCs, Subnets, Route tables, Internet gateways, Egress-only internet gateways, Carrier gateways, DHCP option sets, Elastic IPs, Managed prefix lists, NAT gateways, Peering connections, Route servers.
 - Security:** Network ACLs, Security groups.
 - PrivateLink and Lattice:** Getting started, Endpoints.
- Bottom:** CloudShell, Feedback, © 2026, Amazon Web Services, Inc. or its affiliates., Privacy, Terms, Cookie preferences

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.

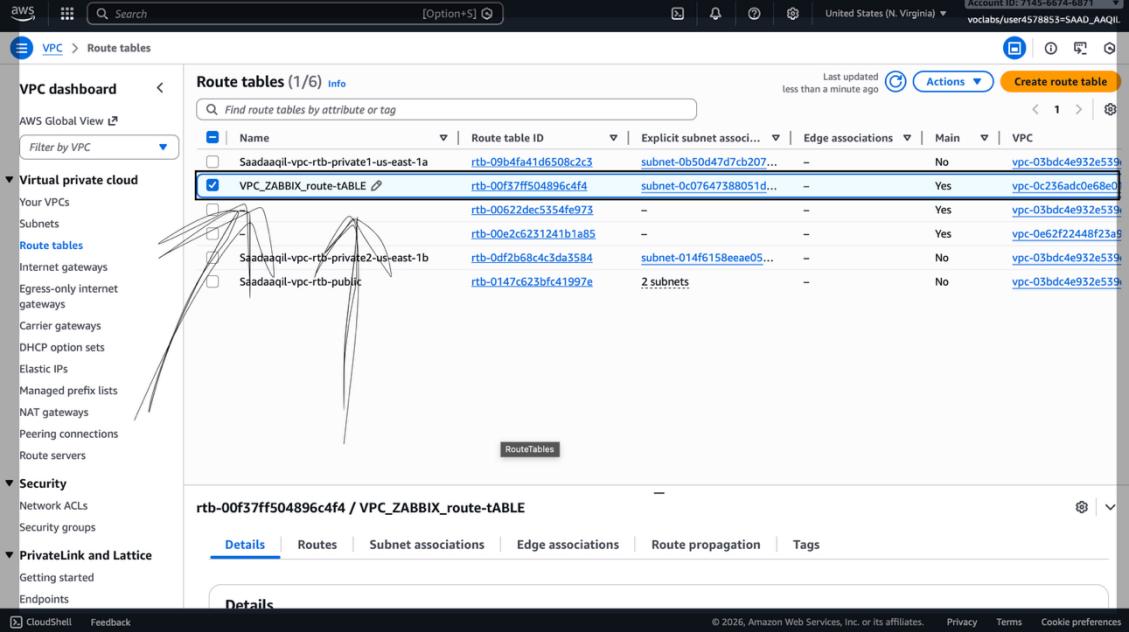


Name	Subnet ID	State	VPC	Block Public...	IPv4 C
Saadaaqil-vpc-subnet-private2-us-east-1a	subnet-014f6158eeae0534d	Available	vpc-03bdc4e932e539c0c Saad...	Off	10.0.1.0/24
public-subnet-1	subnet-0c07647388051de22	Available	vpc-0c236adc0e68e01d1 VPC-...	Off	10.0.1.0/24
-	subnet-056ea8286a52d78c9	Available	vpc-0e62f22448f23a97f	Off	172.31.0.0/24
Saadaaqil-vpc-subnet-public2-us-east-1b	subnet-097ff1a50043696	Available	vpc-03bdc4e932e539c0c Saad...	Off	10.0.1.0/24
-	subnet-083ba736aa36d267c	Available	vpc-0e62f22448f23a97f	Off	172.31.0.0/24
-	subnet-03b2d1669d29aa3a	Available	vpc-0e62f22448f23a97f	Off	172.31.0.0/24
-	subnet-05b51535a359fd0af7	Available	vpc-0e62f22448f23a97f	Off	172.31.0.0/24
-	subnet-0dd3c55ec4cd0219b	Available	vpc-0e62f22448f23a97f	Off	172.31.0.0/24
Saadaaqil-vpc-subnet-private1-us-east-1a	subnet-0b50d47d7cb2076d7	Available	vpc-03bdc4e932e539c0c Saad...	Off	10.0.1.0/24
Saadaaqil-vpc-subnet-public1-us-east-1a	subnet-0492ee599d549c503	Available	vpc-03bdc4e932e539c0c Saad...	Off	10.0.0.0/24
-	subnet-0079c0ea0ee737a2	Available	vpc-0e62f22448f23a97f	Off	172.31.0.0/24

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. The left sidebar navigation includes 'VPC dashboard', 'AWS Global View', 'Virtual private cloud' (with 'Route tables' selected), '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', 'Route servers', 'Security' (Network ACLs, Security groups), 'PrivateLink and Lattice' (Getting started, Endpoints), and links for 'CloudShell' and 'Feedback'.

The main content area displays 'Route tables (1/6) Info'. A table lists route tables:

Name	Route table ID	Explicit subnet associ...	Edge associations	Main	VPC
Saadaqil-vpc-rtb-private1-us-east-1a	rtb-09b4fa41d6508c2c3	subnet-0b50d47d7cb207...	-	No	vpc-03bdc4e932e539...
VPC_ZABBIX_route-tABLE	rtb-00f37ff504896c4f4	subnet-0c07647388051d...	-	Yes	vpc-0c23adc0e68e0...
	rtb-00622dec5354fe973	-	-	Yes	vpc-03bdc4e932e539...
	rtb-00e2c6231241b1a85	-	-	Yes	vpc-0e62f2244bf25a8...
	rtb-0df2b68c4c3da3584	subnet-014f6158eeae05...	-	No	vpc-03bdc4e932e539...
	rtb-0147623bfc41997e	2 subnets	-	No	vpc-03bdc4e932e539...

A diagram on the left illustrates the network topology, showing subnets connected to a central route table via arrows. Labels include 'Saadaqil-vpc-rtb-private2-us-east-1b' and 'Saadaqil-vpc-rtb-public'.

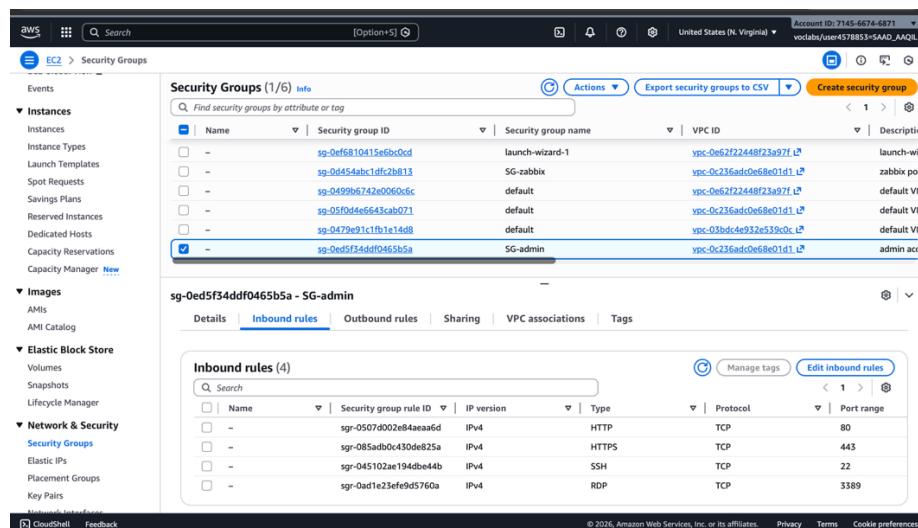
The bottom section shows the details for the selected route table 'rtb-00f37ff504896c4f4 / VPC_ZABBIX_route-tABLE'. It has tabs for 'Details', 'Routes', 'Subnet associations', 'Edge associations', 'Route propagation', and 'Tags'. The 'Details' tab is active.

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

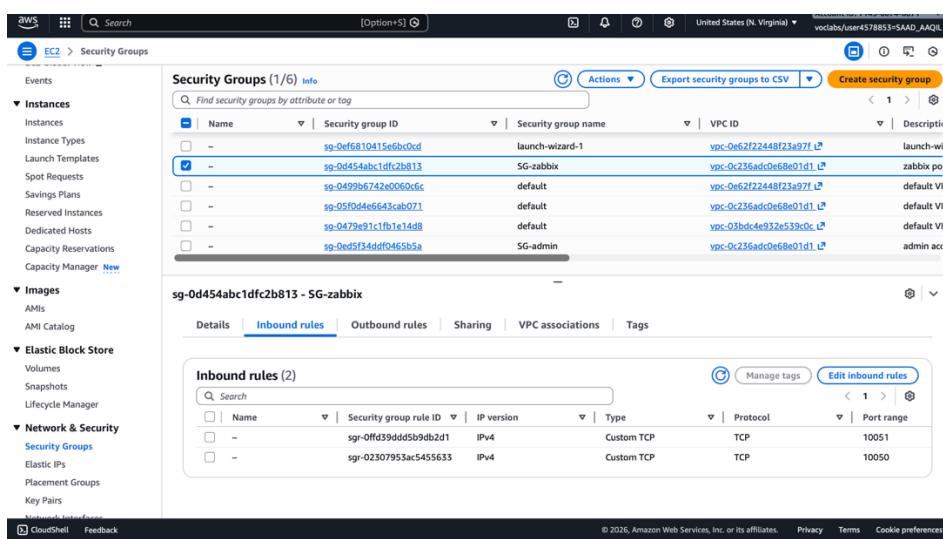
Des règles de sécurité ont été mises en place afin de contrôler les flux réseau :

- 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



Name	Security group rule ID	IP version	Type	Protocol	Port range
sgr-0507d002e84aea6d	IPv4	HTTP	TCP	80	
sgr-085cdb0c430de825a	IPv4	HTTPS	TCP	443	
sgr-045102ae194dbe44b	IPv4	SSH	TCP	22	
sgr-0ad1e23efef9d5760a	IPv4	RDP	TCP	3389	



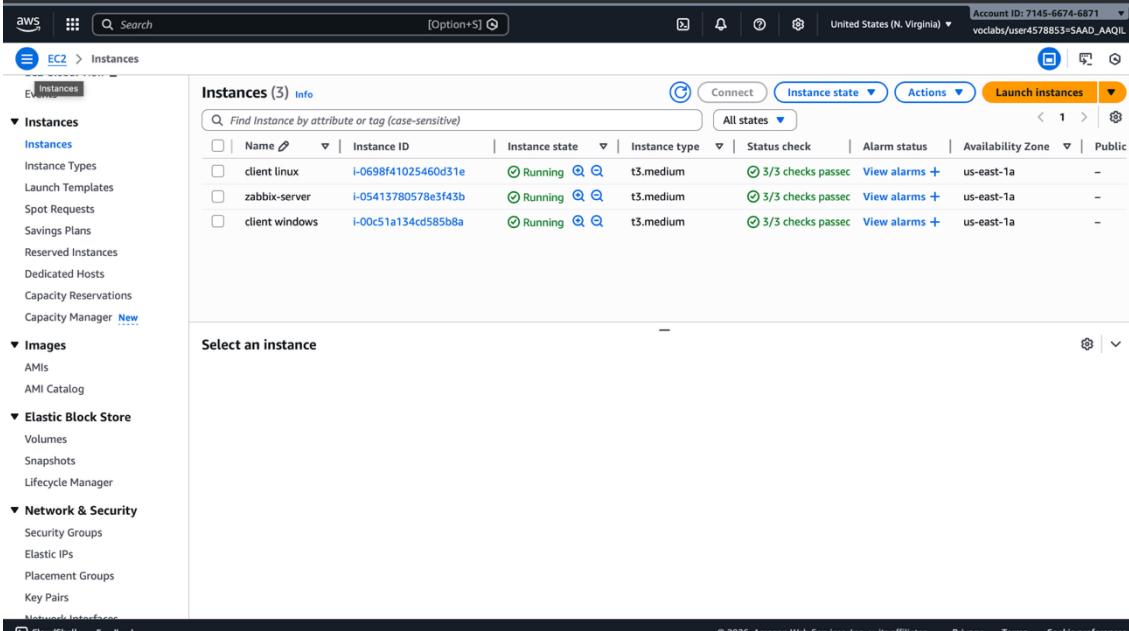
Name	Security group rule ID	IP version	Type	Protocol	Port range
sgr-0fd39ddd5b9db2d1	IPv4	Custom TCP	TCP	10051	
sgr-02307953ac5455633	IPv4	Custom TCP	TCP	10050	

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 Management Console interface for the EC2 service. The left sidebar navigation includes 'Instances', 'Images', 'Elastic Block Store', and 'Network & Security'. The main content area displays a table titled 'Instances (3) Info' with columns for Name, Instance ID, Instance state, Instance type, Status check, Alarm status, Availability Zone, and Public. The three listed instances are all 'Running': 'client linux' (Instance ID: i-0698f41025460d31e), 'zabbix-server' (Instance ID: i-05413780578e3f43b), and 'client windows' (Instance ID: i-00c51a134cd585b8a). The table also includes filters for 'All states' and 'Actions' like 'Connect', 'Launch instances', and 'View alarms'.

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.

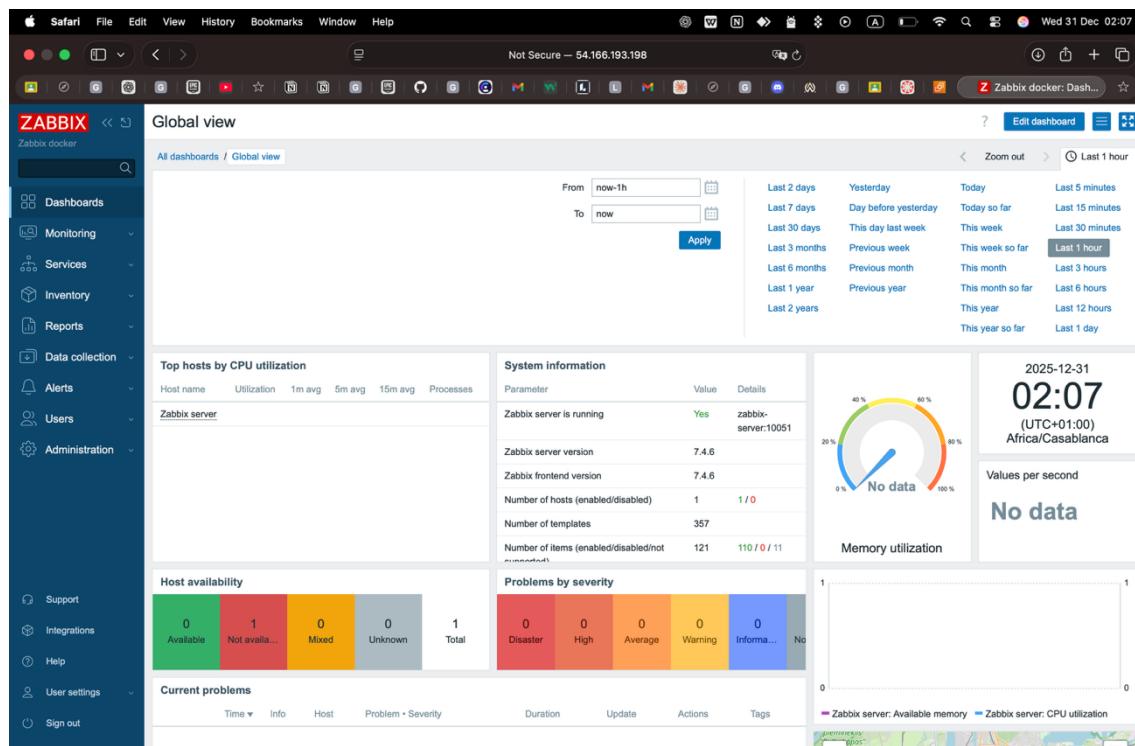
```
ubuntu@ip-10-0-1-59:~$ sudo docker ps -a
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS              PORTS                 NAMES
3af7a48132d2        zabbix/zabbix-server-mysql:latest   "/usr/bin/docker-entrypoint.sh"   8 days ago         Exited (137) 5 days ago          8443/tcp, 0.0.0.0:80->8080/tcp, [::]:80->8080/tcp   zabbix-server
5968f2d8f294        zabbix/zabbix-web-pa...:latest      "docker-entrypoint.sh"           8 days ago         Up 38 minutes (healthy)          3306/tcp, 33869/tcp, 33869/tcp   zabbix-web
6968f2d8f294        zabbix/zabbix-mysq...:latest      "docker-entrypoint.s...s"        5 days ago         Up 38 minutes                   zabbix-mysql
[ubuntu@ip-10-0-1-59:~$ ]
```

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 web interface with the following details:

- Header:** Safari browser, Not Secure - 54.166.193.198, Wed 31 Dec 02:07
- Left Sidebar:**
 - ZABBIX
 - Dashboard
 - Monitoring
 - Services
 - Inventory
 - Reports
 - Data collection
 - Alerts
 - Users
 - Administration
 - Support
 - Integrations
 - Help
 - User settings
 - Sign out
- Global view Dashboard:**
 - From: now-1h, To: now, Apply
 - Time selection: Last 2 days, Yesterday, Today, Last 5 minutes, Last 7 days, Day before yesterday, Today so far, Last 15 minutes, Last 30 days, This day last week, This week so far, This week, Last 30 minutes, Last 3 months, Previous week, This week so far, This month, Last 3 hours, Last 6 months, Previous month, This month, Last 6 hours, Last 1 year, Previous year, This month so far, Last 6 hours, This year, Last 12 hours, This year so far, Last 1 day
 - Hosts: Top hosts by CPU utilization (Zabbix server)
 - System information: Zabbix server is running (Yes), Zabbix server version (7.4.6), Zabbix frontend version (7.4.6), Number of hosts (enabled/disabled) (1 / 1), Number of templates (357), Number of items (enabled/disabled/not monitored) (121 / 110 / 0 / 11)
 - Metrics: Memory utilization (No data)
 - Host availability: 0 Available, 1 Not available, 0 Mixed, 0 Unknown, Total 1
 - Problems by severity: 0 Disaster, 0 High, 0 Average, 0 Warning, 0 Informational, 0 No problem
 - Current problems: Time, Info, Host, Problem + Severity, Duration, Update, Actions, Tags
 - Metrics: Zabbix server: Available memory (green), Zabbix server: CPU utilization (blue)

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.

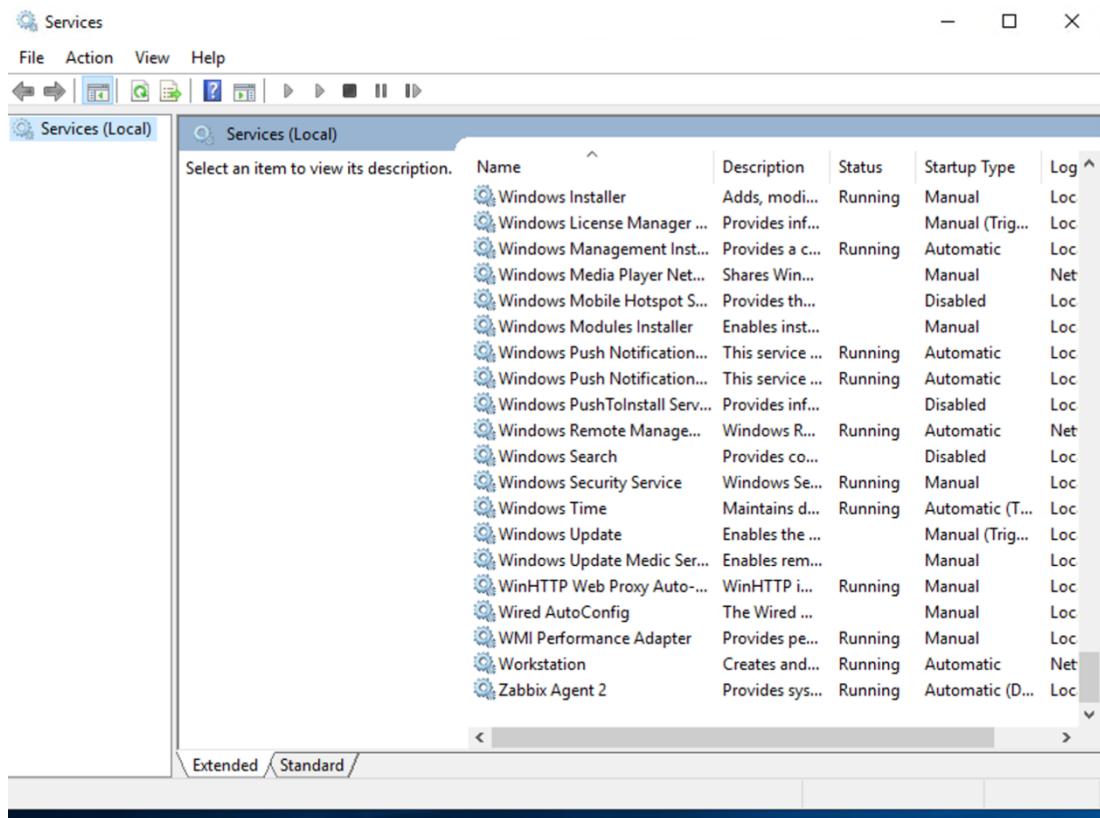
46 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

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 :



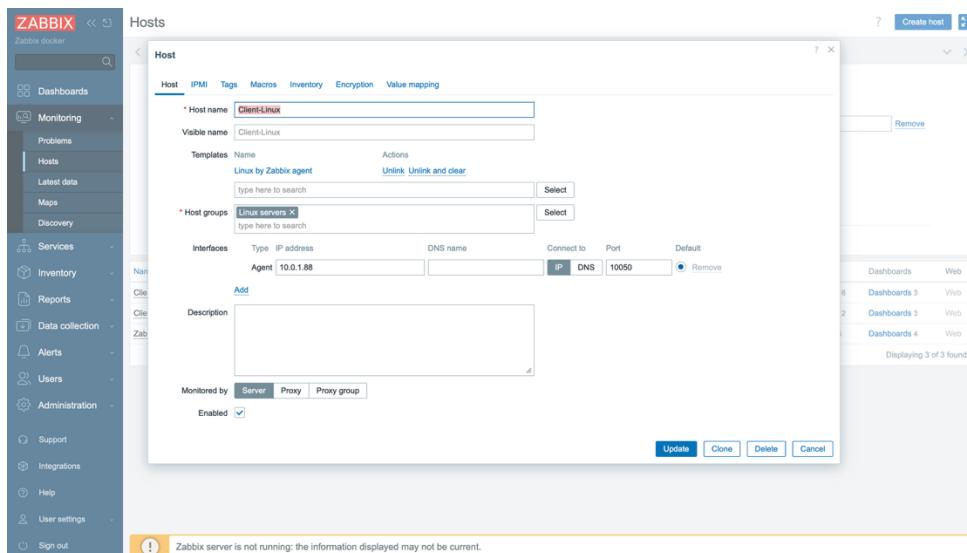
The screenshot shows the Windows Services snap-in window. The title bar reads "Services". The menu bar includes "File", "Action", "View", and "Help". Below the menu is a toolbar with icons for search, refresh, and other actions. The left pane is titled "Services (Local)" and contains a message: "Select an item to view its description.". The right pane is titled "Services (Local)" and displays a table of system services. The columns are: Name, Description, Status, Startup Type, and Log. The table lists 25 services, including Windows Installer, Windows License Manager, Windows Management Instrumentation, Windows Media Player Network, Windows Mobile Hotspot Service, Windows Modules Installer, Windows Push Notification, Windows Push TolInstall Service, Windows Remote Management, Windows Search, Windows Security Service, Windows Time, Windows Update, Windows Update Medic Service, WinHTTP Web Proxy Auto-discovery, Wired AutoConfig, WMI Performance Adapter, Workstation, and Zabbix Agent 2. Most services are running, except for some disabled ones like Windows Modules Installer and Zabbix Agent 2.

Name	Description	Status	Startup Type	Log
Windows Installer	Adds, modifies, removes, and repairs software applications.	Running	Manual	Loc
Windows License Manager	Provides information about the Windows license.	Running	Manual (Triggers)	Loc
Windows Management Instrumentation	Provides a common interface for monitoring and managing computer systems.	Running	Automatic	Loc
Windows Media Player Network	Shares Windows Media Player library.	Running	Manual	Net
Windows Mobile Hotspot Service	Provides tethering functionality for mobile devices.	Disabled	Loc	
Windows Modules Installer	Enables installation of optional Windows components.	Disabled	Loc	
Windows Push Notification	This service handles push notifications for Windows 8 and later versions.	Running	Automatic	Loc
Windows Push Notification	This service handles push notifications for Windows 8 and later versions.	Running	Automatic	Loc
Windows PushToInstall Service	Provides information about Windows Push-to-Install.	Disabled	Loc	
Windows Remote Management	Windows Remote Management service.	Running	Automatic	Net
Windows Search	Provides context-aware search results.	Disabled	Loc	
Windows Security Service	Windows Security Service.	Running	Manual	Loc
Windows Time	Maintains date and time.	Running	Automatic (Triggers)	Loc
Windows Update	Enables the Windows Update feature.	Disabled	Loc	
Windows Update Medic Service	Enables remote updates.	Running	Manual	Loc
WinHTTP Web Proxy Auto-discovery	WinHTTP Web Proxy Auto-discovery service.	Running	Manual	Loc
Wired AutoConfig	The Wired AutoConfig service.	Disabled	Loc	
WMI Performance Adapter	Provides performance data to the Windows Management Instrumentation (WMI) service.	Running	Manual	Loc
Workstation	Creates and maintains session information for the user.	Running	Automatic	Net
Zabbix Agent 2	Provides system monitoring data to the Zabbix server.	Running	Automatic (Determines)	Loc

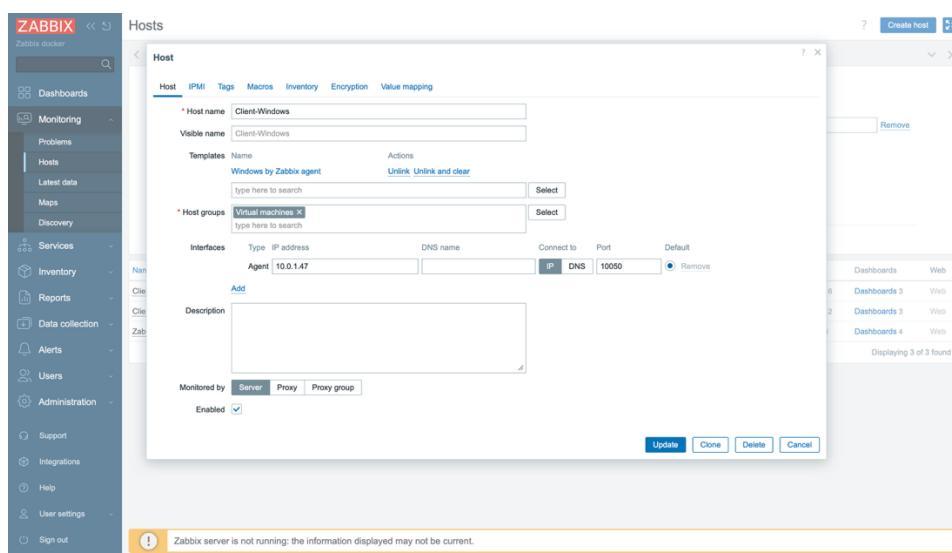
9. Ajout des hôtes dans l'interface Zabbix

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.

