Predictive Infrastructure Monitoring Dashboard Using Zabbix

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Contents

Project Overview: 3
Project Relevance: 4
Methodology: 5
Setup and Environment: 5
Tools, Frameworks, and Resources: 5
Tools 5
Resources Monitored 5
Workflow: 6
Step-by-Step Process: 7
Step 1: Set Up the Virtual Machine 7
Step 2: Install Zabbix Server 7
Step 3: Configure the Zabbix Web Interface 7
Step 4: Add UAlbany Website for Monitoring 7
Step 5: Install and Configure Zabbix Agent on Ubuntu 8
Step 6: Add Ubuntu as a Host in Zabbix 8
Step 7: Validate Monitoring Results 8
Results: 9
Zabbix installation: 9
Monitoring web using Zabbix: 17
Creating ubuntu host 21
Conclusion: 23

Project Overview:

The project mainly focuses on implementing a network and system monitoring solution using zabbix, an open-source enterprise monitoring platform. The objective was to deploy a zabbix server in a virtualized environment, configure monitoring for external web resources, and establish host-level monitoring for a Linux system.

The project began with installing Ubuntu Linux on VirtualBox and setting up the zabbix server, front end, and database components. Once the zabbix environment was operational, an external website the University at Albany ualbany.edu was added for availability and performance monitoring. A web scenario was configured to track uptime, response time, and potential service disruptions and created triggers. If the website experiences availability issues, triggers are activated to alert administrators. In the next phase, a zabbix Agent was installed and configured on the Ubuntu Virtual Machine to enable detailed host level monitoring. The host was added inside the zabbix dashboard, and appropriate templates were applied to collect system metrics such as CPU usage, memory consumption, disk space, processes, and network activity.

Through these steps, the project successfully demonstrated the ability to deploy a monitoring infrastructure, observe real-time metrics, generate alerts, and visualize performance data. This foundational setup can be extended to monitor additional servers, services, and network devices in more complex environments.

Keywords: Virtual Box, ubuntu Linux, Zabbix

Project Relevance:

Predictive monitoring plays a critical role in cybersecurity and digital forensics because many incidents begin with detecting anomalies long before a system fully fails. Tools like Zabbix allow people to detect early warning signs such as unexplained CPU spikes, memory exhaustion, slow website response times, unauthorized downtime, or abnormal network traffic that may indicate emerging vulnerabilities. By continuously collecting and storing system data, Zabbix supports real-time visibility as well as forensic reconstruction after an incident occurs.

We chose Zabbix for this project because it is a widely used, open-source monitoring solution that mirrors what real organizations use in system administration and cybersecurity environments. It provides hands-on exposure to concepts that cybersecurity professionals rely on daily, such as alerts, trend analysis, host monitoring, and understanding system health indicators. By monitoring both an external website and a local Ubuntu host, the project demonstrates how to track system health, analyze performance data, and identify unusual behavior that could indicate security issues.

This project helps develop practical skills that are valuable in cybersecurity and digital forensics, including configuring monitoring agents, interpreting system metrics, detecting anomalies, and understanding service availability. These skills are essential for SOC analysts, incident responders, and forensic investigators who rely on accurate system data to identify threats, troubleshooting issues, and prevent outages. Overall, the project demonstrates how proactive monitoring strengthens system reliability, enhances visibility, and contributes to a stronger defensive posture in modern IT environments.

Methodology:

Setup and Environment:

To complete this project, we created a controlled testing environment using VirtualBox. Inside VirtualBox, we installed Ubuntu Linux, which served as the server for running Zabbix. This virtual machine acted as the main monitoring system. we also ensured that the VM had internet access so Zabbix could monitor the UAlbany website.

Tools, Frameworks, and Resources:

Tools

VirtualBox: to run the Ubuntu virtual machine

Ubuntu Linux: operating system for installing Zabbix

Zabbix Server: main monitoring tool

Zabbix Frontend – for configuring hosts and viewing dashboard

Zabbix Agent – installed on the Ubuntu VM to collect host performance data

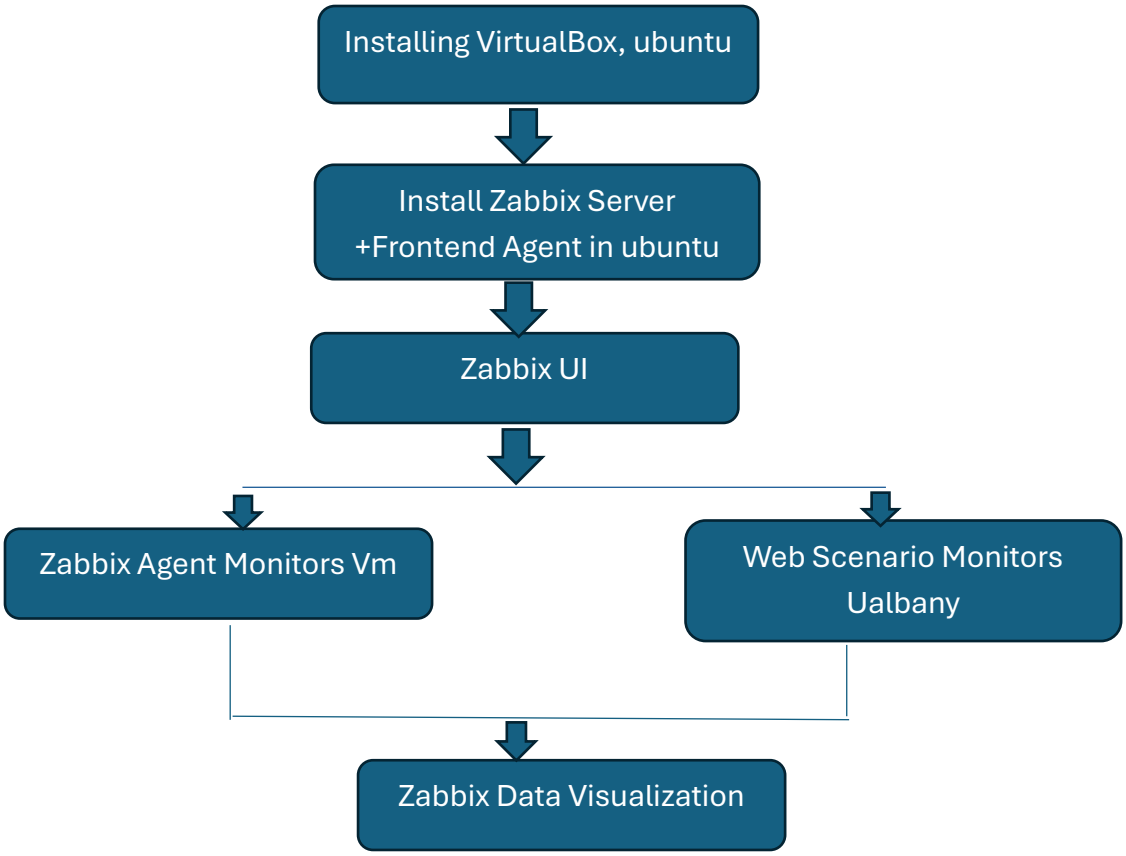
Database: MySQL

Resources Monitored

UAlbany Website (ualbany.edu): monitored through HTTP checks

Ubuntu Virtual Machine: monitored through Zabbix Agent.

Workflow:



Summary:

The workflow for this project begins by creating a VirtualBox environment and installing Ubuntu, which serves as the platform for setting up the Zabbix Server and web frontend. After installing and configuring Zabbix, the dashboard is accessed through a browser to manage monitoring activities. A web scenario is added to monitor the UAlbany website by checking its availability and response time, while the Zabbix Agent is installed on the Ubuntu VM to collect system performance data such as CPU, memory, disk, and network usage. Both the website checks and agent data are continuously sent to the Zabbix Server, which processes and stores the information. Finally, the Zabbix dashboard displays all metrics through graphs, alerts, and real-time updates, completing the monitoring workflow.

Step-by-Step Process:

Step 1: Set Up the Virtual Machine

Installed VirtualBox.

Created a new virtual machine and installed Ubuntu.

Updated the system and installed necessary packages.

Step 2: Install Zabbix Server

Installed Zabbix Server, Zabbix Frontend, and Zabbix Agent package from the official repository.

Configured MySQL database for Zabbix.

Started and enabled Zabbix services.

Accessed Zabbix Web UI through browser using VM's IP address.

Step 3: Configure the Zabbix Web Interface

Logged in with default credentials. (username:Admin,password:password)

Set up time zone and frontend settings.

Verified that the Zabbix server was running.

Step 4: Add UAlbany Website for Monitoring

Created a new Web Scenario to monitor https://www.ualbany.edu.

Added checks such as:

HTTP status

Response time

Uptime

Applied triggers to alert if the site becomes unavailable.

Step 5: Install and Configure Zabbix Agent on Ubuntu

Installed the Zabbix Agent on the same Ubuntu VM.

Edited the configuration file to point the agent to the Zabbix server.

Started and enabled the agent service.

Step 6: Add Ubuntu as a Host in Zabbix

Added a new host in the Zabbix dashboard.

Linked the template OS Linux by Zabbix Agent.

Verified incoming data such as CPU load, RAM, disk usage, and network traffic.

Step 7: Validate Monitoring Results

Checked graphs, latest data, and dashboards.

Confirmed that both:

External website monitoring, and Local host monitoring were working correctly

We added triggers in case the website is unavailable it will trigger the problem so that the appropriate team can handle the situation.

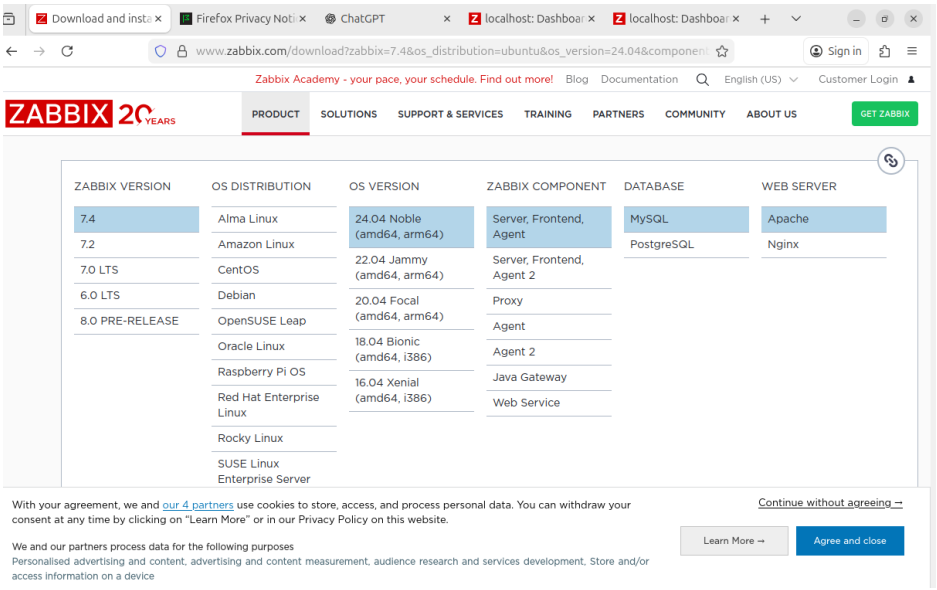
These results show how predictive monitoring improves visibility and incident readiness in real-world cybersecurity environments.

Results:

Zabbix installation:

Prerequestites:**virtual box,ubuntu**

Open the zabbix.com in browser and select the options based on the below screenshot



Step-1:Updating the ubuntu by using the command :sudo apt update

Step-2:Become root privilege by using command sudo-s

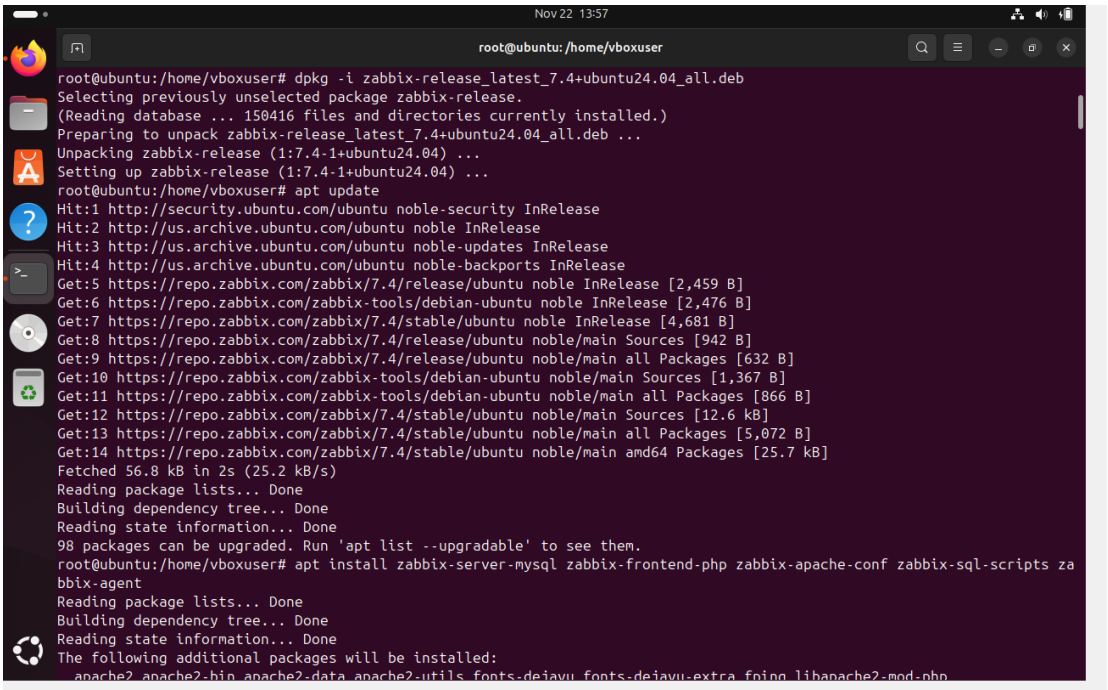
Step-3:install zabbix repositories using the following commands

 # wget https://repo.zabbix.com/zabbix/7.4/release/ubuntu/pool/main/z/zabbix-release/zabbix-release_latest_7.4+ubuntu24.04_all.deb
 # dpkg -i zabbix-release_latest_7.4+ubuntu24.04_all.deb
 # apt update

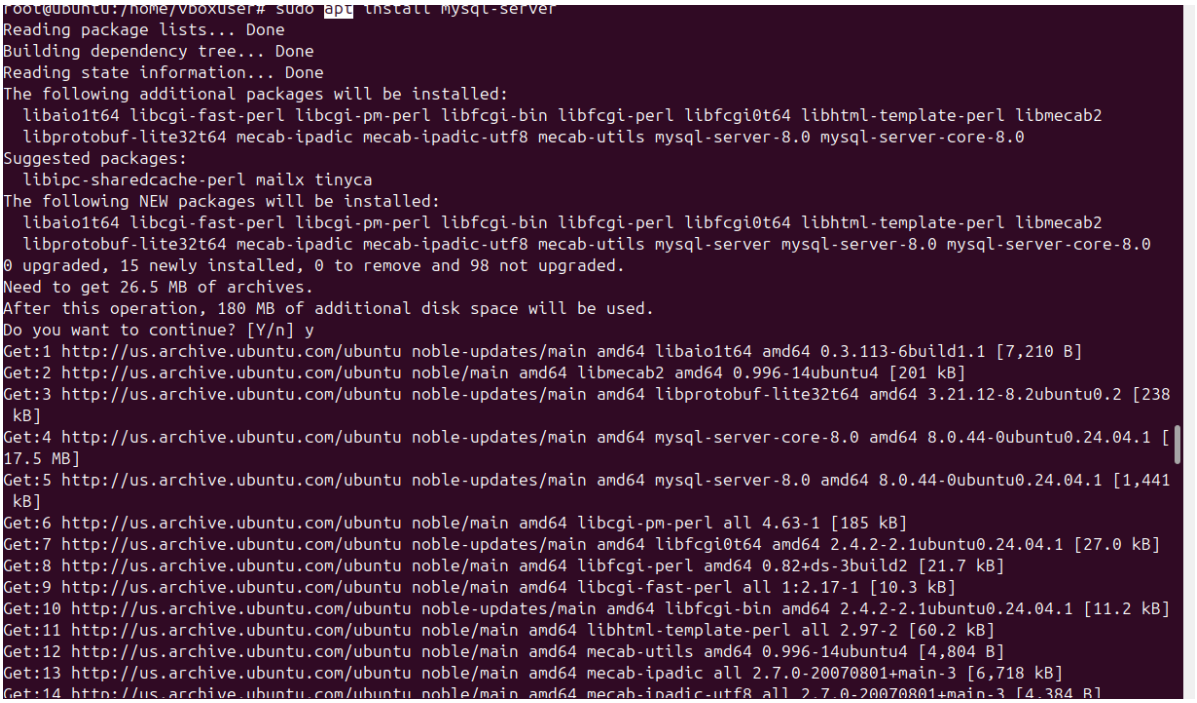
```
See "man sudo_root" for details.

vboxuser@ubuntu:~$ sudo apt update
[sudo] password for vboxuser:
Hit:1 http://us.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://us.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Hit:3 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:4 http://us.archive.ubuntu.com/ubuntu noble-backports InRelease
Get:5 http://us.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [1,620 kB]
Fetched 1,746 kB in 2s (969 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
98 packages can be upgraded. Run 'apt list --upgradable' to see them.
vboxuser@ubuntu:~$ sudo -s
root@ubuntu:/home/vboxuser# ubuntu
ubuntu: command not found
root@ubuntu:/home/vboxuser# wget https://repo.zabbix.com/zabbix/7.4/release/ubuntu/pool/main/z/zabbix-release/zabbix-rel
ease_latest_7.4+ubuntu24.04_all.deb
--2025-11-22 12:46:08--  https://repo.zabbix.com/zabbix/7.4/release/ubuntu/pool/main/z/zabbix-release/zabbix-release_lat
est_7.4+ubuntu24.04_all.deb
Resolving repo.zabbix.com (repo.zabbix.com)... 178.128.6.101, 2604:a880:2:d0::2062:d001
Connecting to repo.zabbix.com (repo.zabbix.com)|178.128.6.101|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 7144 (7.0K) [application/octet-stream]
Saving to: 'zabbix-release_latest_7.4+ubuntu24.04_all.deb'

zabbix-release_latest_7.4+ubu 100%[=================================================>]   6.98K  --.-KB/s    in 0s

2025-11-22 12:46:09 (413 MB/s) - 'zabbix-release_latest_7.4+ubuntu24.04_all.deb' saved [7144/7144]

root@ubuntu:/home/vboxuser# dpkg -i zabbix-release_latest_7.4+ubuntu24.04_all.deb
```

Step-4:Install Zabbix server, frontend, agent by running the following command

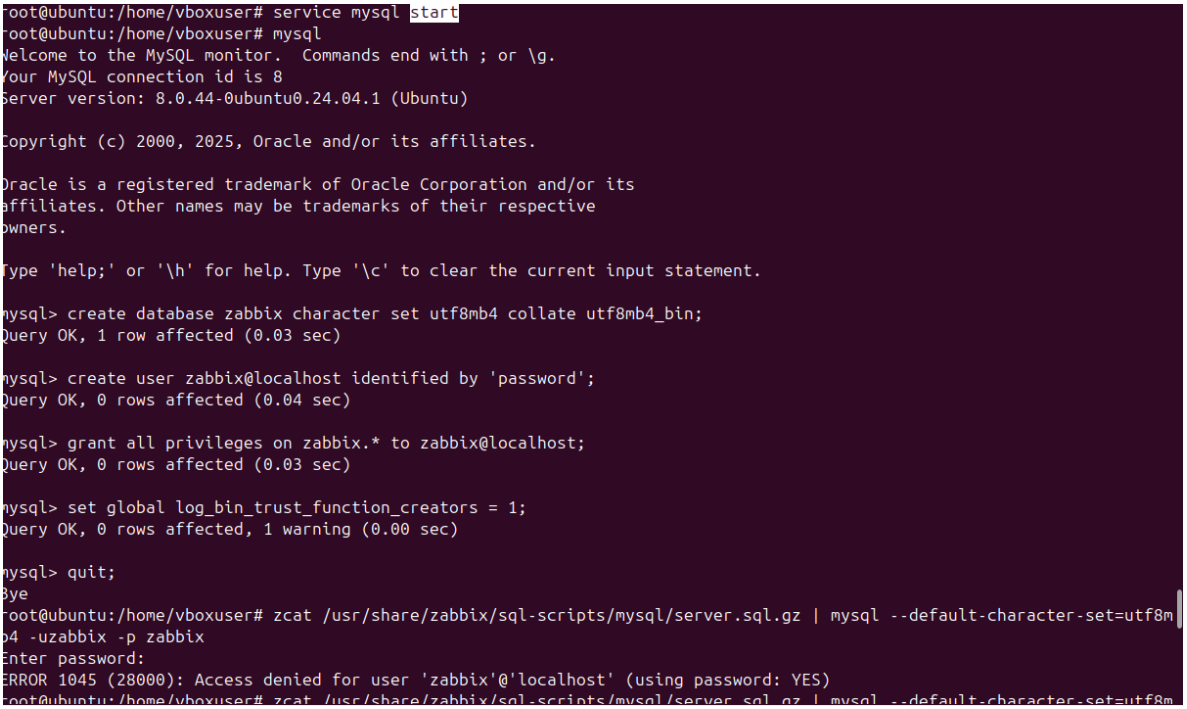
apt install zabbix-server-mysql zabbix-frontend-php zabbix-apache-conf zabbix-sql-scripts zabbix-agent



Step-5:Installing mysql by using the command sudo apt install mysql-server



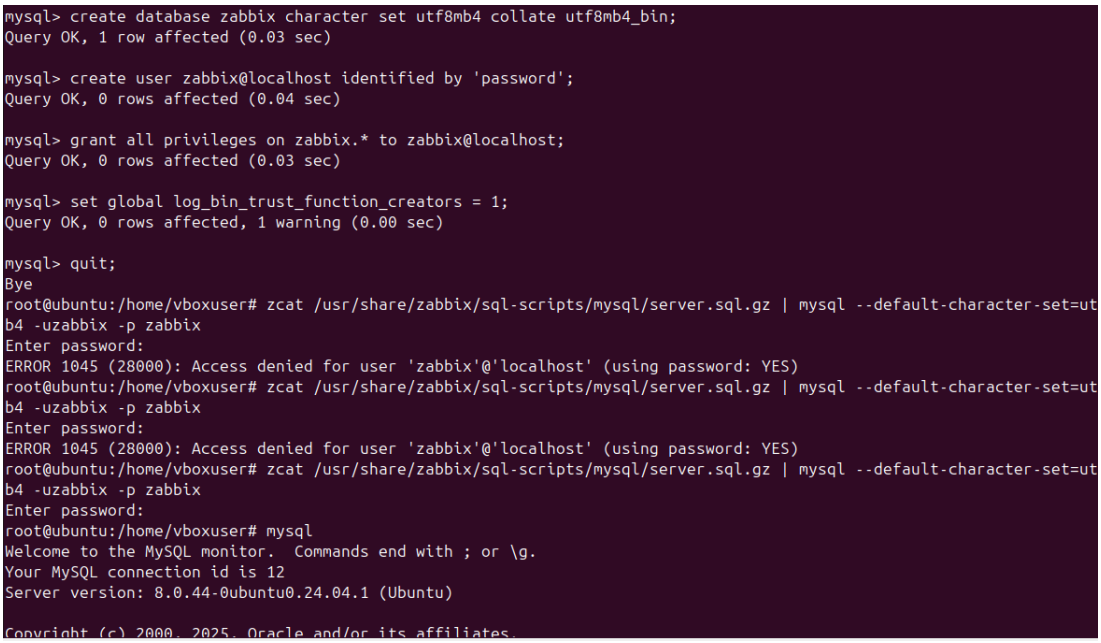
Step-6:starting the mysql service using the command :service mysql start



Step-7:Create initial database
mysql> create database zabbix character set utf8mb4 collate utf8mb4_bin;
mysql> create user zabbix@localhost identified by 'password';
mysql> grant all privileges on zabbix.* to zabbix@localhost;
mysql> set global log_bin_trust_function_creators = 1;
mysql> quit;

Step-8: On Zabbix server host import initial schema and data. You will be prompted to enter your newly created password.(password=password)

zcat /usr/share/zabbix/sql-scripts/mysql/server.sql.gz | mysql --default-character-set=utf8mb4 -uzabbix -p zabbix



Step-9:Edit file /etc/zabbix/zabbix_server.conf using the command sudo nano /etc/zabbix/zabbix _server.conf

Change password=password as shown in below screenshot

Step-10:

Start Zabbix server and agent processes

Start Zabbix server and agent processes and make it start at system boot.

systemctl restart zabbix-server zabbix-agent apache2
systemctl enable zabbix-server zabbix-agent apache2

```
root@ubuntu:/home/vboxuser# sudo nano /etc/zabbix/zabbix_server.conf
root@ubuntu:/home/vboxuser# systemctl restart zabbix-server zabbix-agent apache2
root@ubuntu:/home/vboxuser# systemctl enable zabbix-server zabbix-agent apache2
Synchronizing state of zabbix-server.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable zabbix-server
Synchronizing state of zabbix-agent.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable zabbix-agent
Synchronizing state of apache2.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable apache2
Created symlink /etc/systemd/system/multi-user.target.wants/zabbix-server.service → /usr/lib/systemd/system/zabbix-serve
r.service.
root@ubuntu:/home/vboxuser# sudo systemctl status zabbix-server.service
● zabbix-server.service - Zabbix Server
     Loaded: loaded (/usr/lib/systemd/system/zabbix-server.service; enabled; preset: enabled)
     Active: active (running) since Sat 2025-11-22 13:41:49 UTC; 2min 25s ago
   Main PID: 23673 (zabbix_server)
      Tasks: 77 (limit: 6901)
     Memory: 62.3M (peak: 62.8M)
        CPU: 1.476s
     CGroup: /system.slice/zabbix-server.service
             ├─23673 /usr/sbin/zabbix_server -c /etc/zabbix/zabbix_server.conf
```

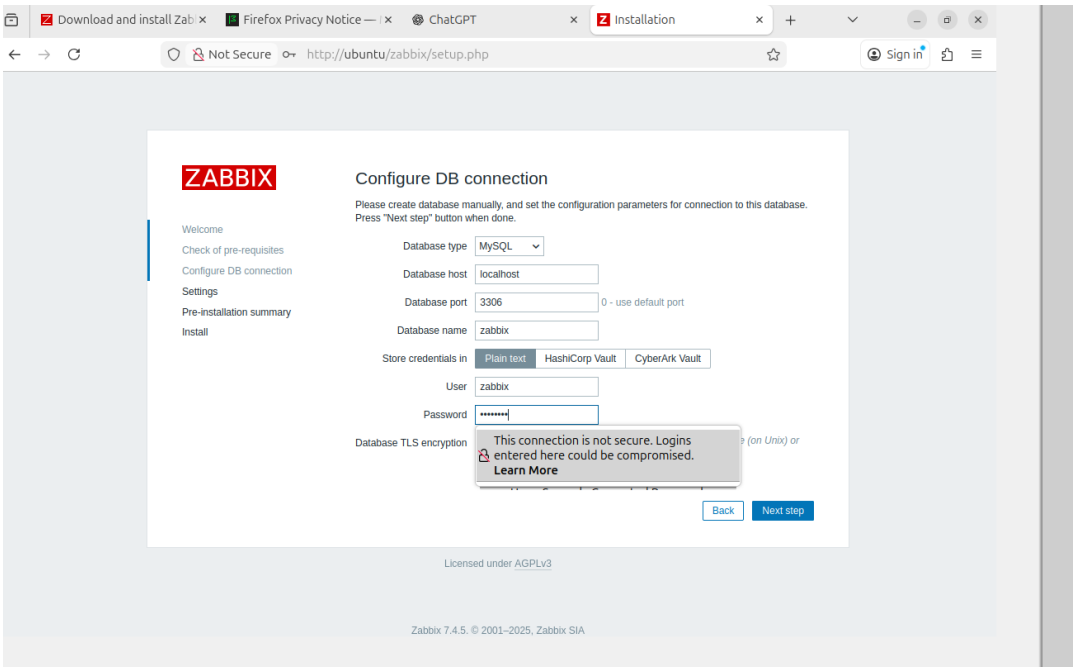
```
# Mandatory: no
# Default:C
DBPassword=password
### Option: DBSocket
#       Path to MySQL socket.
#
# Mandatory: no
# Default:
# DBSocket=

### Option: DBPort
#       Database port when not using local socket.
#
# Mandatory: no
# Range: 1024-65535
# Default for MySQL: 3306
# Default for PostgreSQL: 5432
# DBPort=

### Option: AllowUnsupportedDBVersions
#       Allow server to work with unsupported database versions.
#       0 - do not allow
#       1 - allow
#
# Mandatory: no
# Default:
# AllowUnsupportedDBVersions=0

^G Help      ^O Write Out  ^W Where Is  ^K Cut       ^T Execute   ^C Location  M-U Undo      M-A Set Mark
^X Exit      ^R Read File  ^\ Replace   ^U Paste     ^J Justify   ^/ Go To Line M-E Redo      M-6 Copy
```

```
root@ubuntu:/home/vboxuser# hostname
ubuntu
root@ubuntu:/home/vboxuser# hostname
```

Step-11:

Open Zabbix UI web page

The default URL for Zabbix UI when using Apache web server is http://host/zabbix


Download and install Zab
Firefox Privacy Notice —
ChatGPT
Installation
Not Secure
http://ubuntu/zabbix/setup.php
Sign in
ZABBIX
Configure DB connection
Please create database manually, and set the configuration parameters for connection to this database.
Press "Next step" button when done.
Welcome
Check of pre-requisites
Configure DB connection
Settings
Pre-installation summary
Install
Database type
MySQL
Database host
localhost
Database port
3306
0 - use default port
Database name
zabbix
Store credentials in
Plain text
HashiCorp Vault
CyberArk Vault
User
zabbix
Password
Database TLS encryption
This connection is not secure. Logins entered here could be compromised.
Learn More
Back
Next step
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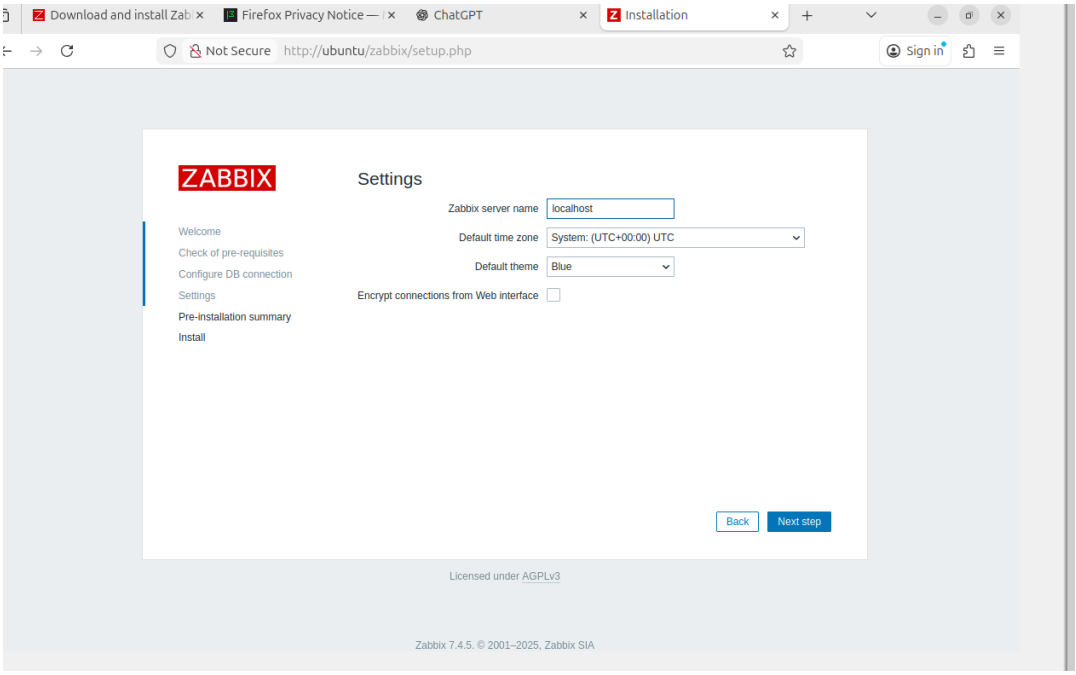
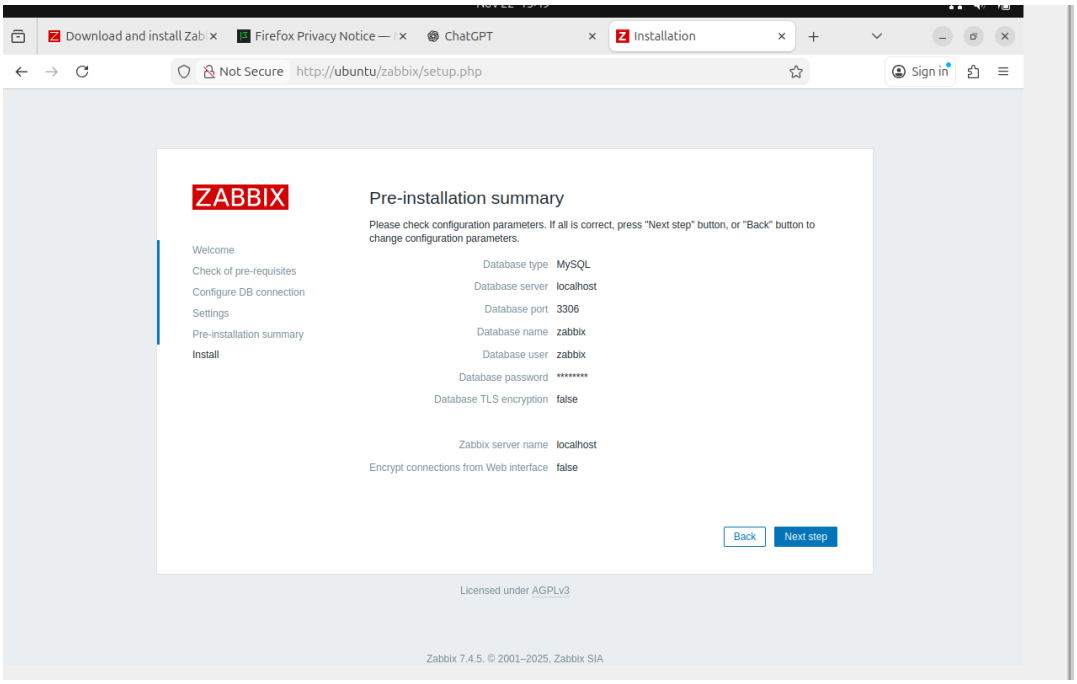
Zabbix 7.4.5. © 2001–2025, Zabbix SIA


Download and install Zab
Firefox Privacy Notice —
ChatGPT
Installation
Not Secure
http://ubuntu/zabbix/setup.php
Sign in
ZABBIX
Settings
Welcome
Check of pre-requisites
Configure DB connection
Settings
Pre-installation summary
Install
Zabbix server name
localhost
Default time zone
System: (UTC+00:00) UTC
Default theme
Blue
Encrypt connections from Web interface
Back
Next step
Licensed under AGPLv3
Zabbix 7.4.5. © 2001–2025, Zabbix SIA


Download and install Zab
Firefox Privacy Notice —
ChatGPT
Installation
Not Secure
http://ubuntu/zabbix/setup.php
Sign in
ZABBIX
Pre-installation summary
Please check configuration parameters. If all is correct, press "Next step" button, or "Back" button to change configuration parameters.
Welcome
Check of pre-requisites
Configure DB connection
Settings
Pre-installation summary
Install
Database type MySQL
Database server localhost
Database port 3306
Database name zabbix
Database user zabbix
Database password ********
Database TLS encryption false
Zabbix server name localhost
Encrypt connections from Web interface false
Back
Next step
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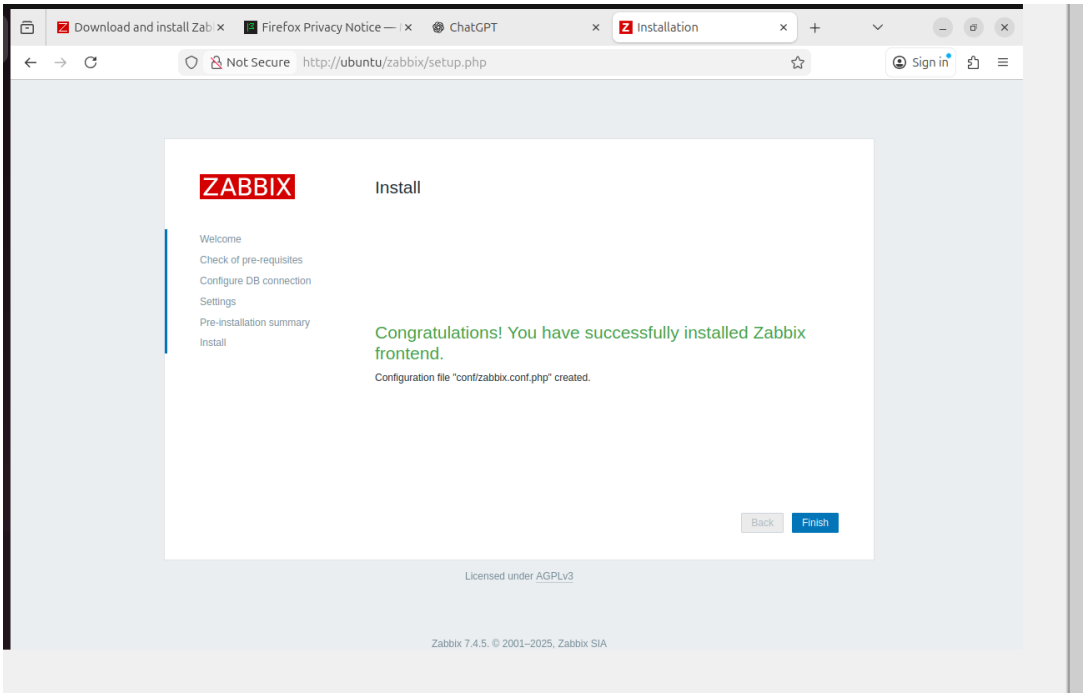
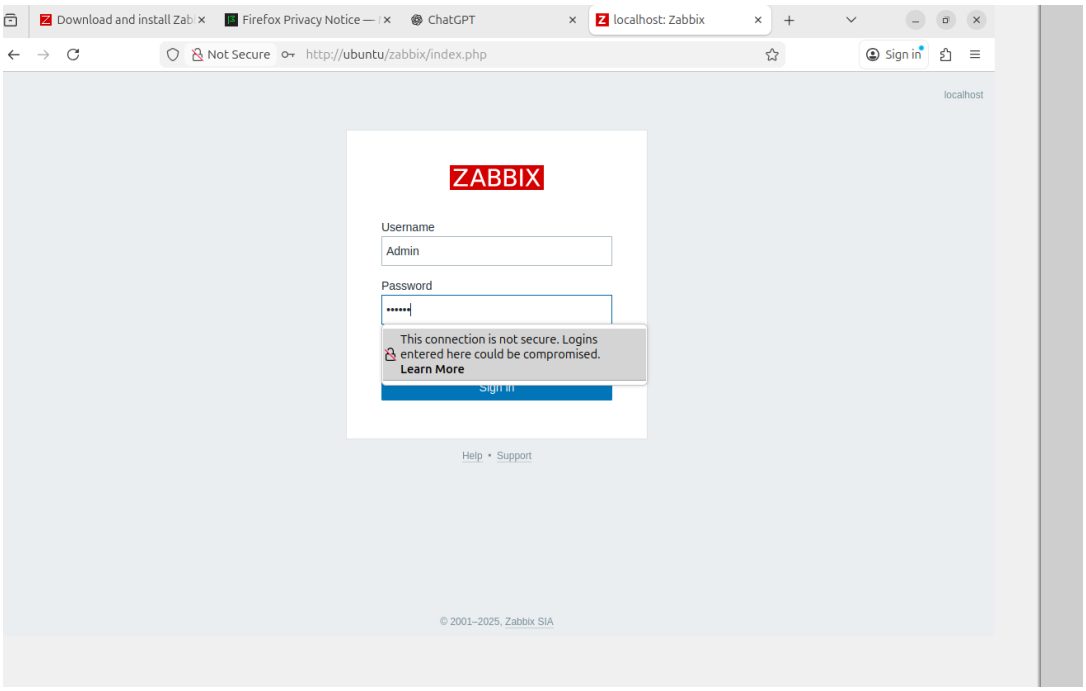
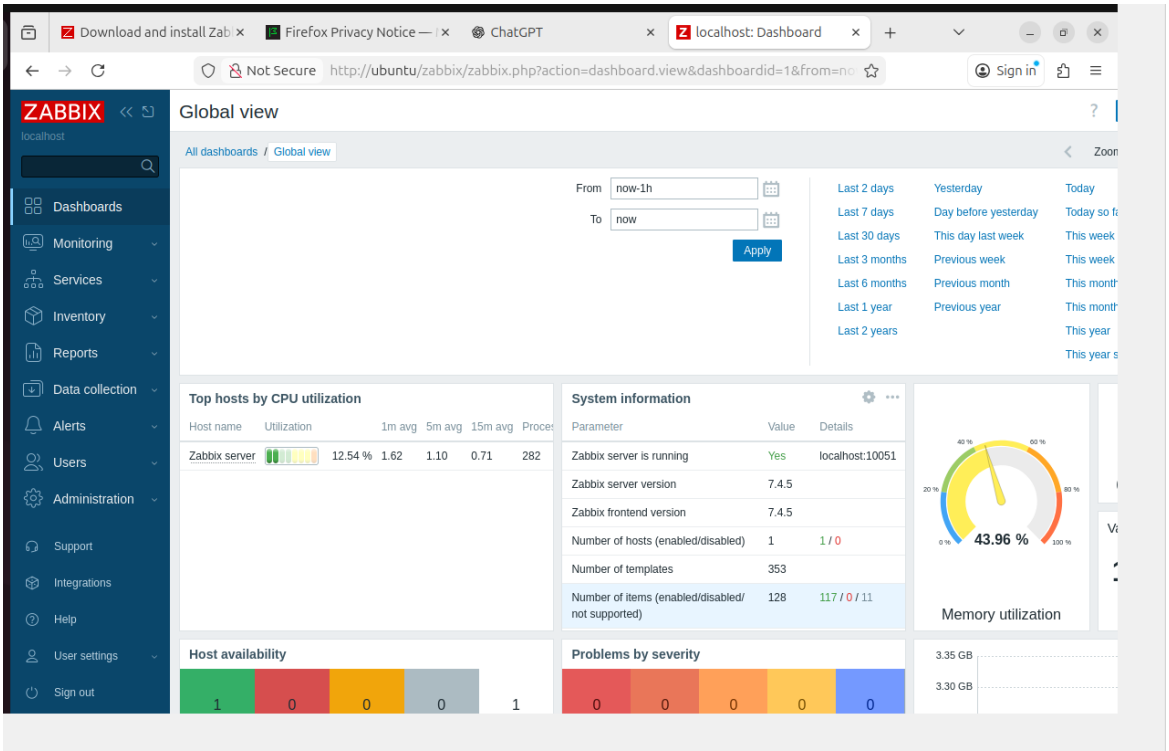

Download and install Zab
Firefox Privacy Notice —
ChatGPT
Installation
Not Secure
http://ubuntu/zabbix/setup.php
Sign in
ZABBIX
Install
Welcome
Check of pre-requisites
Configure DB connection
Settings
Pre-installation summary
Install
Congratulations! You have successfully installed Zabbix frontend.
Configuration file "conf/zabbix.conf.php" created.
Back
Finish
Licensed under AGPLv3
Zabbix 7.4.5. © 2001–2025, Zabbix SIA

Login to Zabbix using

Username: Admin

Password: password



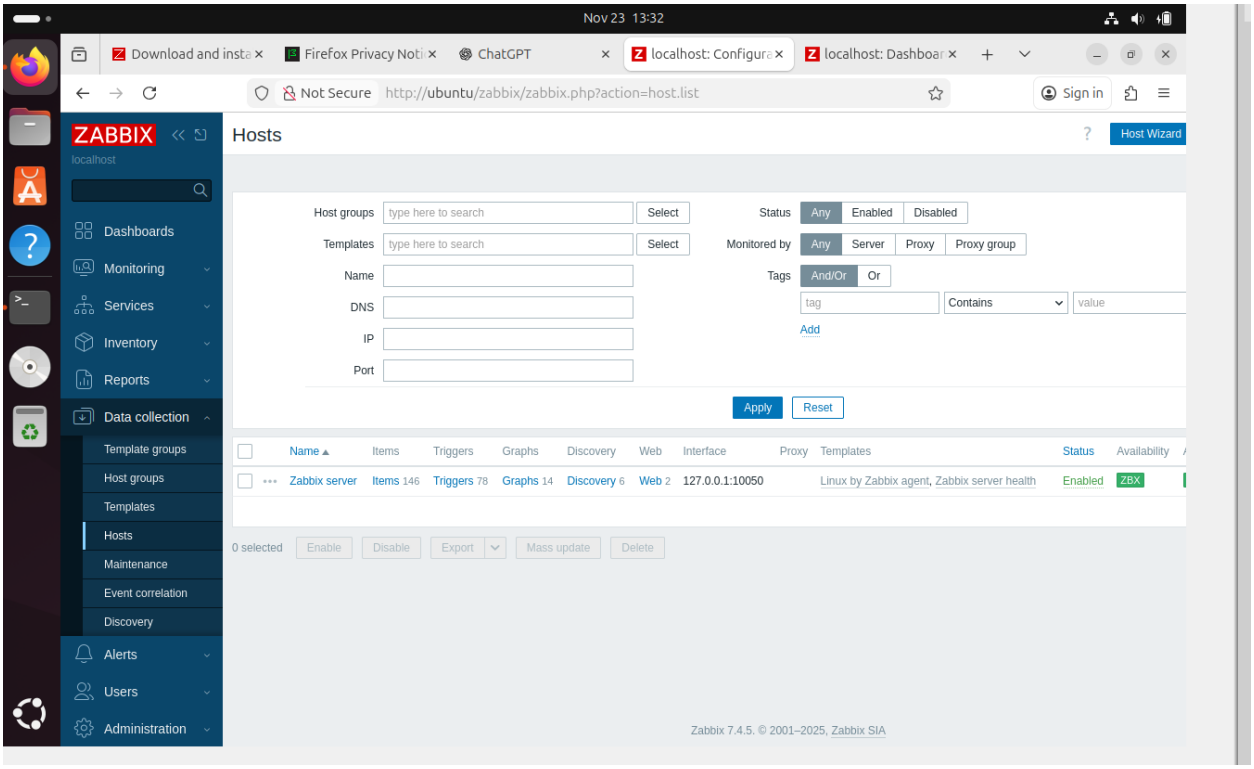


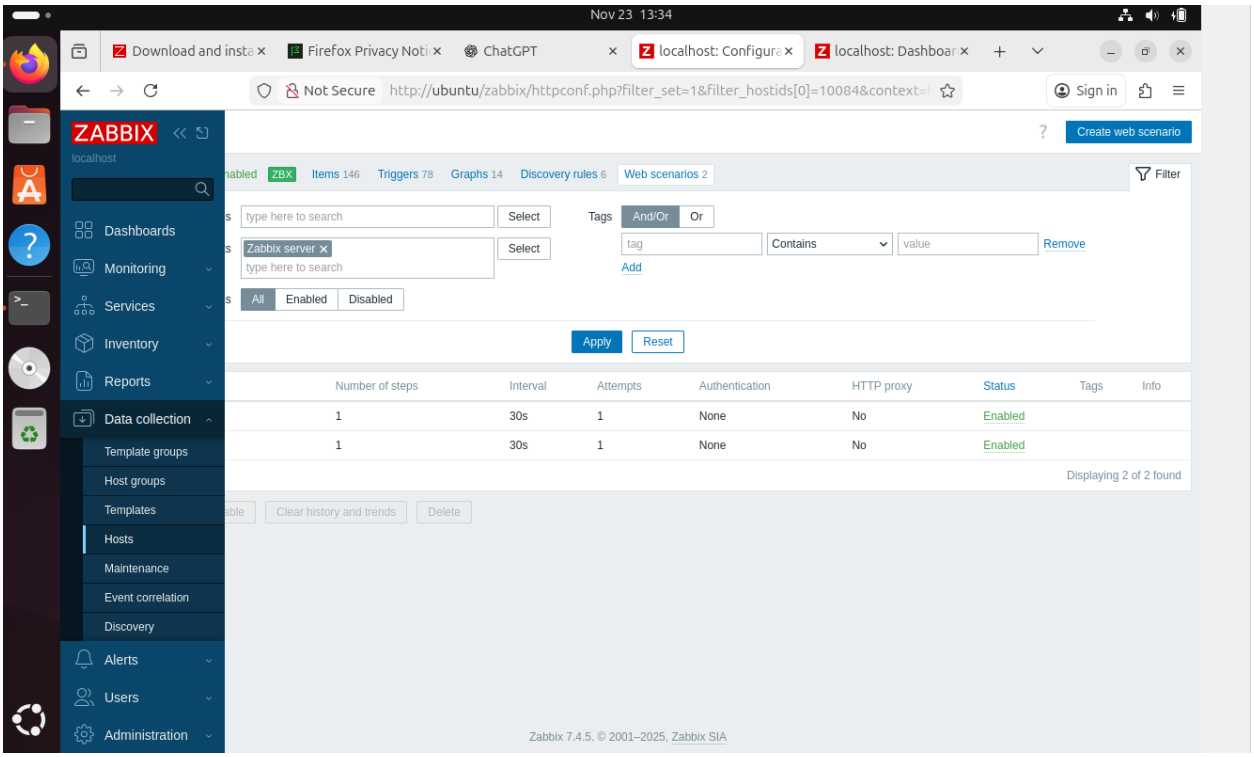
Monitoring web using Zabbix:

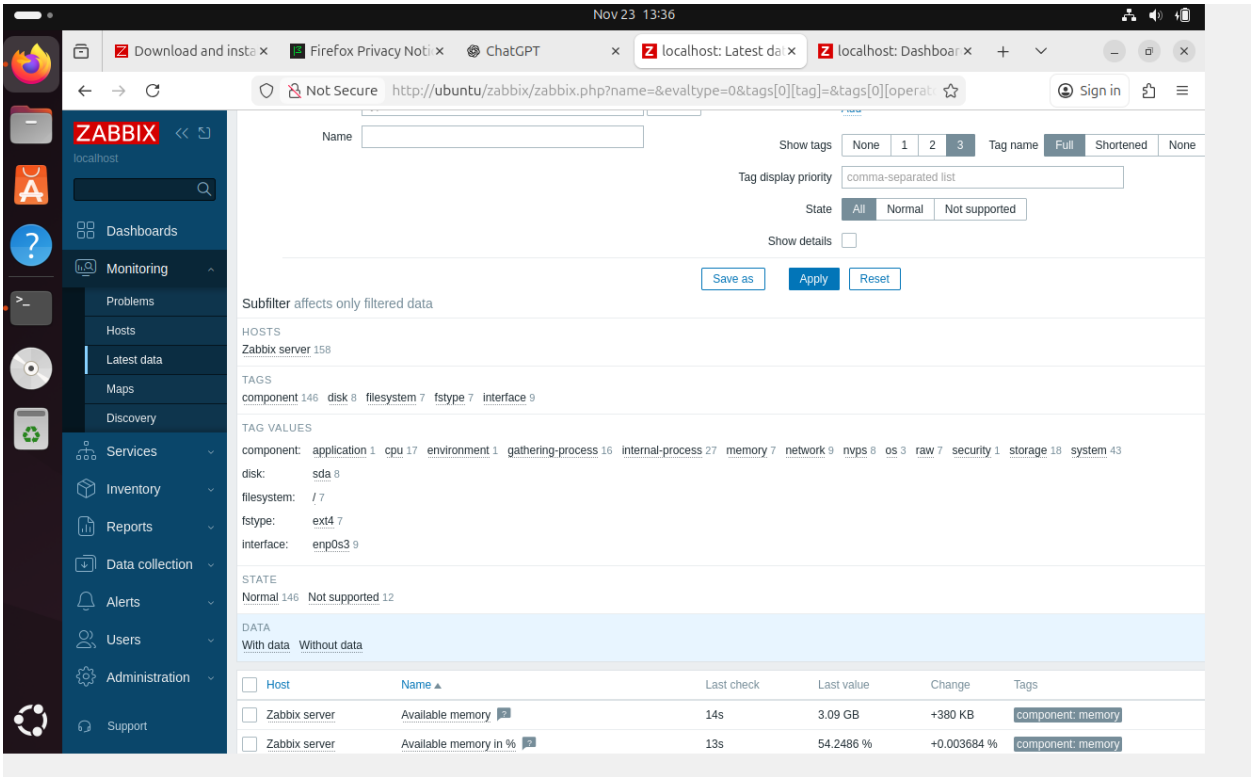
Step-1: Adding website to monitor

Select Data Collection=>Hosts=>web=>select create web scenario and add the websites wants to monitor

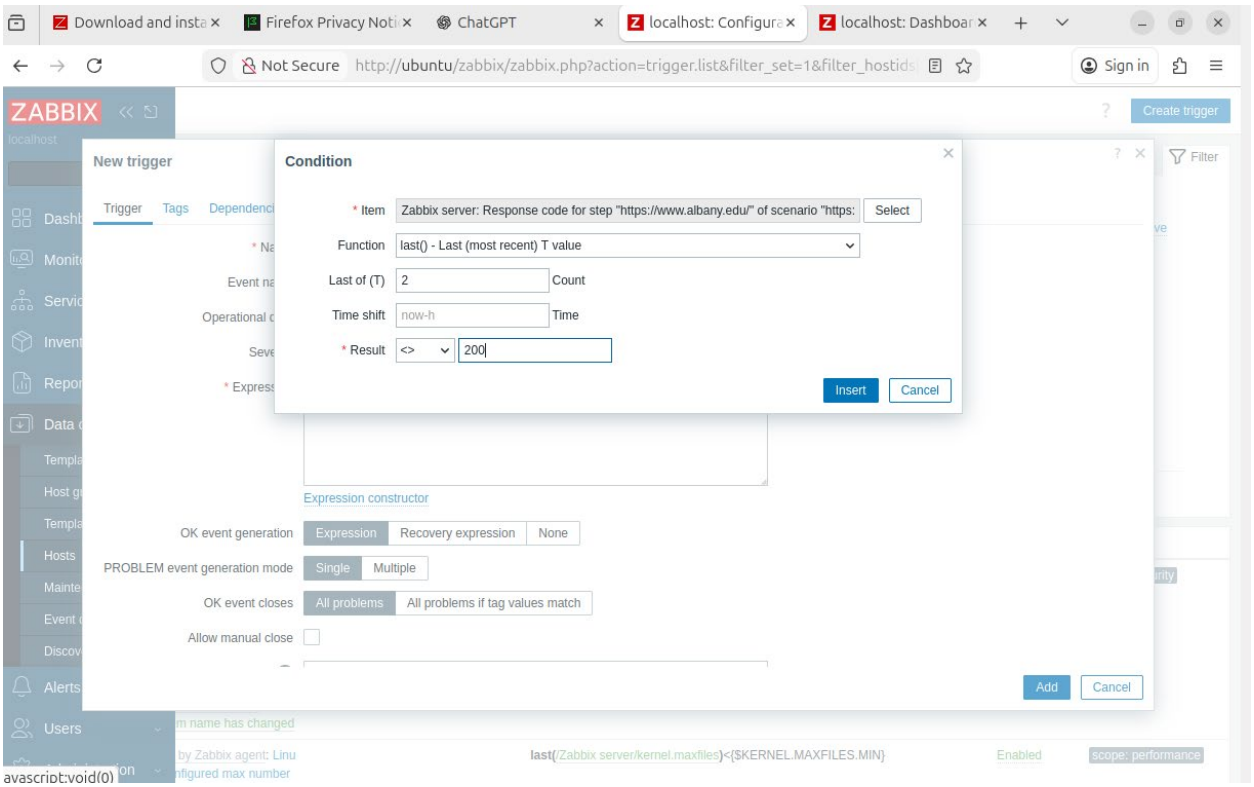
Step-2: select monitoring=>latest data=>select host Zabbix-server=>where you can observe the response code(200)

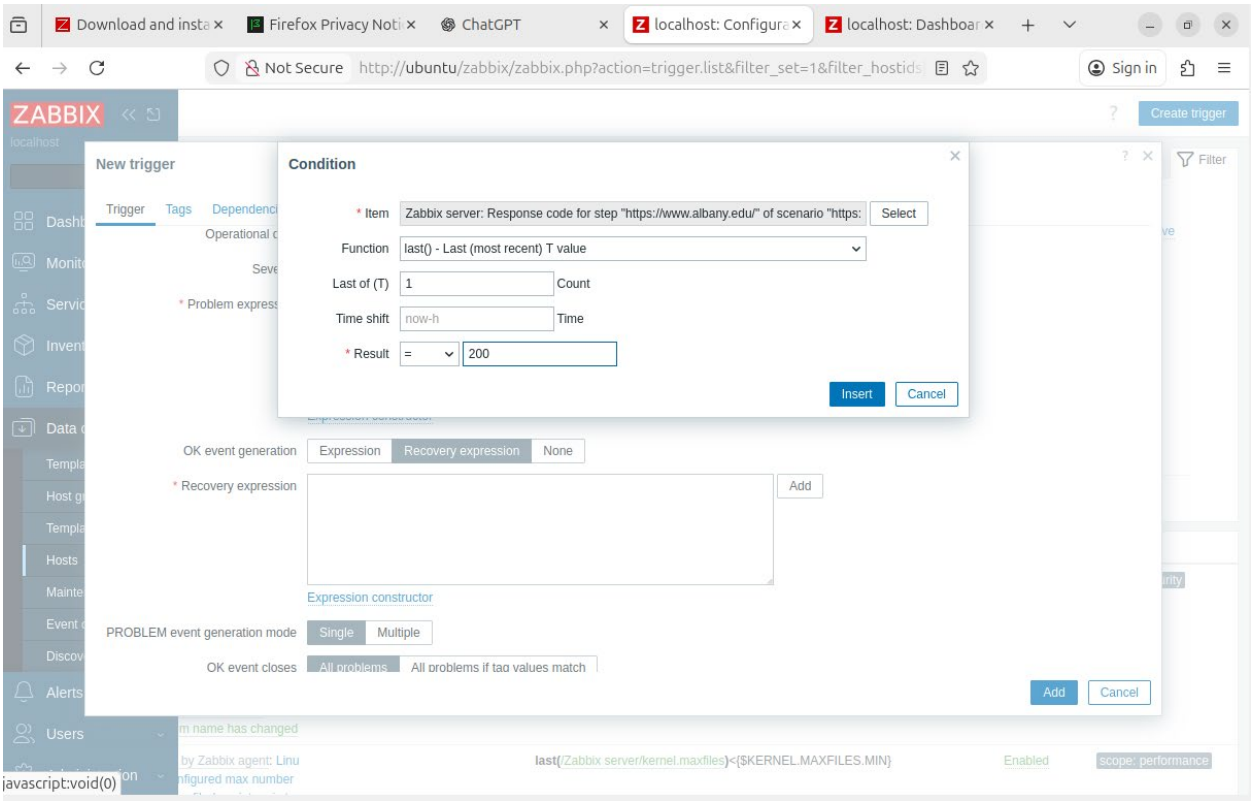


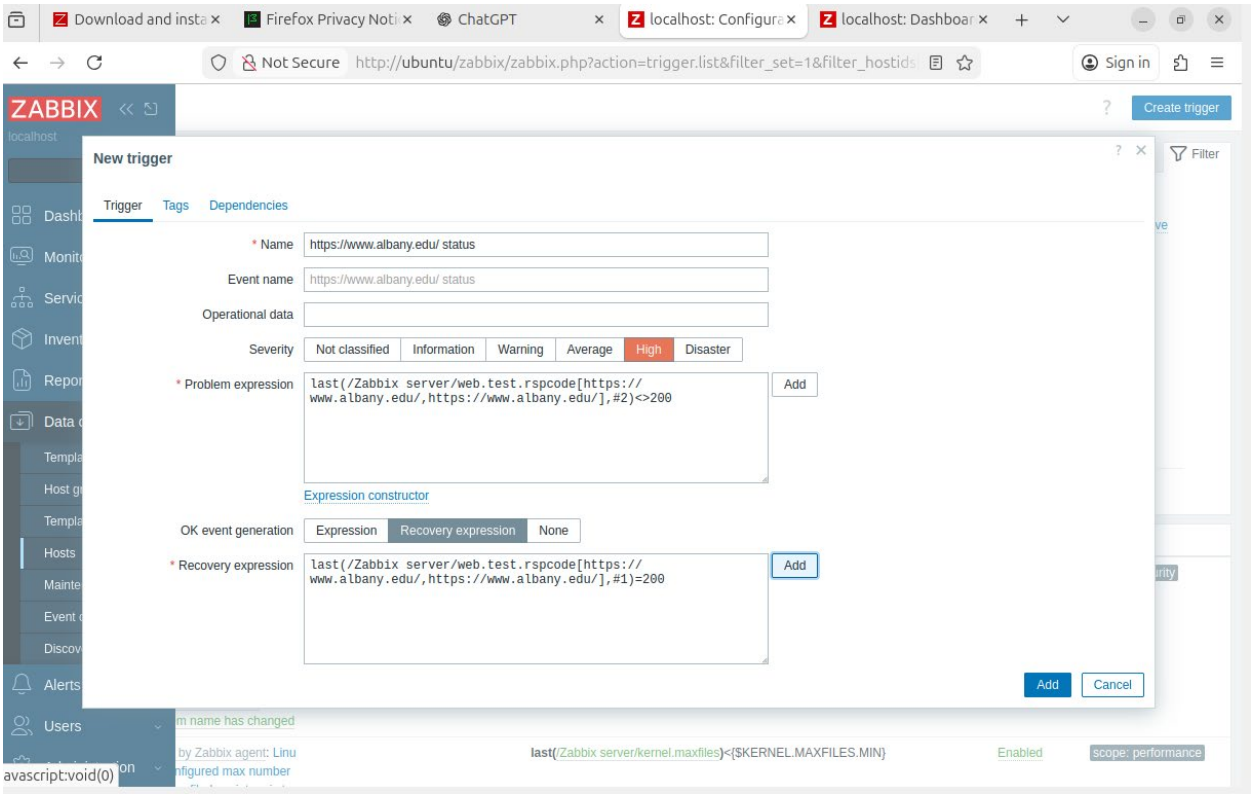


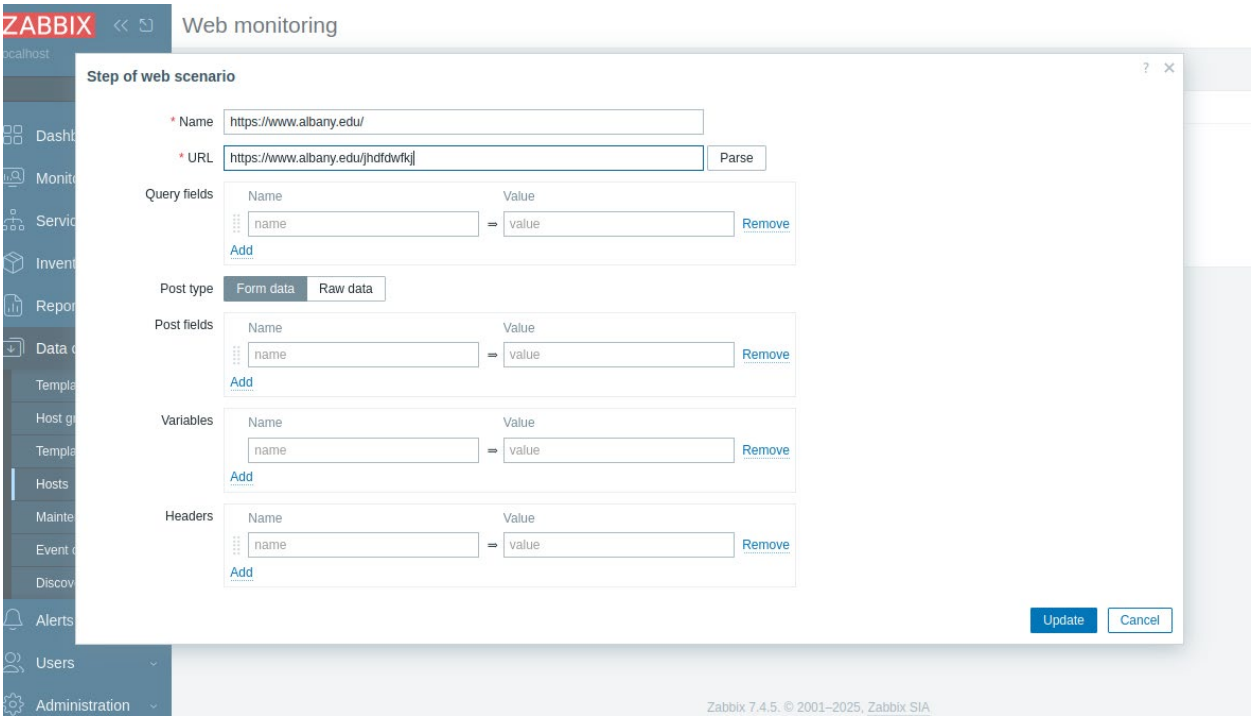


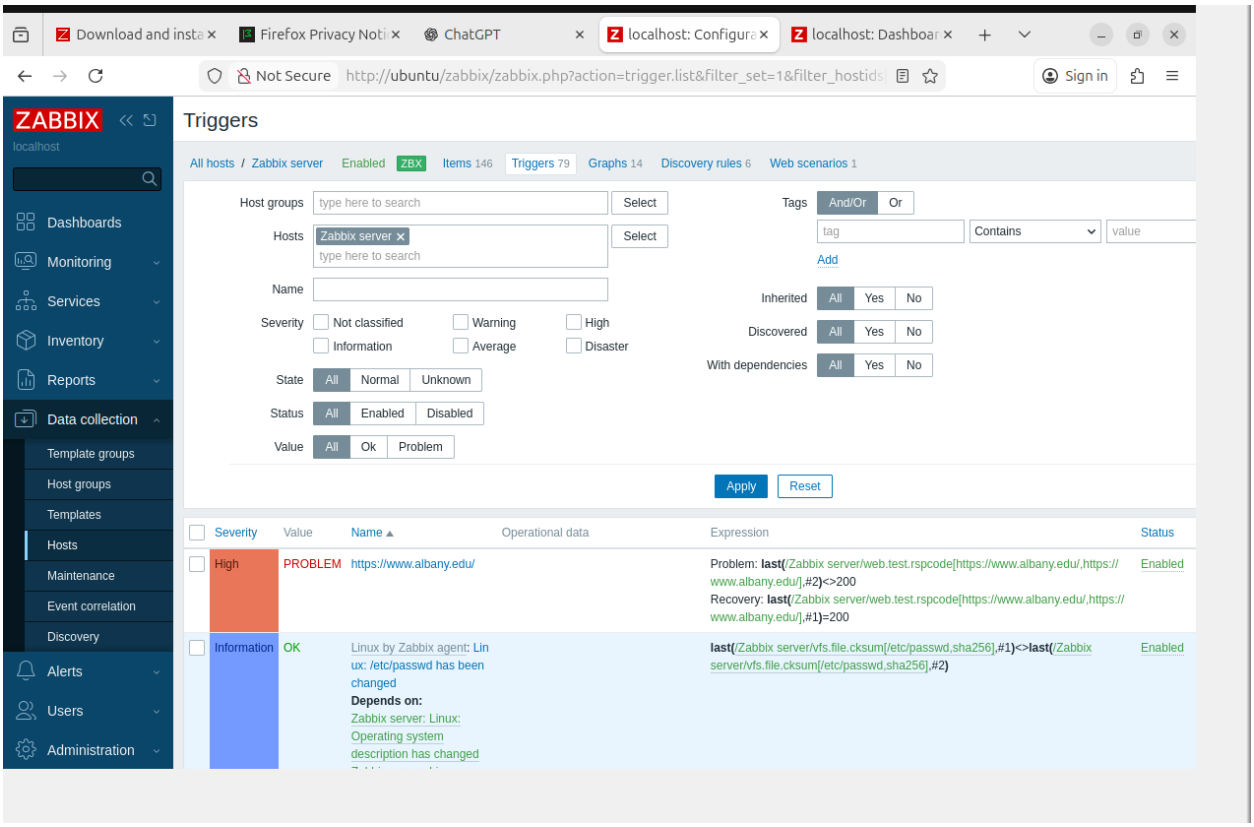
Zabbix server	Queue	7s	0	component: system
Zabbix server	Queue over 10 minutes	8s	0	component: system
Zabbix server	Response code for step "Google.com" of scenario "Goo…	27s	200	
Zabbix server	Response code for step "https://www.albany.edu/" of sce…	28s	200	


Download and insta
Firefox Privacy Noti
ChatGPT
localhost: Configura
localhost: Dashboar
Not Secure
http://ubuntu/zabbix/zabbix.php?action=trigger.list&filter_set=1&filter_hostids
Sign in
ZABBIX
Create trigger
New trigger
Trigger
Tags
Condition
* Item
Zabbix server: Response code for step "https://www.albany.edu/" of scenario "https:
Select
Function
last() - Last (most recent) T value
Last of (T)
2
Count
Time shift
now-h
Time
* Result
<>
200
Insert
Cancel
Filter
Expression constructor
OK event generation
Expression
Recovery expression
None
PROBLEM event generation mode
Single
Multiple
OK event closes
All problems
All problems if tag values match
Allow manual close
Add
Cancel
Alerts
Users
last(/Zabbix server/kernel.maxfiles)<{$KERNEL.MAXFILES.MIN}
Enabled
scope: performance
javascript:void(0)

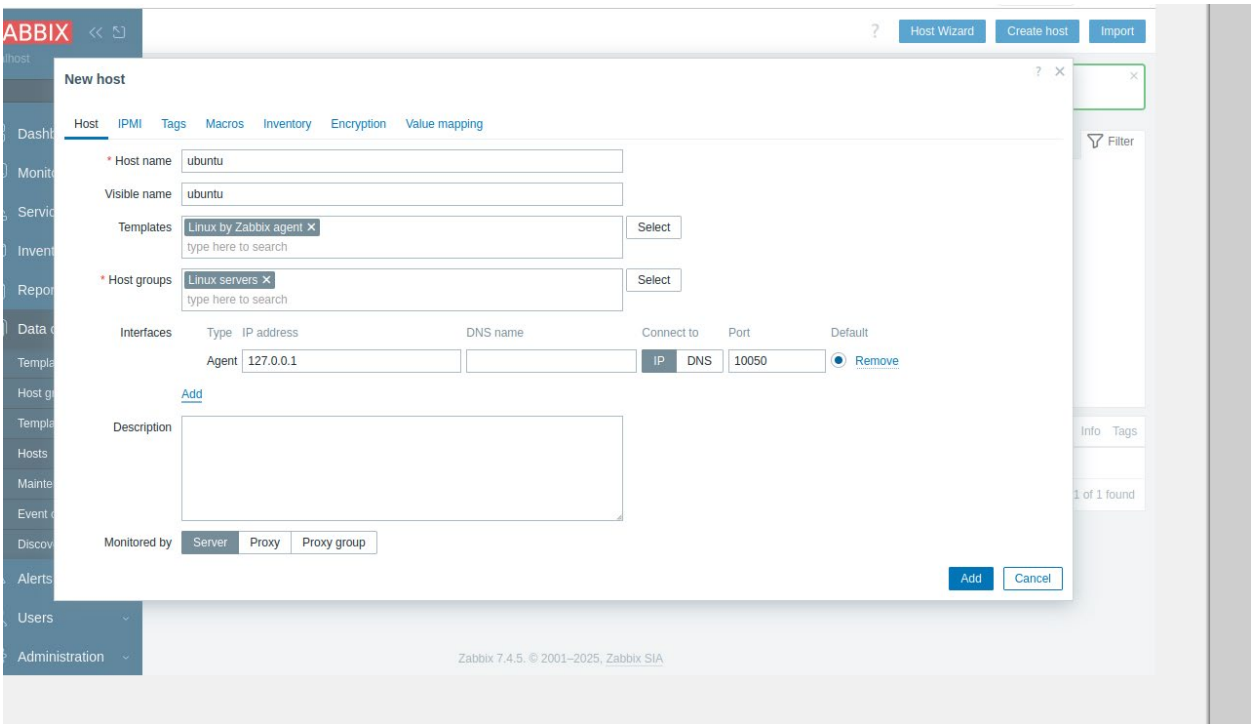

Download and insta
Firefox Privacy Noti
ChatGPT
localhost: Configura
localhost: Dashboar
Not Secure
http://ubuntu/zabbix/zabbix.php?action=trigger.list&filter_set=1&filter_hostids
Sign in
ZABBIX
Create trigger
New trigger
Trigger
Tags
Condition
* Item
Zabbix server: Response code for step "https://www.albany.edu/" of scenario "https:
Select
Function
last() - Last (most recent) T value
Last of (T)
1
Count
Time shift
now-h
Time
* Result
=
200
Insert
Cancel
Filter
OK event generation
Expression
Recovery expression
None
* Recovery expression
Add
Expression constructor
PROBLEM event generation mode
Single
Multiple
OK event closes
All problems
All problems if tag values match
Add
Cancel
Alerts
Users
last(/Zabbix server/kernel.maxfiles)<{$KERNEL.MAXFILES.MIN}
Enabled
scope: performance
javascript:void(0)

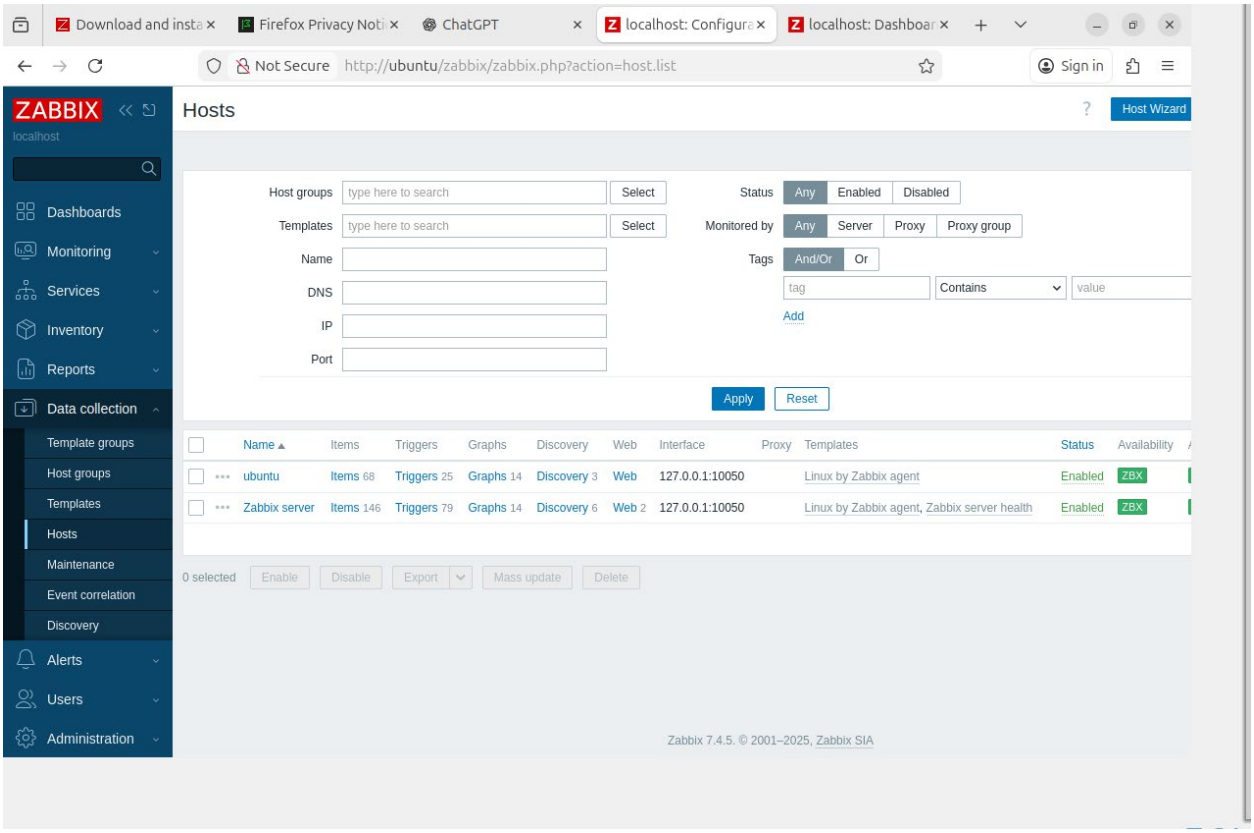

Download and insta
Firefox Privacy Noti
ChatGPT
localhost: Configura
localhost: Dashboar
Not Secure
http://ubuntu/zabbix/zabbix.php?action=trigger.list&filter_set=1&filter_hostids
Sign in
ZABBIX
Create trigger
New trigger
Trigger
Tags
Dependencies
* Name
https://www.albany.edu/ status
Event name
https://www.albany.edu/ status
Operational data
Severity
Not classified
Information
Warning
Average
High
Disaster
* Problem expression
last(/Zabbix server/web.test.rspcode[https://
www.albany.edu/,https://www.albany.edu/],#2)<>200
Add
Expression constructor
OK event generation
Expression
Recovery expression
None
* Recovery expression
last(/Zabbix server/web.test.rspcode[https://
www.albany.edu/,https://www.albany.edu/],#1)=200
Add
Add
Cancel
Filter
Hosts
Alerts
Users
Administration
avascript:void(0)
last(/Zabbix server/kernel.maxfiles)<{$KERNEL.MAXFILES.MIN}
Enabled
scope: performance

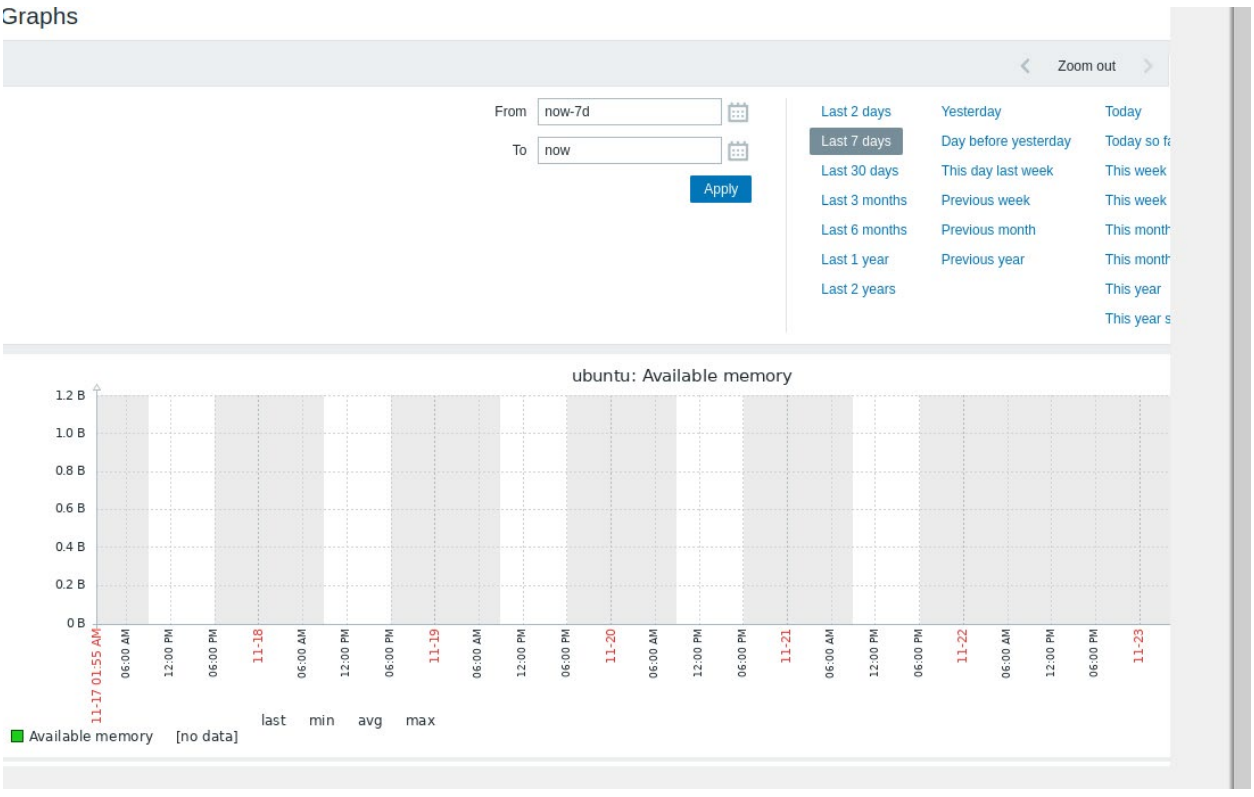

ZABBIX
Web monitoring
Step of web scenario
* Name
https://www.albany.edu/
* URL
https://www.albany.edu/jhdfdwfkj
Parse
Query fields
Name
Value
name
value
Remove
Add
Post type
Form data
Raw data
Post fields
Variables
Headers
Update
Cancel
Hosts
Alerts
Users
Administration
Zabbix 7.4.5. © 2001–2025, Zabbix SIA

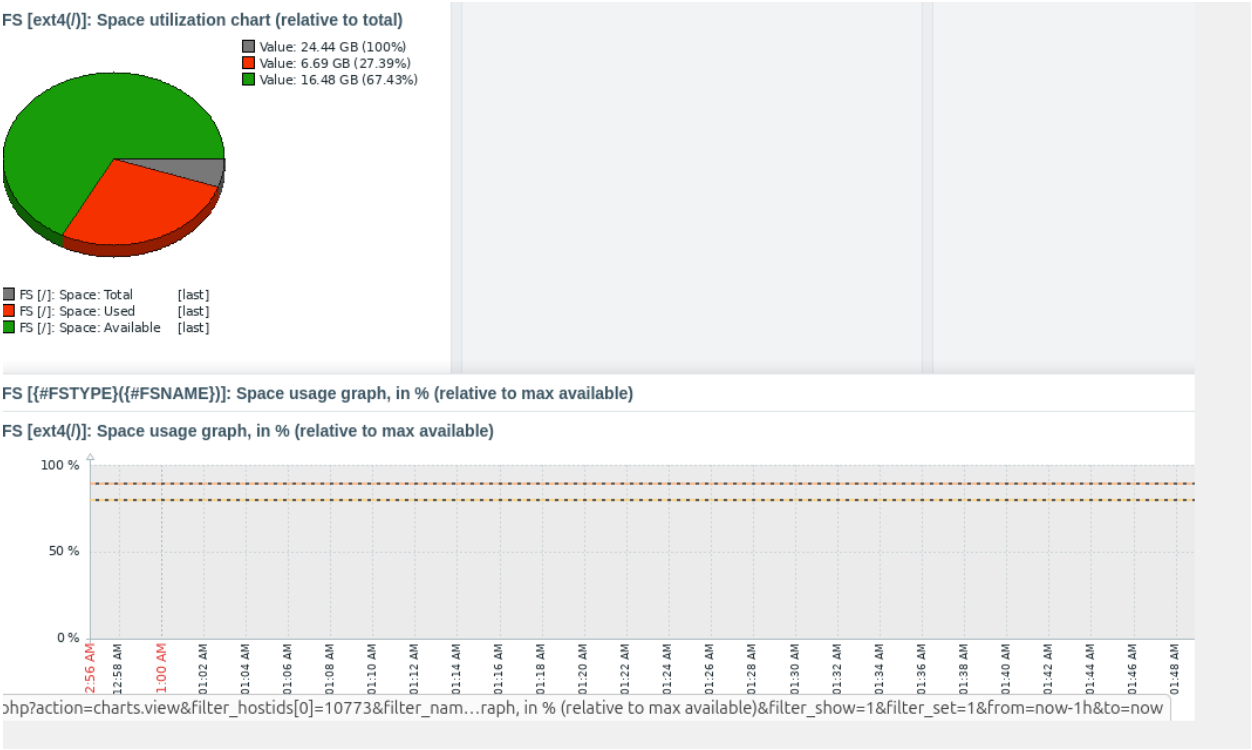


Creating ubuntu host




Download and insta
Firefox Privacy Noti
ChatGPT
localhost: Configura
localhost: Dashboar
Not Secure
http://ubuntu/zabbix/zabbix.php?action=host.list
Sign in
ZABBIX
localhost
Hosts
Host Wizard
Dashboards
Monitoring
Services
Inventory
Reports
Data collection
Template groups
Host groups
Templates
Hosts
Maintenance
Event correlation
Discovery
Alerts
Users
Administration
Host groups
type here to search
Select
Templates
type here to search
Select
Name
DNS
IP
Port
Status
Any
Enabled
Disabled
Monitored by
Any
Server
Proxy
Proxy group
Tags
And/Or
Or
tag
Contains
value
Add
Apply
Reset
Name
Items
Triggers
Graphs
Discovery
Web
Interface
Proxy
Templates
Status
Availability
ubuntu
Items 68
Triggers 25
Graphs 14
Discovery 3
Web
127.0.0.1:10050
Linux by Zabbix agent
Enabled
ZBX
Zabbix server
Items 146
Triggers 79
Graphs 14
Discovery 6
Web 2
127.0.0.1:10050
Linux by Zabbix agent, Zabbix server health
Enabled
ZBX
0 selected
Enable
Disable
Export
Mass update
Delete
Zabbix 7.4.5. © 2001–2025, Zabbix SIA


Graphs
Zoom out
From
now-7d
To
now
Apply
Last 2 days
Last 7 days
Last 30 days
Last 3 months
Last 6 months
Last 1 year
Last 2 years
Yesterday
Day before yesterday
This day last week
Previous week
Previous month
Previous year
Today
Today so fa
This week
This week
This month
This month
This year
This year s
ubuntu: Available memory
1.2 B
1.0 B
0.8 B
0.6 B
0.4 B
0.2 B
0 B
11-17 01:55 AM
06:00 AM
12:00 PM
06:00 PM
11-18
11-19
11-20
11-21
11-22
11-23
last
min
avg
max
Available memory
[no data]



Conclusion:

In this project, Zabbix was successfully installed and configured on an Ubuntu virtual machine to monitor both an external website and a local system. By setting up web monitoring for the UAlbany website and deploying the Zabbix Agent on the Ubuntu host, the project demonstrated how real-time system data, performance metrics, and availability checks can be collected and analyzed through a centralized dashboard. This hands-on experience showed how monitoring tools play a vital role in cybersecurity by helping detect problems early, identify unusual activity, and maintain system reliability.

Future enhancements can include fully implementing email alerting, monitoring multiple hosts, and applying anomaly detection models for predictive risk analysis. Overall, the project provided valuable practical skills in Linux administration, system monitoring, and the use of open-source tools that are essential for cybersecurity and digital forensics work.