  
***Internet Service Protocols***

***Labe 4***

**SNMP**

**📝 kheder hassoun**

1. **Write a Short Description About SNMP and Its Features ?**

⚠ Resource (geeksforgeeks.org)

If an organization has 1000 devices, then to check all devices, one by one every day, are working properly or not is a hectic task. To ease these up, a Simple Network Management Protocol (SNMP) is used.

**Simple Network Management Protocol (SNMP)**

SNMP is an application layer protocol that uses UDP port number 161/162.SNMP is used to monitor the network, detect network faults, and sometimes even to configure remote devices.

**Components of SNMP**

**There are mainly three components of SNMP:**

1. **SNMP Manager –**   
   It is a centralized system used to monitor the network. It is also known as a Network Management Station (NMS). A router that runs the SNMP server program is called an agent, while a host that runs the SNMP client program is called a manager.
2. **SNMP agent –**   
   It is a software management software module installed on a managed device. The manager accesses the values stored in the database,
3. **Management Information Base –**   
   MIB consists of information on resources that are to be managed. This information is organized hierarchically. It consists of objects instances which are essentially variables.

**Advantages of SNMP**

* 1. It is simple to implement.
* 2. Agents are widely implemented.
* 3. Agent level overhead is minimal.
* 4. It is robust and extensible.
* 5. Polling approach is good for LAN based managed object.
* 6. It offers the best direct manager agent interface.
* 7. SNMP meet a critical need.

**Limitation of SNMP**

* 1. It is too simple and does not scale well.
* 2. There is no object-oriented data view.
* 3. It has no standard control definition.
* 4. It has many implementations specific (private MIB) extensions.
* 5. It has high communication overhead due to polling

1. **Mention the most important tools used for network monitoring (both open-source and commercial)**

⚠ Resource ([netwrix.com](https://blog.netwrix.com/2023/12/27/network-monitoring-tools/))

**Network Monitoring Tools: Open Source vs. Commercial**

**Open Source:**

* **Nagios**



* Highly customizable with a large community and extensive plugin support for comprehensive monitoring.
* **Zabbix**



* Offers real-time alerts, advanced visualization, and scalability for complex network monitoring.
* **Prometheus**



* Reliable and performant, designed for high-dimensional data collection and querying (often integrated with Grafana for visualization).
* **Icinga**



* Modular design with strong community support and a wide range of plugins for network and application monitoring.
* **Cacti**



* Easy to set up and use, known for its extensive templates and graphing capabilities (front-end for RRDTool).
* **Wireshark**



* Deep inspection of network traffic with live capture and offline analysis capabilities (protocol analyzer).

**Commercial:**

* **SolarWinds Network Performance Monitor (NPM)**



* User-friendly interface with advanced alerting, customizable dashboards, and automatic network discovery for comprehensive network monitoring.
* **PRTG Network Monitor**



* Easy setup with customizable alerts, extensive reporting, and auto-discovery for all-in-one network monitoring of availability and bandwidth usage.
* **ManageEngine OpManager**



* Provides real-time network monitoring with powerful visualization tools and automated workflows for managing complex networks.

1. **Provide an introduction to the Zabbix tool.**

## What is Zabbix?

Zabbix is an open-source monitoring software tool for diverse IT components, including networks, servers, virtual machines (VMs) and cloud services. Zabbix provides monitoring metrics, such as network utilization, CPU load and disk space consumption. The software monitors operations on Linux, Hewlett Packard Unix, Mac OS X, Solaris and other operating systems (OSes); however, Windows monitoring is only possible through agents.

1. **Describe the features of the Zabbix tool.**
2. **Automatic discovery:** Zabbix can automatically find and add new devices to your network for monitoring.
3. **Multiple monitoring methods:** It can collect data using various methods, including SNMP, agents, and IPMI.
4. **Flexible data collection:** Zabbix allows you to define what data to collect and how often.
5. **Alerts and notifications:** It can send alerts and notifications when something goes wrong.
6. **Visualization tools:** Zabbix provides dashboards and reports to help you visualize your monitoring data.
7. **Scalability:** Zabbix can be used to monitor small networks or large enterprises.
8. **How Zabbix Works for Network Monitoring.**

⚠ Resource ([techtarget.com](https://www.techtarget.com/searchitoperations/definition/Zabbix))

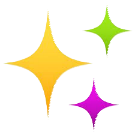
Zabbix works via three discovery mode options:

* **Network discovery.** Periodically scans an IT environment and records a device's type, IP address, status, uptimes and downtimes.
* **Low-level discovery.** Automatically creates items, triggers and graphs based on the discovered device. Low-level discovery can create metrics from Simple Network Management Protocol object identifiers, Windows services, Open Database Connectivity Structured Query Language queries and network interfaces.
* **Active agent auto registration.** Automatically starts monitoring any discovered device using a Zabbix agent.

With Zabbix distributed monitoring, remotely run scripts collect data from multiple devices in distributed locations and combine that data in one dashboard or report, such as server availability across the country.

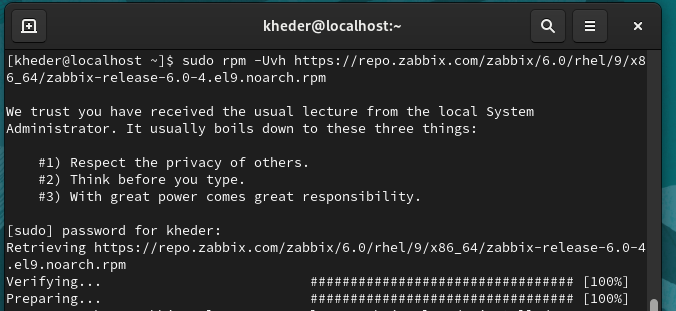
1. **Comparison Between Zabbix and Other Tools.**

|  |  |  |  |
| --- | --- | --- | --- |
| Feature | Zabbix | Nagios Core | Prometheus |
| Focus | All-around infrastructure monitoring | Network & service monitoring | Server & application monitoring (time-series data) |
| Open Source | Yes (Free & Paid) | Yes (Free & Paid) | Yes |
| Ease of Use | Moderately easy | More complex | Easier |
| Scalability | Highly Scalable | Scalable | Highly Scalable |
| Data Collection | SNMP, Zabbix Agent, JMX, IPMI, Custom Scripts | SNMP, Plugins | Pulls data via exporters |
| Alerting | Flexible alerting with various notification methods | Flexible alerting | Alerting based on thresholds |
| Visualization | Built-in dashboards and reports | Requires additional plugins (NagVis) | Excellent for time-series data visualization |
| Community & Support | Large & active community, paid support available | Large community, limited free support | Large & active community |
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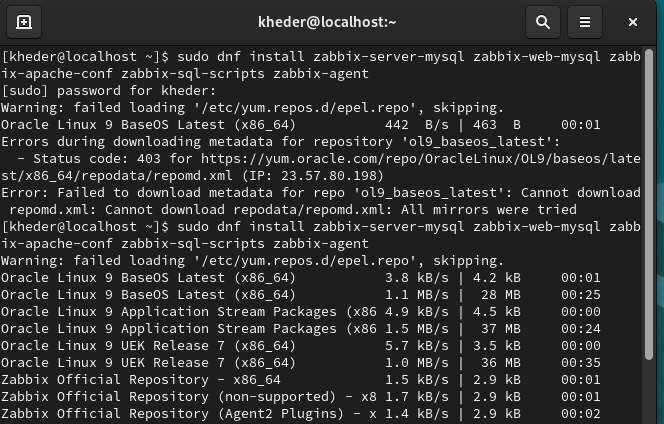


**Finally practical Part**

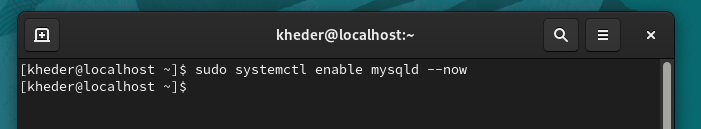
|  |
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| * **installs the Zabbix repository package**   **Sudo rpm – Uvh https://repo.zabbix.com/zabbix/6.0/rhel/9/x86\_64/zabbix-release-6.0-4.el9.noarch.rpm** |

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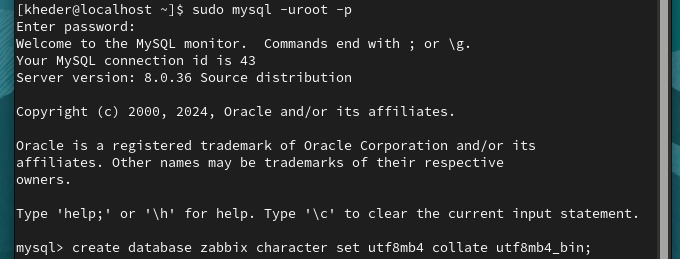
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| * **installs the Zabbix server, web interface, Apache configuration, SQL scripts, and agent on a system using the dnf package manager with elevated privileges.**   **sudo dnf install zabbix-server-mysql zabbix-web-mysql zabbix-apache-conf zabbix-sql-scripts zabbix-agent** |



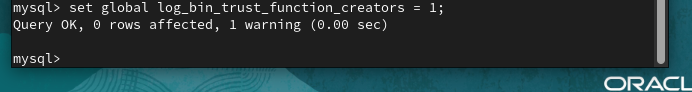
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| * **enables and starts the MySQL database service immediately, ensuring it starts on boot.**   **sudo systemctl enable mysqld –now** |



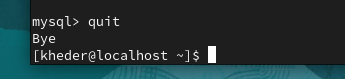
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| * **log into MySQL as the root user, create a database named zabbix with UTF-8 encoding, and create a user zabbix with a specified password.**   **sudo mysql -uroot -p**  **mysql> create database zabbix character set utf8mb4 collate utf8mb4\_bin;**  **mysql> create user zabbix@localhost identified by 'password';** |



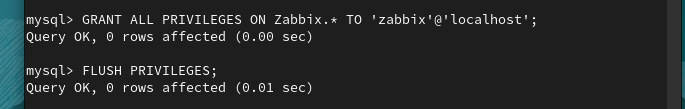
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| * **sets the global MySQL variable log\_bin\_trust\_function\_creators to 1, allowing the creation of stored functions and triggers by non-super users**   **set global log\_bin\_trust\_function\_creators = 1;** |



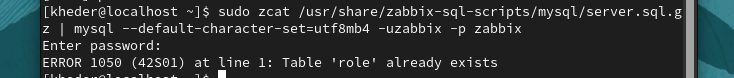
**✔ This is the reason Why I love MySQL ❤**

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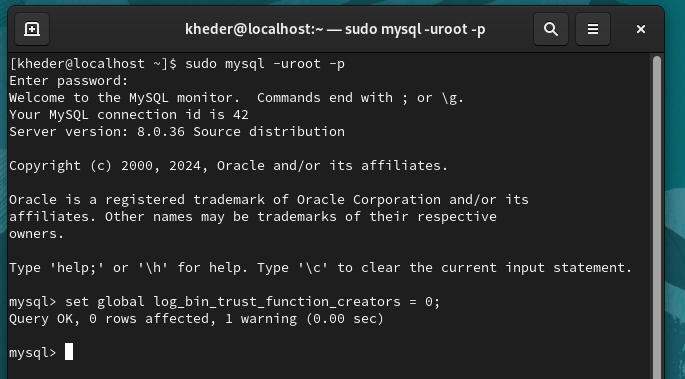
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| * **Give some permissions because I can’t do the next step of import initial schema and data GRANT ALL PRIVILEGES ON Zabbix.\* TO 'zabbix'@'localhost';**   **FLUSH PRIVILEGES;** |



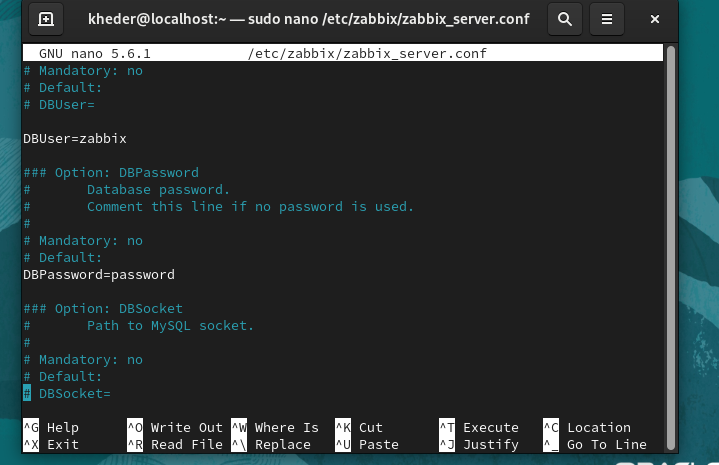
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| **sudo zcat /usr/share/zabbix-sql-scripts/mysql/server.sql.gz | mysql --default-character-set=utf8mb4 -uzabbix -p Zabbix**  **(error already installed not actual error 😁)** |



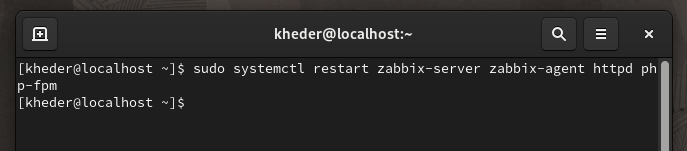
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| * **sets the global MySQL variable log\_bin\_trust\_function\_creators back to 0, disabling the ability for non-super users to create stored functions and triggers.**   **set global log\_bin\_trust\_function\_creators = 0;** |



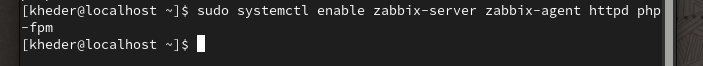
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| **Configure the database for Zabbix server by editing file /etc/zabbix/zabbix\_server.conf** |



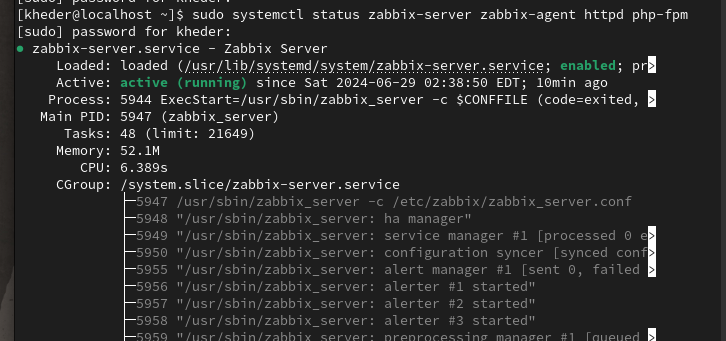
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| * **Start Zabbix server and agent processes**   **sudo systemctl restart zabbix-server zabbix-agent httpd php-fpm** |



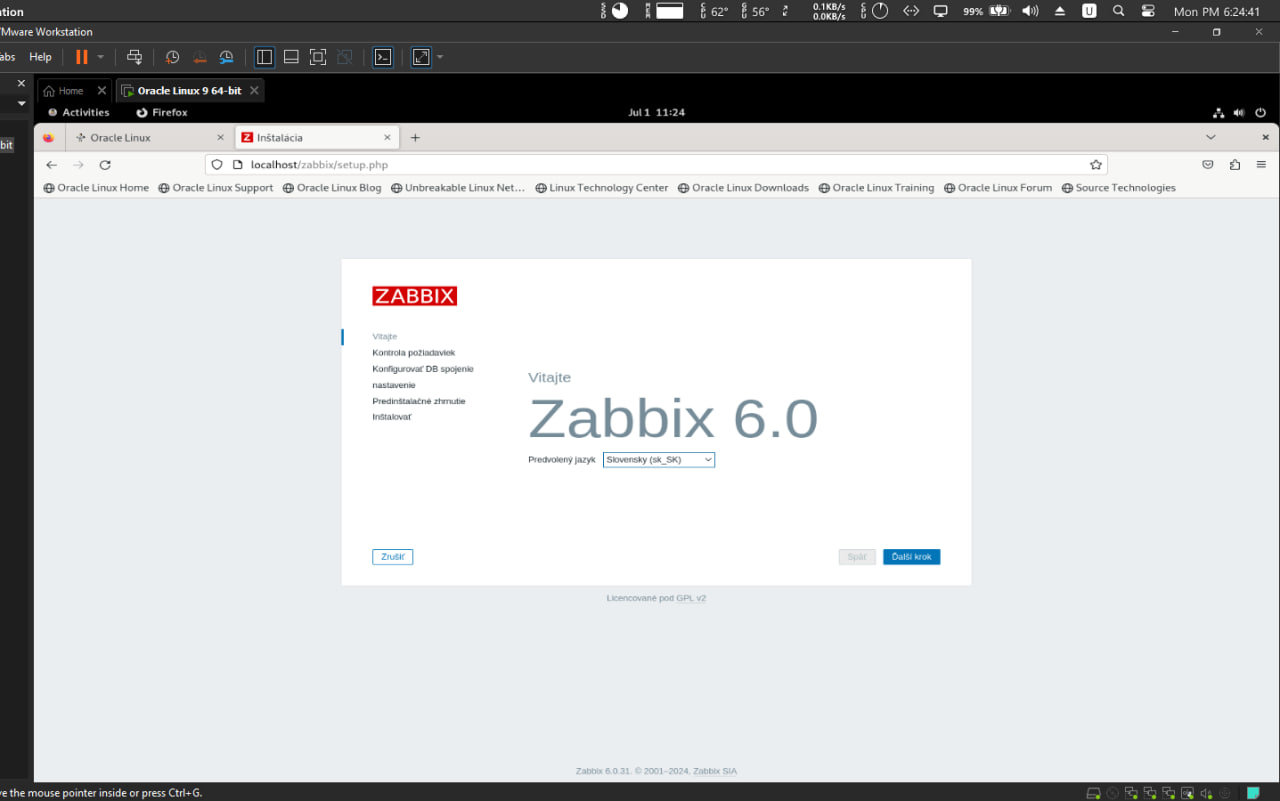
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| **[kheder@localhost ~]$ sudo systemctl enable zabbix-server zabbix-agent httpd php-fpm** |

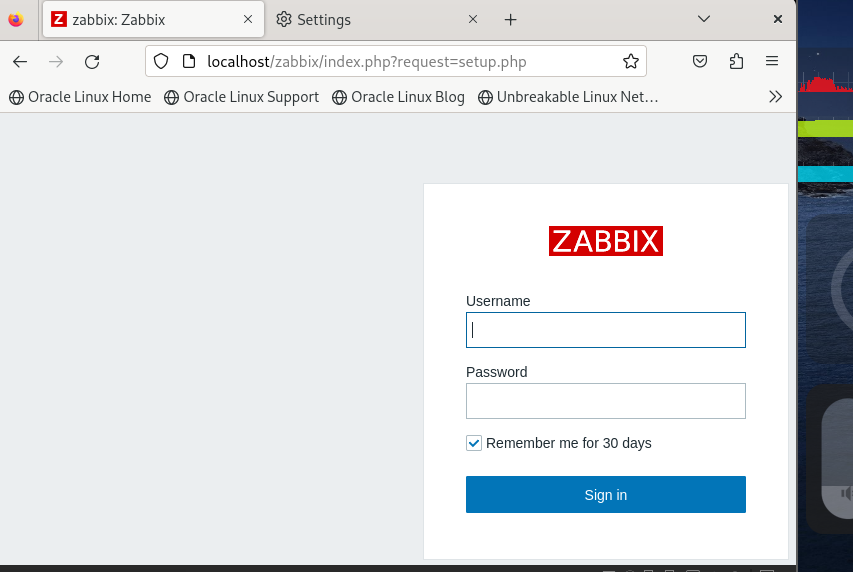


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| **No output because it’s already Enabled**  **Let’s check status**  **sudo systemctl status zabbix-server zabbix-agent httpd php-fpm** |



|  |
| --- |
| Open [**http://localhost/zabbix/setup.php**](http://localhost/zabbix/setup.php) |





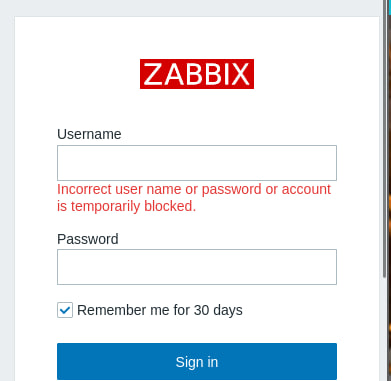
**I tried**

**Username: Admin**

**Password:password**

**As the documentation said But !!**

**It Doesn’t Work 💔💔💔💔💔💔💔💔💔💔💔💔💔💔💔**



After searching for Hours

I found that I have to set the Hash of the password

|  |
| --- |
| update zabbix.users set passwd='$2a$12$gJJZ9FvHYVdPfZd/Lk1XOeEQM1vJAgkPKUO6GFYNzoNBtqE6m.3Zq' where username='Admin'; |

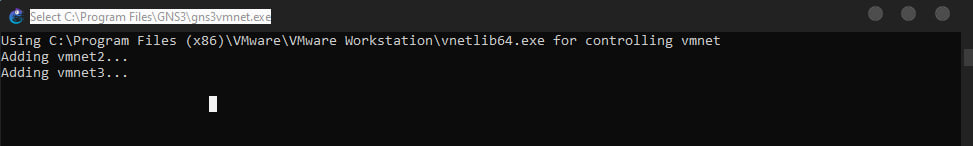
Then it’s Works 🥰😁

* Now let’s build the network and connect the Gns3 with VMware

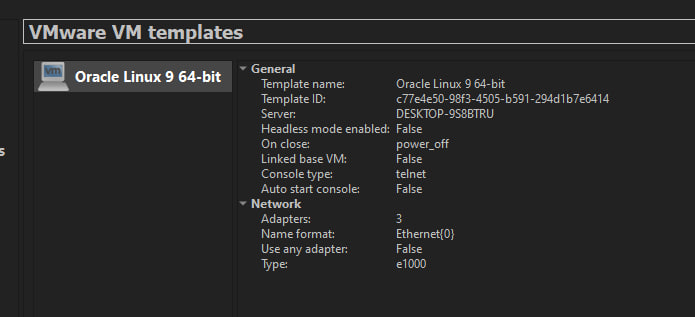
**(in this section I handle hundreds of Problems 😥 )**

One of these problems destroyed the VM and I just repeat everything 💔

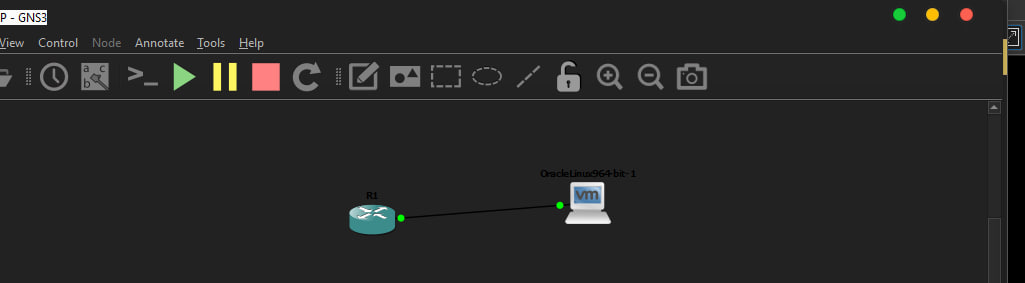
* Firstly, let’s configure the adapters



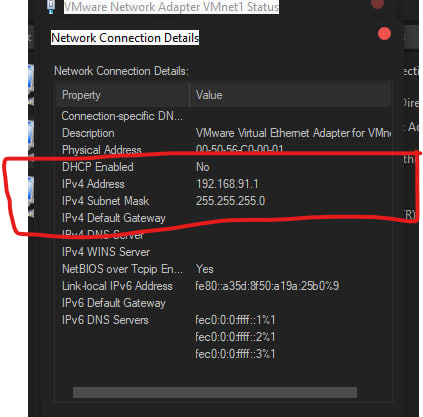
* Now let’s build our VM template

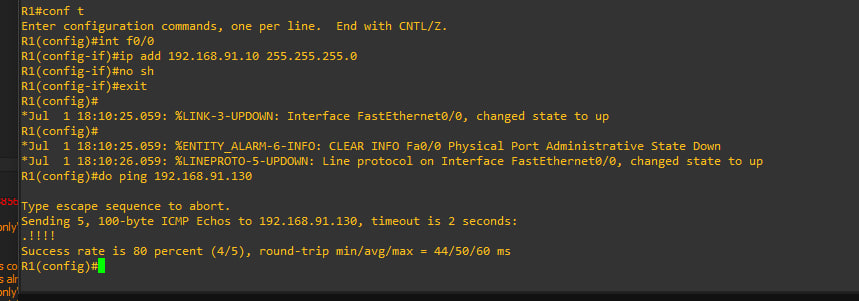


* Now the network

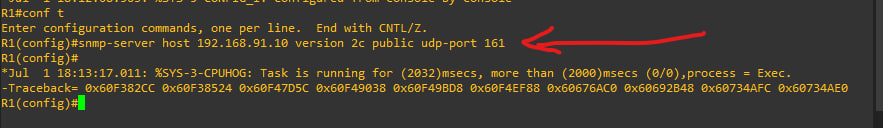


* Then configure the router with IP in the same network of adapter

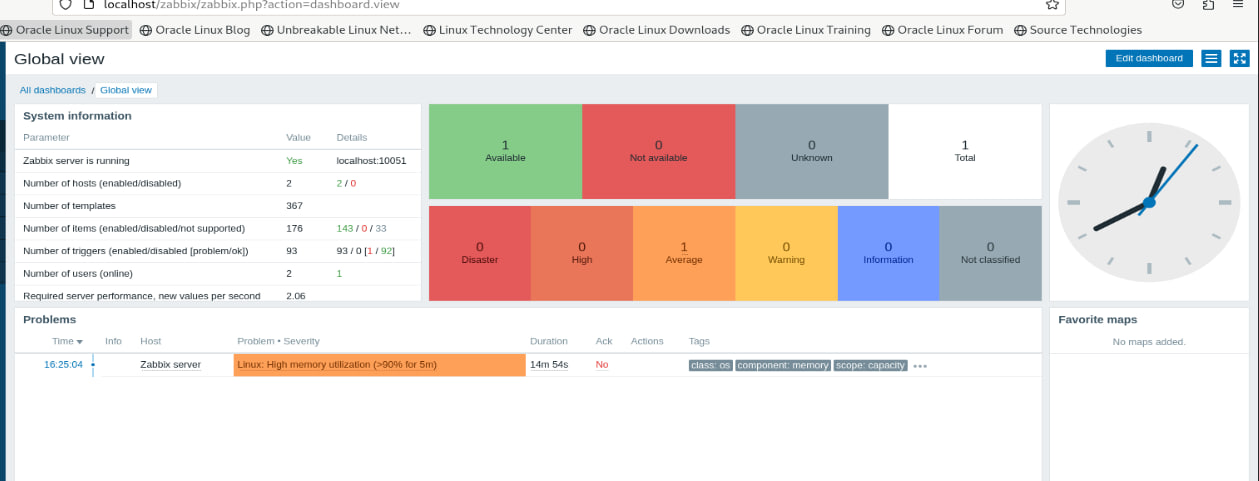




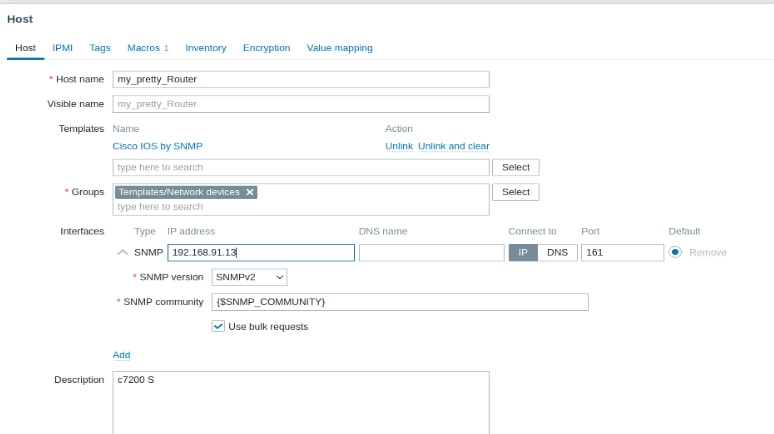
* Enable SNMP



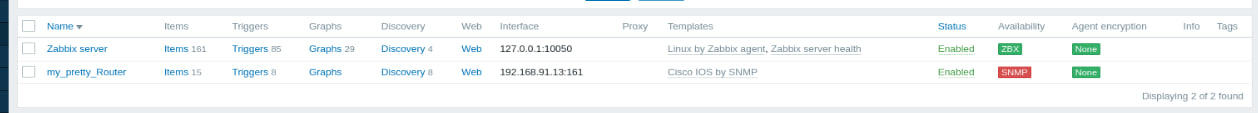
* The pretty dashboard 😍



* Let’s add our Router I named it ( **my pretty Router** )

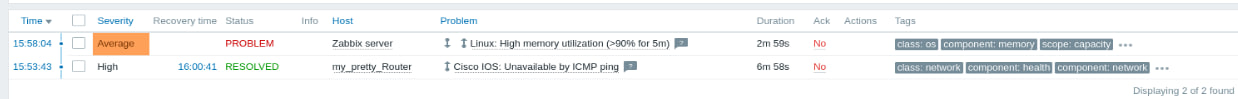


* Let’s see the hosts



* Let’s see the problems

now it’s okay but we can see proplem in sever (height memory)

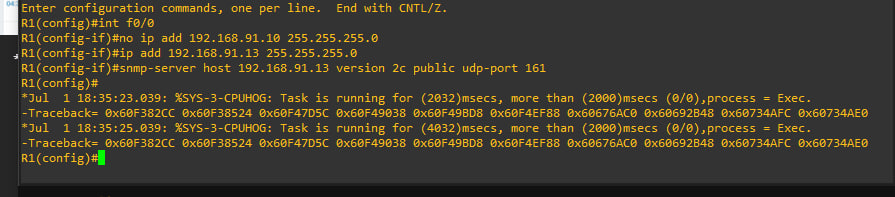


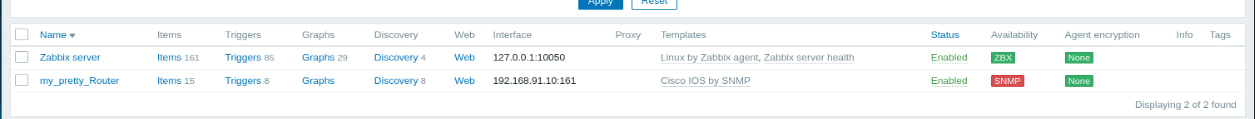
* Now it’s good



**😎 Let’s Make some Problems 😏😏**

* Change Router IP (192.168.91.10 => 192.168.91.13 )

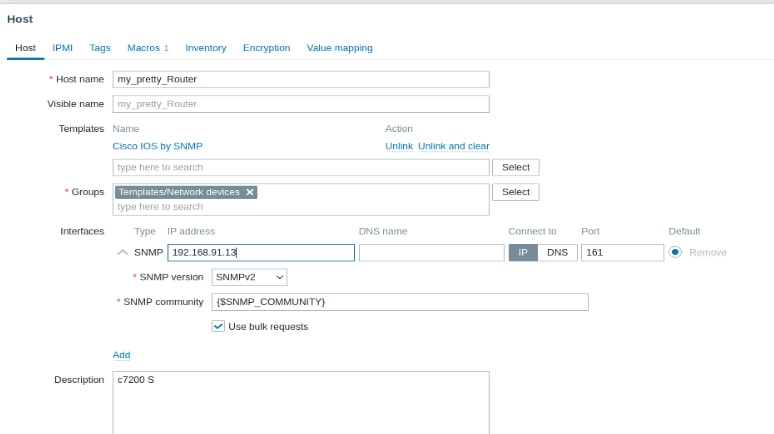


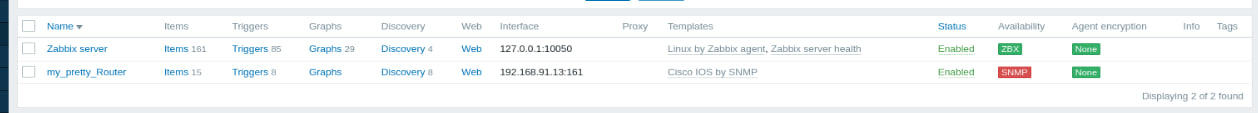


* And here we go it’s down



* let’s fix it in Zabbix configuration hosts

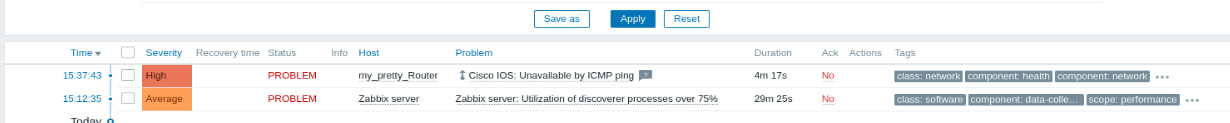




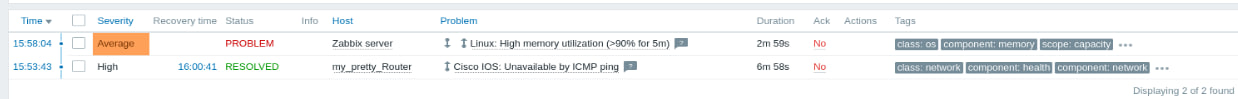
* now everything is back good



* we can also just shutdown the interface



* after enabling it again



And that’s it 😁😁😁😁

Finally, I will delete the Oracle’s VM 🥰

**Thanks**

**🥰🤍🥰**