



GROUP PORTFOLIO 2 ASSIGNMENT

Docker and Zabbix Real Use-Case

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Introduction

This assignment was done on both WSL, windows subsystems for Linux, and tested on the intell server provided by the university. The Zabbix version used is version 6.0, and it is the same version throughout the whole assignment. In the first section, we implemented a docker-compose stack, defined a docker bridge network, as well as volume mount and configuration of the docker containers. In the second section, we implemented and used the Zabbix monitoring tool. We configured a Zabbix Proxy and a Zabbix Agent in each virtual machine and configured a connection between the Zabbix Server to the proxy and agent. In the third section, we installed, configured, and started a web server that was connected to localhost and redirected the Zabbix-server frontend. The fourth section included the Zabbix frontend, basic host adding, psk encryption usage, and templates with items and triggers.

Zabbix and Docker

Zabbix is a software that monitors parameters of a network and the status of a server, virtual machine, applications, databases, websites and more. Zabbix, among other things, helps catch server problems faster by flexible notification mechanisms. Zabbix server is a repository that stores all configuration, statistics, and operations. Agent also reports availability and integrity information and statistics to the server. Zabbix proxy collects data for the Zabbix server. The Zabbix Agent's purpose is the monitoring of the status of system resources such as CPU load, network utilization, hard drivers, statistics, and more. Docker compose is used to define and share multiple container applications. With Docker compose, you can create YAML/YML files, define application stacks in a file, and much more.

VM1: Docker containers setup

We started by setting up the docker containers by creating docker-compose stacks with Zabbix-server -MySQL, Zabbix-server-web, MySQL-server, and Zabbix-agent. We defined a docker bridge network for the stack and assigning an ipv4 address for each docker container in the correct subnet, along with the correct gateway for the subnet. The reason for using a bridge network will allow the containers to connect to the same bridged network and be able to communicate with each other. We started by creating all the Zabbix containers and MySQL container. In the docker compose file, we created a network for the Zabbix and MySQL, so they would have permanent ip-addresses.

```
mysql-server:
  image: haakco/mysql80
  ports:
    - 3306:3306
  hostname: mysql-server
  container_name: mysql-server
  restart: unless-stopped
  volumes:
    - mysql-database:/var/lib/mysql
  environment:
    - MYSQL_ROOT_PASSWORD=123
    - MYSQL_DATABASE=zabbix
    - MYSQL_USER=zabbix
    - MYSQL_PASSWORD=123
  cap_add:
    - SYS_NICE
  networks:
    compose_network:
      ipv4_address: 172.25.0.5
```

Figure 1. MySQL server

```
zabbix-server:
  image: zabbix/zabbix-server-mysql
  ports:
    - 10051:10051
  hostname: zabbix-server
  container_name: zabbix-server
  restart: unless-stopped
  volumes:
    - zabbix-server-config:/etc/zabbix
  environment:
    - DB_SERVER_HOST=mysql-server
    - MYSQL_DATABASE=zabbix
    - MYSQL_USER=zabbix
    - MYSQL_PASSWORD=123
  depends_on:
    - mysql-server
  networks:
    compose_network:
      ipv4_address: 172.25.0.2
```

Figure 2. Zabbix-server

```
zabbix-web:
  image: zabbix/zabbix-web-nginx-mysql
  ports:
    - 80:8080
  hostname: zabbix-web
  container_name: zabbix-web
  restart: unless-stopped
  volumes:
    - zabbix-web-config:/etc/zabbix
  environment:
    - DB_SERVER_HOST=mysql-server
    - MYSQL_DATABASE=zabbix
    - MYSQL_USER=zabbix
    - MYSQL_PASSWORD=123
    - ZBX_SERVER_HOST=zabbix-server
  depends_on:
    - zabbix-server
    - mysql-server
  networks:
    compose_network:
      ipv4_address: 172.25.0.3
```

Figure 3. Zabbix-web

```
zabbix-agent:
  image: zabbix/zabbix-agent
  ports:
    - 10050:10050
  hostname: zabbix-agent
  container_name: zabbix-agent
  restart: unless-stopped
  volumes:
    - zabbix-agent-config:/etc/zabbix
  environment:
    - ZBX_SERVER_HOST=zabbix-server
  depends_on:
    - zabbix-server
  networks:
    compose_network:
      ipv4_address: 172.25.0.4
```

Figure 4. Zabbix-agent

```

networks:
  compose_network:
    external: true

volumes:
  mysql-database:
  zabbix-server-config:
  zabbix-web-config:
  zabbix-agent-config:

```

Figure 5. Volumes and Network

VM2 and VM3: Install Zabbix-agent and Zabbix-proxy

The first thing done with at VM2 was installing both MariaDB and Zabbix proxy. Then we connected the Zabbix server from VM1 with MariaDB and Zabbix proxy in VM2.

```

root@6f3a93c705d3: /
root@6f3a93c705d3:/# service mariadb status
* /usr/bin/mysqladmin Ver 9.1 Distrib 10.6.7-MariaDB, for debian-linux-gnu on x86_64
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Server version          10.6.7-MariaDB-1:10.6.7+maria~focal
Protocol version        10
Connection              Localhost via UNIX socket
UNIX socket             /run/mysqld/mysqld.sock
Uptime:                 15 min 33 sec

Threads: 17  Questions: 12299  Slow queries: 0  Opens: 96  Open tables: 89  Queries per second avg: 13.182
root@6f3a93c705d3:/# service zabbix-proxy status
* zabbix_proxy is running
root@6f3a93c705d3:/#

```

Figure 6. MariaDB

Proxies Create proxy

Name Mode Any Active Passive Filter

Apply Reset

<input type="checkbox"/> Name	Mode	Encryption	Compression	Last seen (age)	Host count	Item count	Required performance (tps)	Hosts
<input type="checkbox"/> Zabbix proxy	Active	None	On	3s	1	81	0.87	Sub server

Displaying 1 of 1 found

Figure 7. Zabbix proxy

* Host name

Visible name

Templates

Name	Action
zabbix-monitoring	Unlink Unlink and clear

* Groups

Interfaces

Type	IP address	DNS name	Connect to	Port	Default
Agent	<input type="text" value="172.25.0.4"/>	<input type="text"/>	<input checked="" type="radio"/> IP <input type="radio"/> DNS	<input type="text" value="10050"/>	<input checked="" type="radio"/> Remove

[Add](#)

Figure 8. Zabbix server

Later we installed Zabbix agent to VM3.

```

root@2dafec2778a1: /
root@2dafec2778a1: /# service zabbix-agent start
* Starting Zabbix agent zabbix_agentd
root@2dafec2778a1: /# service zabbix-agent status
* zabbix_agentd is running
root@2dafec2778a1: /#

```

Figure 9. Zabbix agent running

We then generated the hex values for psk encryption file on VM3. Then moved the file to directory giving it permission so that Zabbix agent can have access to the file:

```

root@2dafec2778a1: /opt
root@2dafec2778a1: /opt# cd opt/
root@2dafec2778a1: /opt# tree
.
-- zabbix
    -- zabbix_agent.psk

1 directory, 1 file
root@2dafec2778a1: /opt# cat zabbix/zabbix_agent.psk
4d6487ad25d75ac30c7b9349abab21acc5877bfbb0c49feadffab1936b6e07c7
root@2dafec2778a1: /opt#

```

Figure 10. Zabbix agent psk file

We enabled the psk encryption in the Zabbix agent, configured the file and set the valid server address:



Figure 11. Zabbix agent information

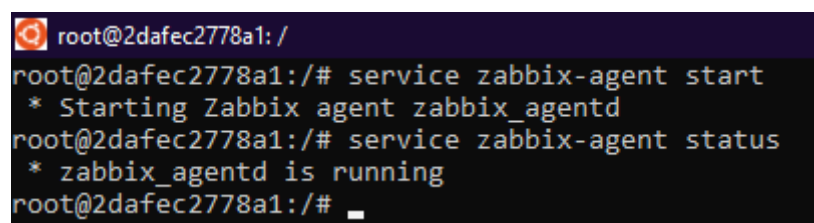


Figure 12. Zabbix proxy running

VM2: Nginx proxy

First, we installed nginx proxy and prepared the configuration file for nginx:

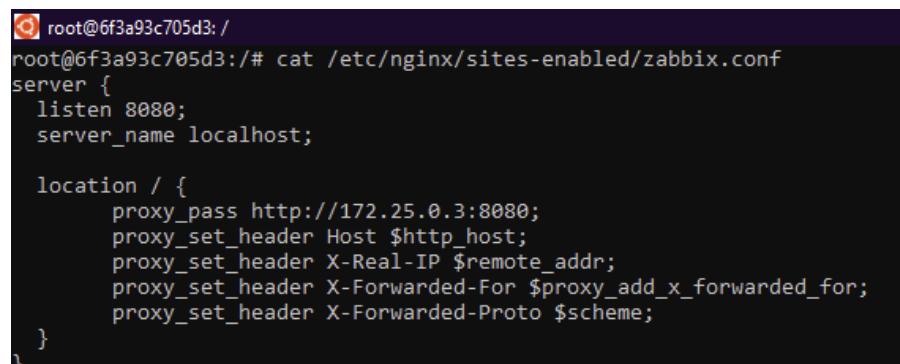


Figure 13. Zabbix.conf

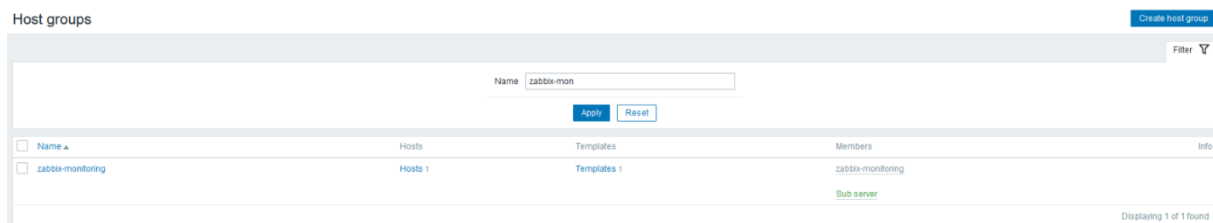
Then we added directories to the nginx directory, including sites-enabled and includes. We configured the nginx.conf file to connect to the Zabbix-server-web, and to be able to accessed on port 8080.

```
include /etc/nginx/conf.d/*.conf;  
include /etc/nginx/sites-enabled/*;  
include /etc/nginx/includes/*;
```

Figure 14. Enabling and including directories

VM1: Zabbix frontend

To start the frontend process we created a host group named Zabbix-monitoring.



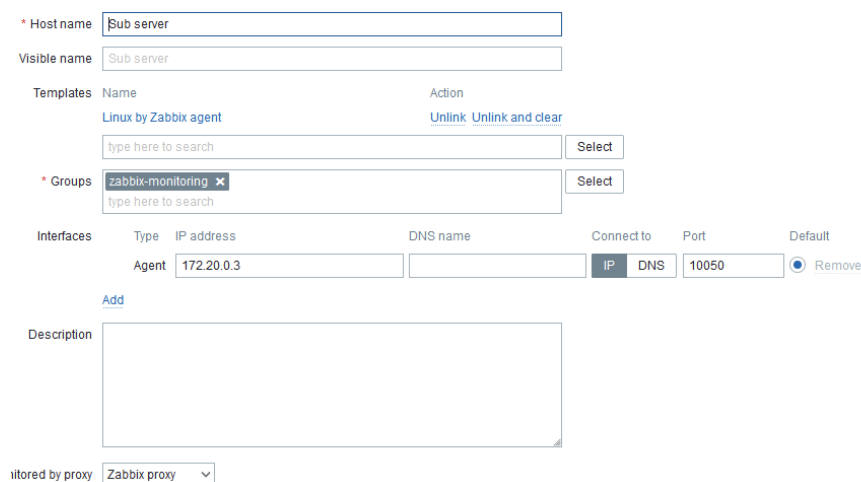
The screenshot shows the 'Host groups' page in the Zabbix web interface. At the top, there is a 'Create host group' button. Below it, a search bar contains 'zabbix-mon' with 'Apply' and 'Reset' buttons. A table lists the host groups:

Name	Hosts	Templates	Members	Info
zabbix-monitoring	Hosts 1	Templates 1	zabbix-monitoring Sub server	

At the bottom right, it says 'Displaying 1 of 1 found'.

Figure 15. Zabbix-monitoring

We added a host named “Sub server” that is configured with VM3 ipv4 address and port used by Zabbix-agent.



The screenshot shows the 'Host configuration' page for a host named 'Sub server'. The 'Host name' field is 'Sub server' and the 'Visible name' is also 'Sub server'. Under 'Templates', 'Linux by Zabbix agent' is selected. Under 'Groups', 'zabbix-monitoring' is selected. In the 'Interfaces' section, an 'Agent' interface is configured with IP address '172.20.0.3' and port '10050'. The 'Connect to' dropdown is set to 'IP'. There is an 'Add' button below the interfaces. A 'Description' text area is empty. At the bottom, 'Monitored by proxy' is set to 'Zabbix proxy'.

Figure 16. Sub server

Then we enabled the encryption with PSK and configured it.

Host

Host IPMI Tags Macros Inventory **Encryption** Value mapping

Connections to host: No encryption **PSK** Certificate

Connections from host: ☐ No encryption ☒ PSK ☐ Certificate

* PSK identity: cbt_psk_01

* PSK: 4d6487ad25d75ac30c7b9349abab21acc5877bfb0c49feadffab1936b6e07c7

Update

Figure 17. Sub server psk

We then created a new template named Zabbix-monitoring and added the following items and triggers:

Templates

Host groups: zabbix-monitoring (type here to search)

Linked templates: (type here to search)

Name:

<input type="checkbox"/>	Name ▲	Hosts	Items	Triggers
<input type="checkbox"/>	zabbix-monitoring	Hosts 1	Items 4	Triggers 2

Figure 18. Zabbix-monitoring template

1. An item in the template that monitors the total used disk space on the directory /var, interval 1h (one hour).

* Name

Type

* Key

Type of information

Units

* Update interval

2. An item in the template that monitors docker process usage, interval 1m, units %.

* Name

Type

* Key

Type of information

Units

* Update interval

3. A trigger in the template that triggers when uptime is longer than 240 days, assign it type information.

* Name

Event name

Operational data

Severity

* Expression

[Expression constructor](#)

4. A trigger in the template that triggers when disk I/o is overloaded, higher than 20, average 5min

* Name

Event name

Operational data

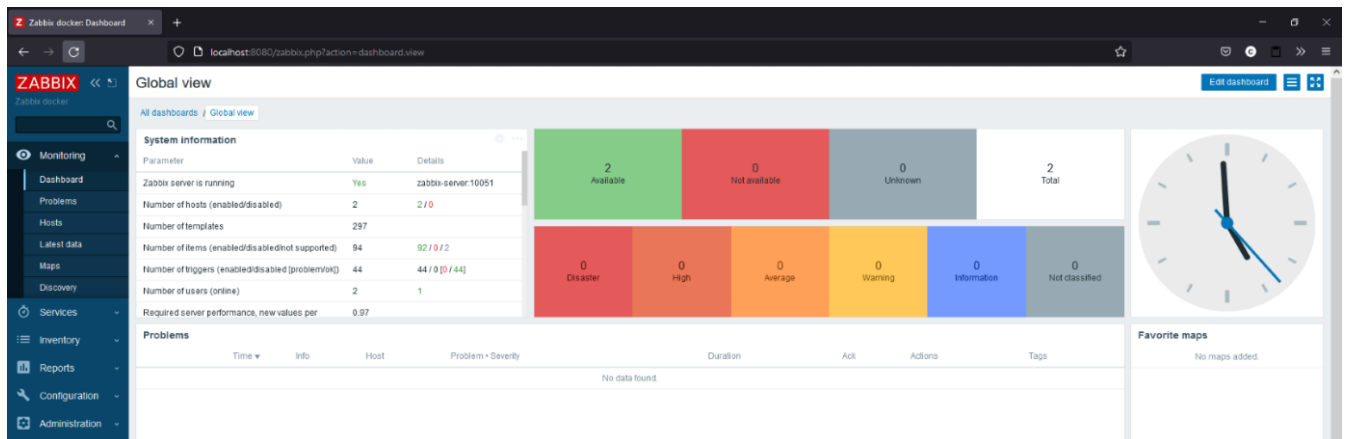
Severity

* Expression

[Expression constructor](#)

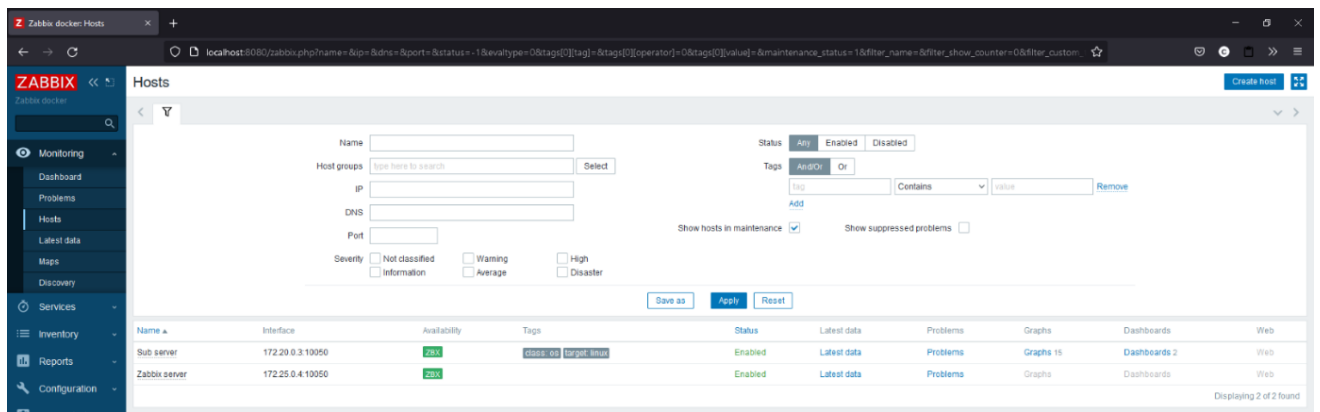
Results

Zabbix dashboard:



The screenshot shows the Zabbix Configuration - Proxies page. It includes a form to add a new proxy and a table listing existing proxies.

Name	Mode	Encryption	Compression	Last seen (age)	Host count	Item count	Required performance (bps)	Hosts
Zabbix proxy	Active	None	On	5s	1	90	0.92	Sub server



<input type="checkbox"/>	Name	Triggers	Key	Interval	History	Trends	Type	Status	Tags
<input type="checkbox"/>	...	Avail	vfs.dirsize[var._disk]	1h	90d	365d	Zabbix agent	Enabled	
<input type="checkbox"/>	...	CPU usage	system.cpu.util	1m	90d	365d	Zabbix agent	Enabled	
<input type="checkbox"/>	...	CPU util	system.cpu.util[iowait]	1m	90d	365d	Zabbix agent	Enabled	
<input type="checkbox"/>	...	Uptime	system.uptime	1m	90d	365d	Zabbix agent	Enabled	

<input type="checkbox"/>	Severity	Name	Operational data	Expression	Status	Tags
<input type="checkbox"/>	Information	uptime > 240		last[(zabbix-monitoring)system.uptime]>240d	Enabled	
<input type="checkbox"/>	Warning	io is overloaded		avg[(zabbix-monitoring)system.cpu.util[iowait],5m]>20	Enabled	

<input type="checkbox"/>	Host	Name	Last check	Last value	Change	Tags	Info
<input type="checkbox"/>	Zabbix server	Avail	6m 5s	80.02 Kb			Graph
<input type="checkbox"/>	Zabbix server	CPU usage	3s	0.7848 %	-0.213 %		Graph
<input type="checkbox"/>	Zabbix server	CPU util	7s	0.5636	-0.1213		Graph
<input type="checkbox"/>	Zabbix server	Uptime	6s	10537	+60		Graph

```

root@DESKTOP-HF9T6QQ: /home/kader# docker ps
CONTAINER ID   IMAGE                                COMMAND                  CREATED        STATUS        PORTS                               NAMES
6f3a93c705d3   ubuntu:20.04                        "bash"                  About an hour ago   Up 7 minutes   0.0.0.0:8080->8080/tcp, :::8080->8080/tcp   VM2
2dafec2778a1   ubuntu:20.04                        "bash"                  6 days ago       Up 3 hours     Up 3 hours                               VM3
b30045a31894   teracy/ubuntu:20.04-dind-latest    "docker-entrypoint.s..." 7 days ago       Up 3 hours     Up 3 hours                               VM1

```

VM1 – with the docker containers:

```

root@DESKTOP-HF9T6QQ: /home/kader# docker exec -it VM1 bash
root@DESKTOP-HF9T6QQ: /# docker ps
CONTAINER ID   IMAGE                                COMMAND                  CREATED        STATUS        PORTS                               NAMES
8710f8567bc2   zabbix/zabbix-web-nginx-mysql      "docker-entrypoint.sh"   3 days ago     Up 3 hours     8443/tcp, 0.0.0.0:80->8080/tcp, :::80->8080/tcp   zabbix-web
3191bdde8db3   zabbix/zabbix-agent                "/sbin/tini -- /usr/..." 3 days ago     Up 3 hours     0.0.0.0:10050->10050/tcp, :::10050->10050/tcp   zabbix-agent
1e6142763527   zabbix/zabbix-server-mysql         "/sbin/tini -- /usr/..." 3 days ago     Up 3 hours     0.0.0.0:10051->10051/tcp, :::10051->10051/tcp   zabbix-server
8c7dd554c1bd   haako/mysql180                     "/entrypoint.sh mysql..." 3 days ago     Up 3 hours     0.0.0.0:3306->3306/tcp, :::3306->3306/tcp, 33060/tcp   mysql-server

```

VM2:

```
root@6f3a93c705d3: /
root@6f3a93c705d3:/# service zabbix-agent status
zabbix-agent: unrecognized service
root@6f3a93c705d3:/# service zabbix-proxy status
* zabbix_proxy is running
root@6f3a93c705d3:/# service mariadb status
* /usr/bin/mysqldadmin Ver 9.1 Distrib 10.6.7-MariaDB, for debian-linux-gnu on x86_64
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Server version      10.6.7-MariaDB-1:10.6.7+maria~focal
Protocol version    10
Connection          Localhost via UNIX socket
UNIX socket         /run/mysqld/mysqld.sock
Uptime:             13 min 51 sec

Threads: 17  Questions: 11008  Slow queries: 0  Opens: 96  Open tables: 89  Queries per second avg: 13.246
root@6f3a93c705d3:/# service nginx status
* nginx is running
root@6f3a93c705d3:/#
```

VM3:

```
root@2dafec2778a1: /opt
root@2dafec2778a1:/opt# tree
.
-- zabbix
   |-- zabbix_agent.psk

1 directory, 1 file
root@2dafec2778a1:/opt# cat zabbix/zabbix_agent.psk
4d6487ad25d75ac30c7b9349abab21acc5877bfbb0c49feadffab1936b6e07c7
root@2dafec2778a1:/opt# service zabbix-agent status
* zabbix_agentd is running
root@2dafec2778a1:/opt#
```

Conclusion

In this assignment we used WSL, and we copied all the files to the intel1 server and tested the containers on the intel1 server. It compiled the files successfully. We started by creating the docker-compose files for VM1. Thereafter we made the Zabbix-Proxy and nginx proxy in VM2 and configured them so they could work as they should. In VM3 we created Zabbix-agent, configured, and connected it to Zabbix-proxy in VM2. Then we configured nginx, setting them up correctly. At last, we worked on the Zabbix frontend site. All the applications work on both the WSL and intel1 server.

Sources

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