



**IE2060**

**Directory Services and Network  
Management**

**3<sup>rd</sup> Year, 2<sup>nd</sup> Semester**

Assignment

**Implementation of a Linux-based Domain  
Controller with Active Directory and  
Zabbix Monitoring**

Submitted to

Sri Lanka Institute of Information Technology

In partial fulfillment of the requirements for the  
Bachelor of Science Special Honors Degree in Information Technology

07/05/2025

## **Declaration**

I certify that this report does not incorporate without acknowledgement, any material previously submitted for a degree or diploma in any university, and to the best of my knowledge and belief it does not contain any material previously published or written by another person, except where due reference is made in text.

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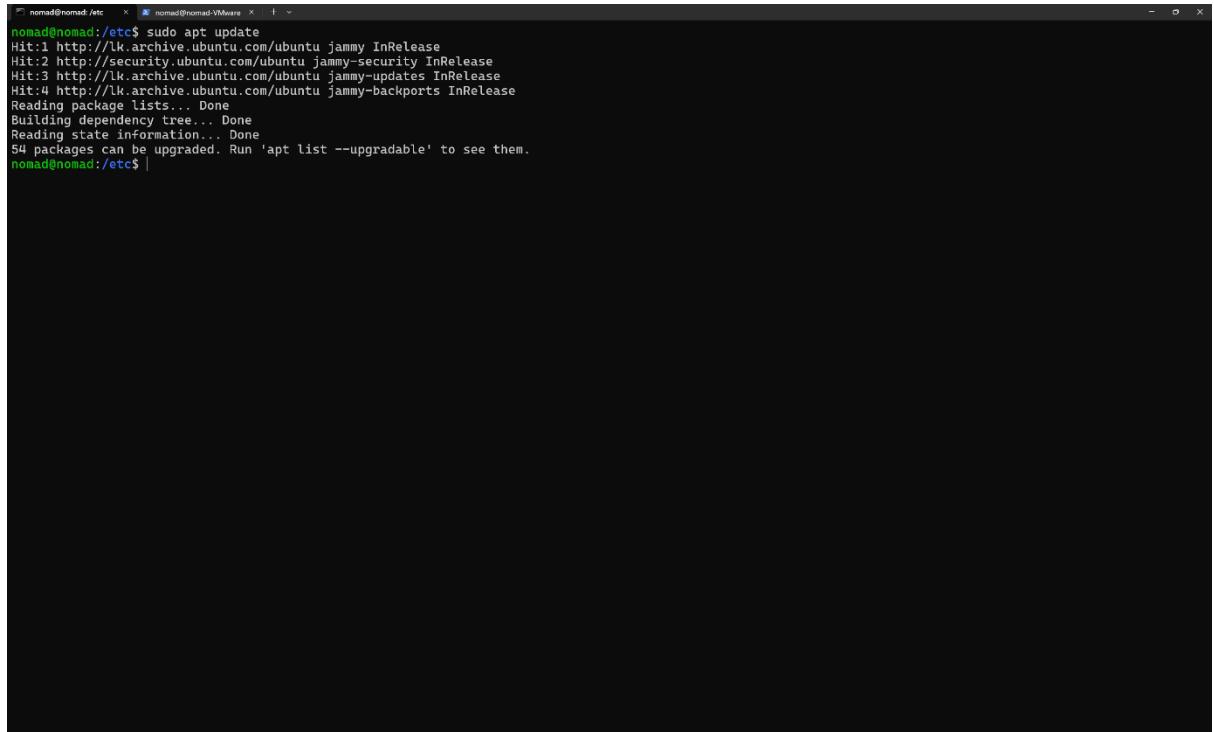
# 1 Setting up domain controller

Server machine: Ubuntu server 22.04.5

Client machine: Ubuntu desktop 24.04 , Ubuntu desktop 20.04.6

## 1.1 Update the package list of OS

Sudo apt update



```
nomad@nomad:/etc$ sudo apt update
Hit:1 http://lk.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://security.ubuntu.com/ubuntu jammy-security InRelease
Hit:3 http://lk.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:4 http://lk.archive.ubuntu.com/ubuntu jammy-backports InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
54 packages can be upgraded. Run 'apt list --upgradable' to see them.
nomad@nomad:/etc$ |
```

Figure 1.Update the package list of OS

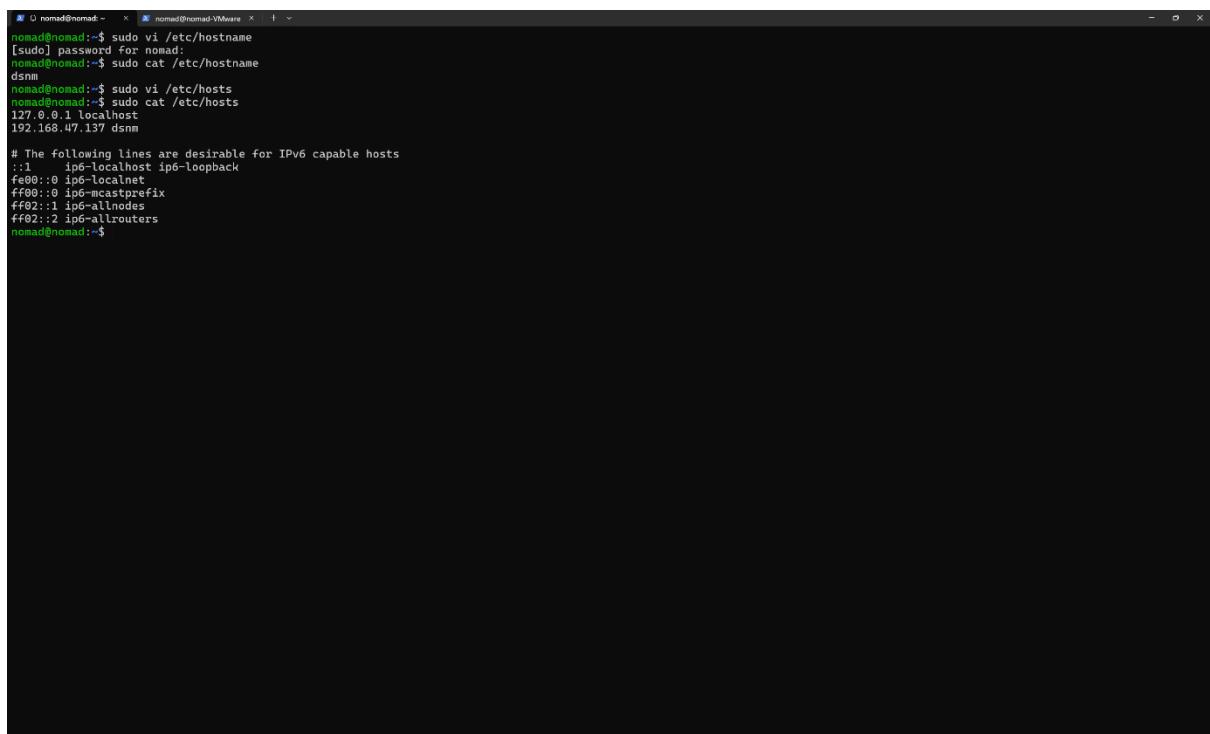
## 1.2 Change hostname of server and perform local hostname resolution

Sudo vi /etc/hostname

dsnm

sudo vi /etc/hosts

192.168.47.137 dsnm



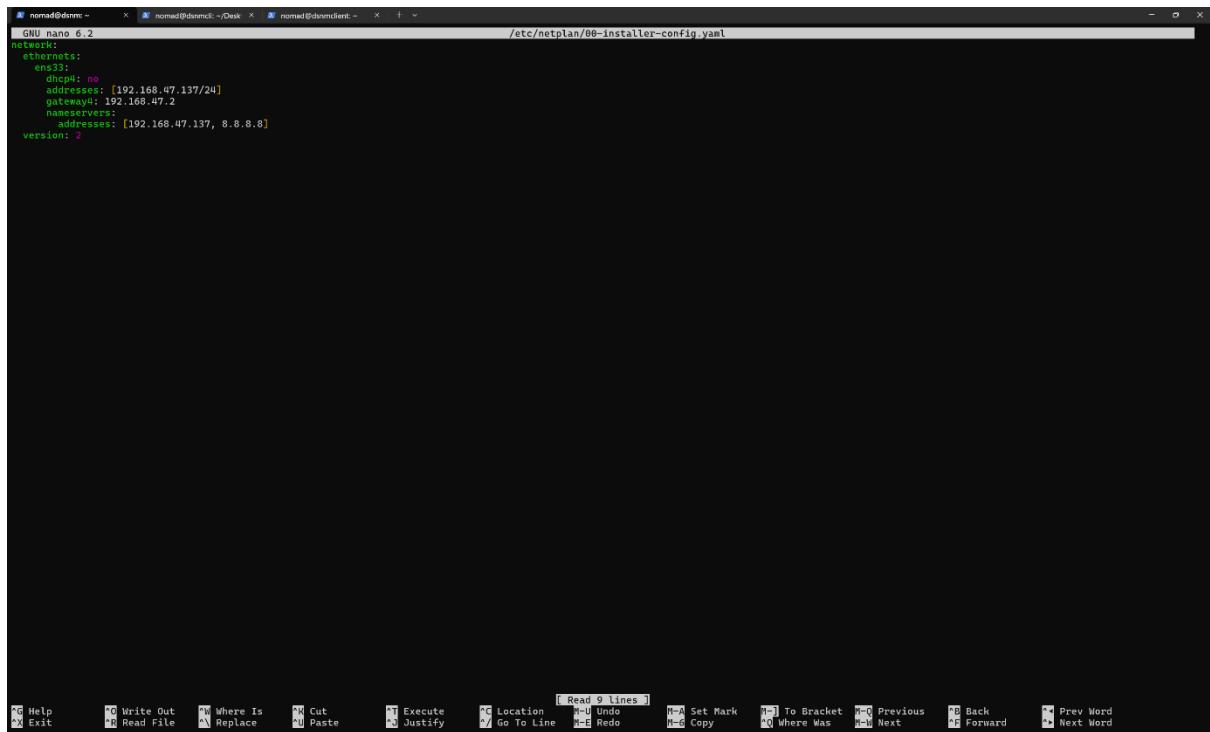
```
nomad@nomad:~$ sudo vi /etc/hostname
[sudo] password for nomad:
nomad@nomad:~$ sudo cat /etc/hostname
dsnm
nomad@nomad:~$ sudo vi /etc/hosts
nomad@nomad:~$ sudo cat /etc/hosts
127.0.0.1 localhost
192.168.47.137 dsnm

# The following lines are desirable for IPv6 capable hosts
::1      ip6-localhost ip6-loopback
fe00::0  ip6-localnet
ff00::0  ip6-mcastprefix
ff02::1  ip6-allnodes
ff02::2  ip6-allrouters
nomad@nomad:~$
```

Figure 2.hostname resolution

### 1.3 Open netplan configuration file

`sudo nano /etc/netplan/00-installer-config.yaml`



The screenshot shows a terminal window titled "GNU nano 6.2" with the file "/etc/netplan/00-installer-config.yaml" open. The content of the file is:

```
network:
  ethernets:
    ens3:
      dhcp4: no
      addresses: [192.168.47.137/24]
      gateway4: 192.168.47.2
      nameservers:
        addresses: [192.168.47.137, 8.8.8.8]
version: 2
```

The terminal window has a dark background and light-colored text. At the bottom, there is a menu bar with various options like Help, Write Out, Read File, etc., and a status bar indicating "[ Read 9 lines ]".

Figure 3. Open netplan configuration file

## 1.4 Apply netplan configurations

### sudo netplan apply

```

nomad@dsnm:~$ sudo vi /etc/netplan/00-installer-config.yaml
[sudo] password for nomad:
nomad@dsnm:~$ sudo cat /etc/netplan/00-installer-config.yaml
network:
  ethernets:
    ens3:
      dhcp4: no
      addresses: [192.168.47.137/24]
      gateway4: 192.168.47.5
      nameservers:
        addresses: [192.168.47.10, 8.8.8.8]
version: 2
nomad@dsnm:~$ sudo netplan apply
** (generate:1246): WARNING **: 13:34:55.969: Permissions for /etc/netplan/00-installer-config.yaml are too open. Netplan configuration should NOT be accessible by others.
** (generate:1246): WARNING **: 13:34:55.969: 'gateway4' has been deprecated, use default routes instead.
See the 'Default routes' section of the documentation for more details.
WARNING:root:Cannot call Open vSwitch: ovsdb-server.service is not running.

** (process:1244): WARNING **: 13:34:56.324: Permissions for /etc/netplan/00-installer-config.yaml are too open. Netplan configuration should NOT be accessible by others.
** (process:1244): WARNING **: 13:34:56.324: 'gateway4' has been deprecated, use default routes instead.
See the 'Default routes' section of the documentation for more details.

** (process:1244): WARNING **: 13:34:56.435: Permissions for /etc/netplan/00-installer-config.yaml are too open. Netplan configuration should NOT be accessible by others.
** (process:1244): WARNING **: 13:34:56.435: 'gateway4' has been deprecated, use default routes instead.
See the 'Default routes' section of the documentation for more details.

** (process:1244): WARNING **: 13:34:56.435: Permissions for /etc/netplan/00-installer-config.yaml are too open. Netplan configuration should NOT be accessible by others.
** (process:1244): WARNING **: 13:34:56.435: 'gateway4' has been deprecated, use default routes instead.
See the 'Default routes' section of the documentation for more details.
nomad@dsnm:~$ 

```

Figure 4.Apply netplan configurations

## 1.5 Install packages

```
sudo apt install samba winbind krb5-config smbclient dnsutils net-tools -y
```

```

root@dsnm:/home/nomad$ apt install -y samba winbind krb5-config smbclient dnsutils net-tools
Reading package lists... Done
Building dependency tree... Done
Reading information... Done
The following additional packages will be installed:
  attr libavahi-client3 libavahi-common-data libavahi-common3 libboost-iostreams1.74.0 libboost-thread1.74.0 libcephfs2 libcups2 libgfapi0 libgfrpc0
  liblbcfs2 libluster0 liblusterfs0 liblbcfs1 liblbd2 libnl-route-3-200 librados2 librdmacml libsmclient libtalloc2 libtdb1 libtevent0 liburing2 libwclient3 python3-dnspython
  python3-gpg python3-lsb python3-markdown python3-pymments python3-requests-toolbelt python3-samba python3-talloc python3-tob samba-common-bin samba-dsdb-modules
  samba-libs samba-vfs-modules tdb-tools
Suggested packages:
  cups-common python3-sniffio python3-trio python-markdown-doc python-pymgments-doc ttf-bitstream-vera bind9 bind9utils ctdb ldb-tools ntp | chrony smbdap-tools
  heimdal-clients cifs-utils libnss-winbind libpam-winbind
The Following NEW packages will be installed:
  attr dnsutils ibverbs-providers krb5-config libavahi-client3 libavahi-common-data libavahi-common3 libboost-iostreams1.74.0 libboost-thread1.74.0 libcephfs2 libcups2
  libgfapi0 liblbcfs2 libluster0 liblusterfs0 liblbcfs1 liblbd2 libnl-route-3-200 librados2 librdmacml libsmclient libtalloc2 libtdb1 libtevent0 liburing2 libwclient3
  python3-dnspython python3-gpg python3-lsb python3-markdown python3-pymments python3-requests-toolbelt python3-samba python3-talloc python3-tdb samba samba-common-bin
  samba-dsdb-modules samba-libs samba-vfs-modules smbdclient tdb-tools winbind
0 upgraded, 45 newly installed, 0 to remove and 54 not upgraded.
Need to get:
After this operation, 111 MB of additional disk space will be used.
  Igno 1 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libtalloc2 amd64 2.3.3-2build1
  Err:2 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libtevent0 amd64 0.11.0-1build1
  Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4002::1:101). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4002::1:101). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:102). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:103). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4002::1:102). - connect (101: Network is unreachable)
  Err:3 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libwclient0 amd64 2:4.15.13+dfsg-0ubuntul6
  Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:101). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:103). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:102). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:103). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4002::1:102). - connect (101: Network is unreachable)
  Err:4 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 python3-dnspython all 2.1.0-ubuntu2
  Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:101). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:103). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:102). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:103). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4002::1:102). - connect (101: Network is unreachable)
  Err:5 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libtdb1 amd64 1.4.5-2build1
  Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:101). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4002::1:103). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:102). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:103). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4002::1:102). - connect (101: Network is unreachable)
  Ign:6 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 python3-lsb amd64 2:2.4.4-ubuntu0.22.04.2
  Ign:7 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 python3-tdb amd64 1.4.5-2build1
  Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:101). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:102). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4000::1:103). - connect (101: Network is unreachable) Cannot initiate the connection to lk.archive.ubuntu.com:80 (2620:2d:4002::1:102). - connect (101: Network is unreachable)
  Ign:9 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libavahi-common-data amd64 0.8-5ubuntu5.2

```

Figure 5.Install packages

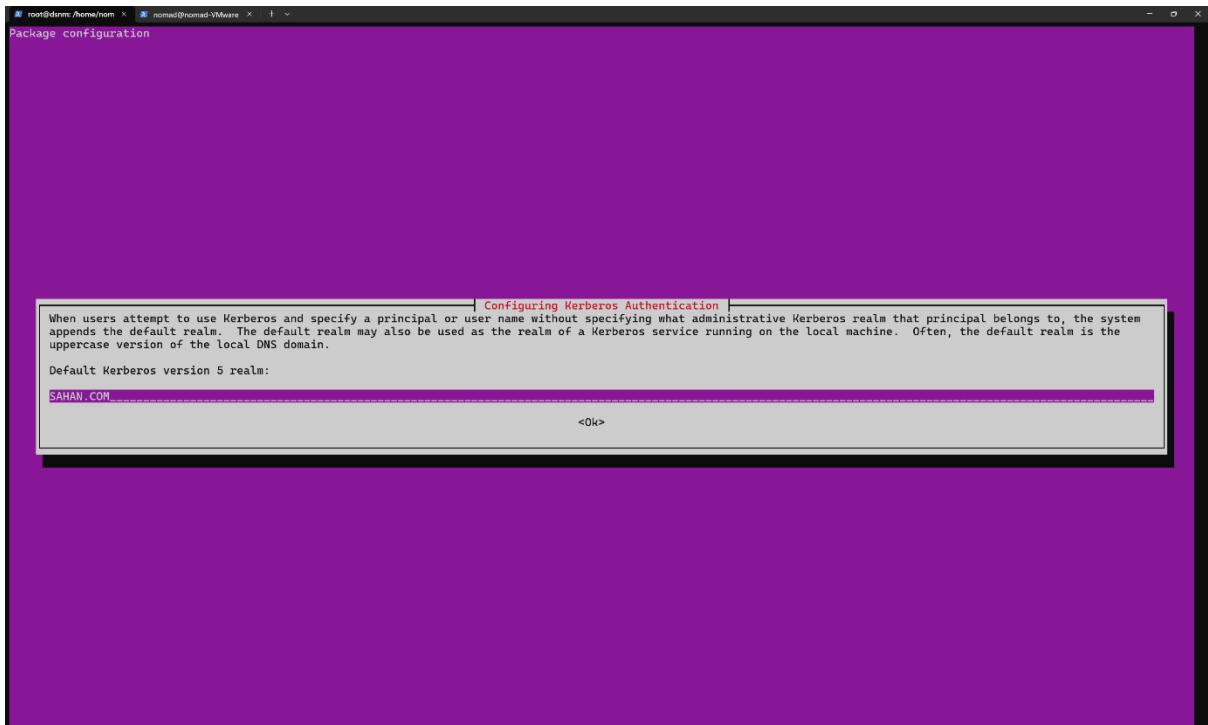


Figure 6.kerberos realm name

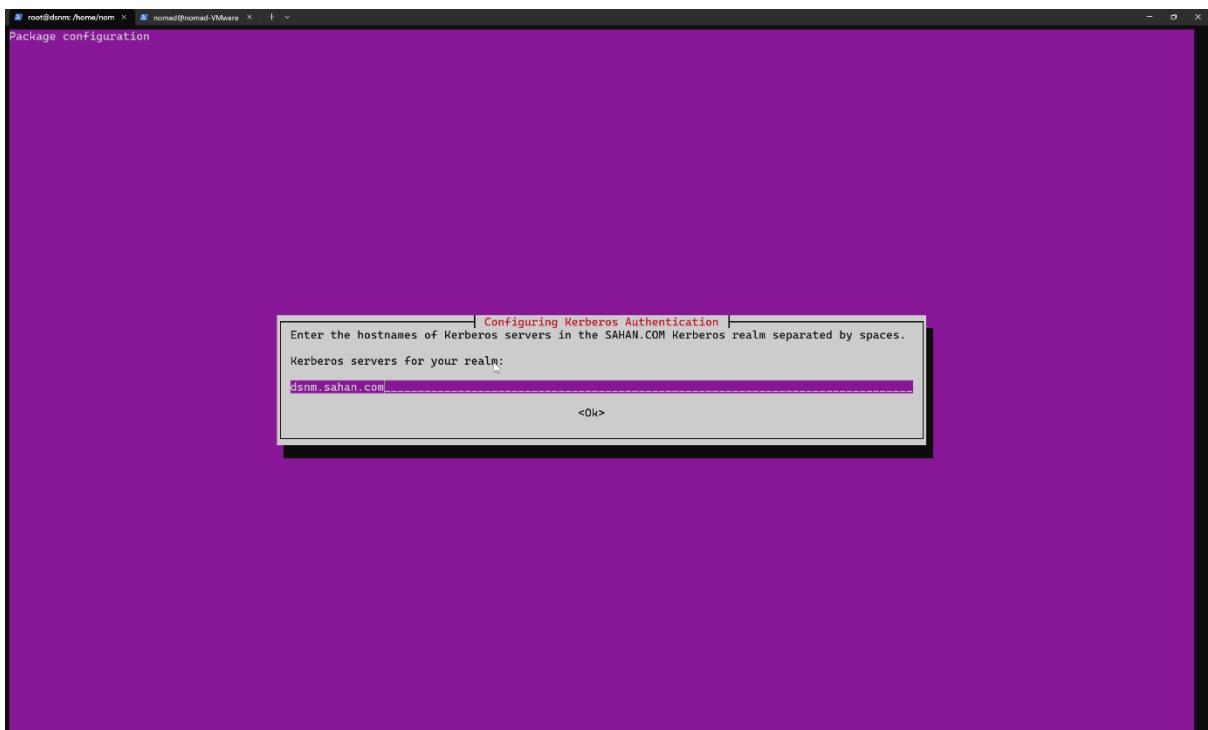


Figure 7.kerberos server for realm

## 1.6 Keep backup of smb.conf file and initialize new AD

```
sudo mv /etc/samba/smb.conf /etc/samba/smb.conf.original
```

```
sudo samba-tool domain provision --use-rfc2307 --interactive
```

Realm: SAHAN.COM

Domain [SAHAN]: SAHAN

Server Role (dc, member, standalone) [dc]: dc

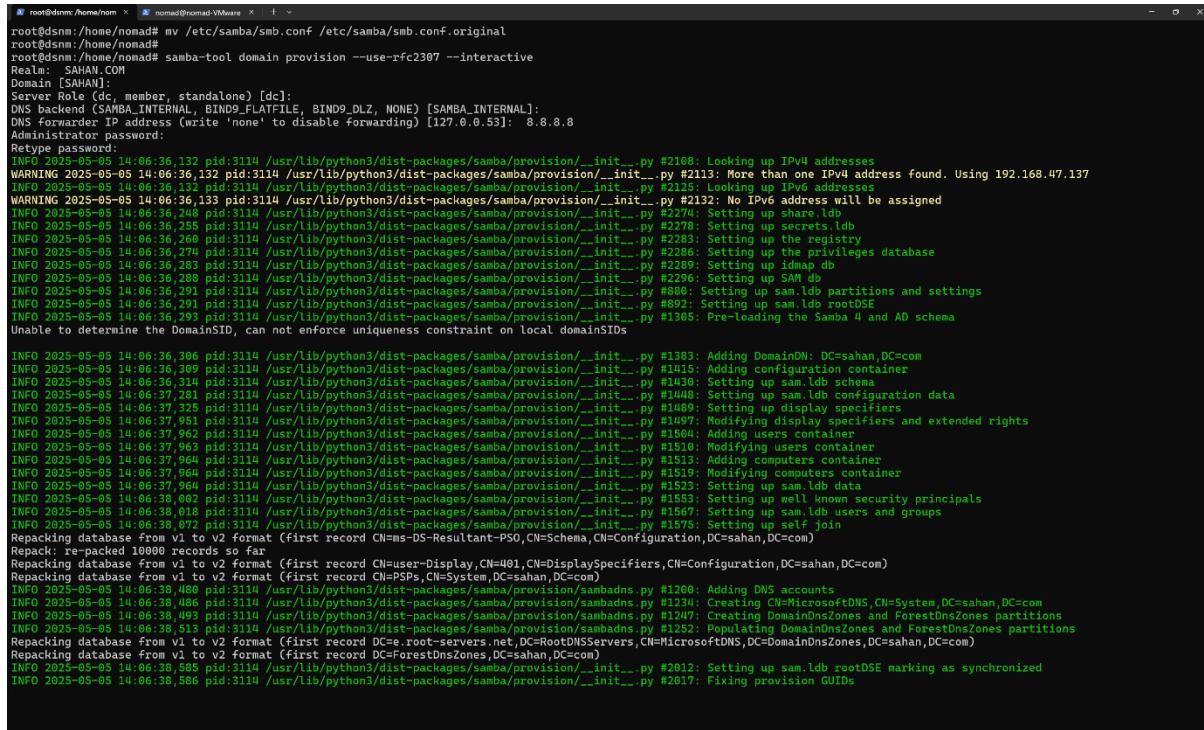
DNS backend (SAMBA\_INTERNAL, BIND9\_FLATFILE, BIND9\_DLZ, NONE)

[SAMBA\_INTERNAL]: SAMBA\_INTERNAL

DNS forwarder IP address (write 'none' to disable forwarding) [127.0.0.53]: 8.8.8.8

Administrator password:

Retype password:



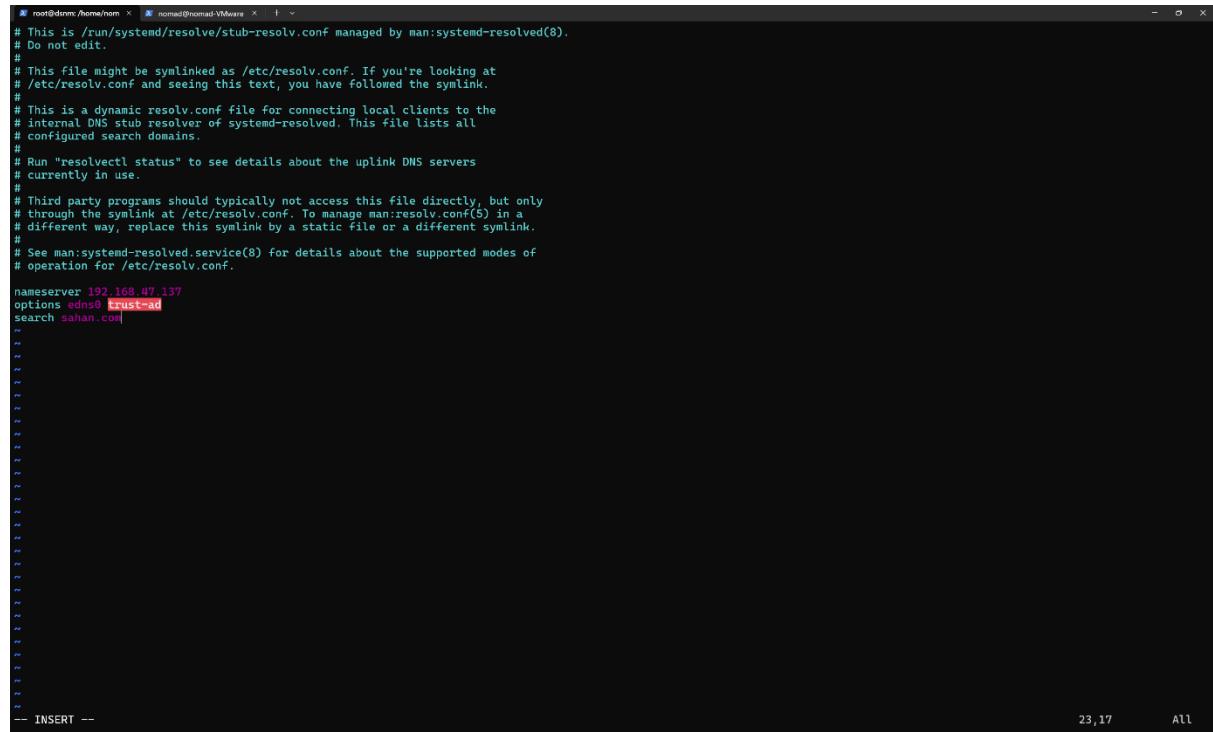
```
root@dsname:/home/nomad# mv /etc/samba/smb.conf /etc/samba/smb.conf.original
root@dsname:/home/nomad#
root@dsname:/home/nomad# samba-tool domain provision --use-rfc2307 --interactive
Realm: SAHAN.COM
Domain [SAHAN]:
Server Role (dc, member, standalone) [dc]: dc
DNS backend (SAMBA_INTERNAL, BIND9_FLATFILE, BIND9_DLZ, NONE) [SAMBA_INTERNAL]:
DNS Forwarder IP address (write 'none' to disable forwarding) [127.0.0.53]: 8.8.8.8
Administrator password:
Retype password:

[Terminal Output]
INFO 2025-05-05 14:06:36.122 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2100: Looking up IPv4 addresses
WARNING 2025-05-05 14:06:36.132 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2113: More than one IPv4 address found. Using 192.168.47.137
INFO 2025-05-05 14:06:36.132 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2125: Looking up IPv6 addresses
WARNING 2025-05-05 14:06:36.133 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2132: No IPv6 address will be assigned
INFO 2025-05-05 14:06:36.248 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2274: Setting up share ldb
INFO 2025-05-05 14:06:36.255 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2278: Setting up secrets ldb
INFO 2025-05-05 14:06:36.260 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2283: Setting up the registry
INFO 2025-05-05 14:06:36.274 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2286: Setting up the privileges database
INFO 2025-05-05 14:06:36.283 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2289: Setting up idmap db
INFO 2025-05-05 14:06:36.284 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2296: Setting up SAM db
INFO 2025-05-05 14:06:36.291 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #880: Setting up sam.ldb partitions and settings
INFO 2025-05-05 14:06:36.293 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #892: Setting up sam.ldb rootDSE
INFO 2025-05-05 14:06:36.293 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1905: Pre-loading the Samba 4 and AD schema
Unable to determine the DomainSID, can't enforce uniqueness constraint on local domainSIDs
[...]
INFO 2025-05-05 14:06:36.306 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1383: Adding DomainDN: DC=sahan,DC=com
INFO 2025-05-05 14:06:36.306 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1415: Adding configuration container
INFO 2025-05-05 14:06:36.314 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1430: Setting up sam.ldb schema
INFO 2025-05-05 14:06:37.281 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1448: Setting up sam.ldb configuration data
INFO 2025-05-05 14:06:37.321 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1489: Setting up display specifiers
INFO 2025-05-05 14:06:37.951 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1497: Modifying display specifiers and extended rights
INFO 2025-05-05 14:06:37.952 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1504: Adding users container
INFO 2025-05-05 14:06:37.961 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1510: Modifying users container
INFO 2025-05-05 14:06:37.964 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1513: Adding computers container
INFO 2025-05-05 14:06:37.964 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1519: Modifying computers container
INFO 2025-05-05 14:06:37.965 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1523: Setting up sam.ldb data
INFO 2025-05-05 14:06:38.018 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1557: Setting up well known security principals
INFO 2025-05-05 14:06:38.018 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1557: Setting up sam.ldb users and groups
INFO 2025-05-05 14:06:38.072 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1575: Setting up sam.ldb rootDSE
INFO 2025-05-05 14:06:38.072 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #1575: Setting up sam.ldb schema
Repacking database from v1 to v2 format (first record CN=MS-DS-Resultant-PSO,CN=Schema,CN=Configuration,DC=sahan,DC=com)
Repack: re-packed 108000 records so far
Repacking database from v1 to v2 format (first record CN=user-Display,CN=401,CN=DisplaySpecifiers,CN=Configuration,DC=sahan,DC=com)
Repacking database from v1 to v2 format (first record CN=SPS,CN=System,DC=sahan,DC=com)
INFO 2025-05-05 14:06:38.488 pid:3114 /usr/lib/python3/dist-packages/samba/provision/sambadns.py #1200: Adding DNS accounts
INFO 2025-05-05 14:06:38.488 pid:3114 /usr/lib/python3/dist-packages/samba/provision/sambadns.py #1234: Creating CN=MicrosoftDNS,CN=System,DC=sahan,DC=com
INFO 2025-05-05 14:06:38.493 pid:3114 /usr/lib/python3/dist-packages/samba/provision/sambadns.py #1247: Creating DomainDnsZones and ForestDnsZones partitions
INFO 2025-05-05 14:06:38.513 pid:3114 /usr/lib/python3/dist-packages/samba/provision/sambadns.py #1252: Populating DomainDnsZones and ForestDnsZones partitions
Repacking database from v1 to v2 format (first record DC=Root-Servers.net,DC=RootDNSServers,CN=MicrosoftDNS,DC=DomainDnsZones,DC=sahan,DC=com)
Repacking database from v1 to v2 format (first record DC=ForestDnsZones,DC=sahan,DC=com)
INFO 2025-05-05 14:06:38.581 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2012: Setting up sam.ldb rootDSE marking as synchronized
INFO 2025-05-05 14:06:38.586 pid:3114 /usr/lib/python3/dist-packages/samba/provision/__init__.py #2017: Fixing provision GUIDs
```

Figure 8.initialize new AD

## 1.7 Edit resolv.conf in server

sudo vi /etc/resolv.conf



```
# This is /run/systemd/resolve/stub-resolv.conf managed by man:systemd-resolved(8).
# Do not edit.
#
# This file might be symlinked as /etc/resolv.conf. If you're looking at
# /etc/resolv.conf and seeing this text, you have followed the symlink.
#
# This is a dynamic resolv.conf file for connecting local clients to the
# internal DNS stub resolver of systemd-resolved. This file lists all
# configured search domains.
#
# Run "resolvectl status" to see details about the uplink DNS servers
# currently in use.
#
# Third party programs should typically not access this file directly, but only
# through the symlink at /etc/resolv.conf. To manage man:resolv.conf(5) in a
# different way, replace this symlink by a static file or a different symlink.
#
# See man:systemd-resolved.service(8) for details about the supported modes of
# operation for /etc/resolv.conf.

nameserver 192.168.47.137
options edns0 trust-ad
search sahan.co|
```

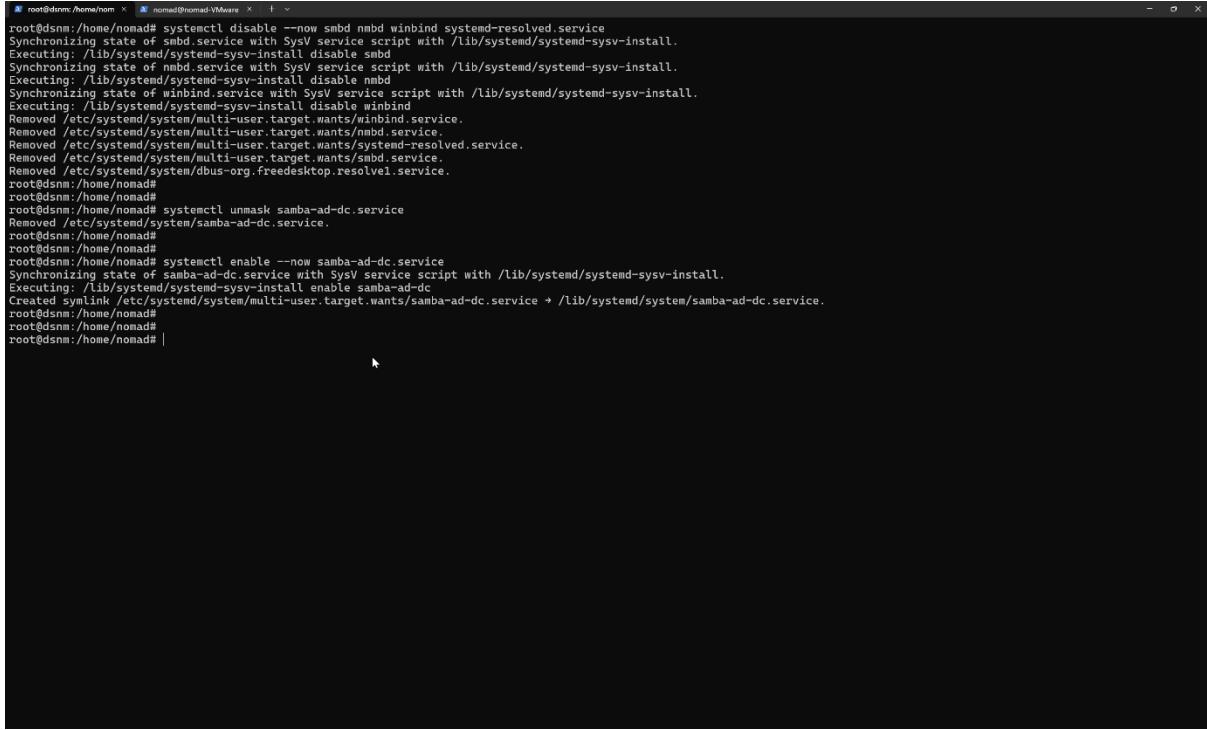
Figure 9.Edit relove.conf in server

## 1.8 Prepare system to run samba-AD-DC service

```
sudo systemctl disable --now smbd nmbd winbind systemd-resolved.service
```

```
sudo systemctl unmask samba-ad-dc.service
```

```
sudo systemctl enable --now samba-ad-dc.service
```

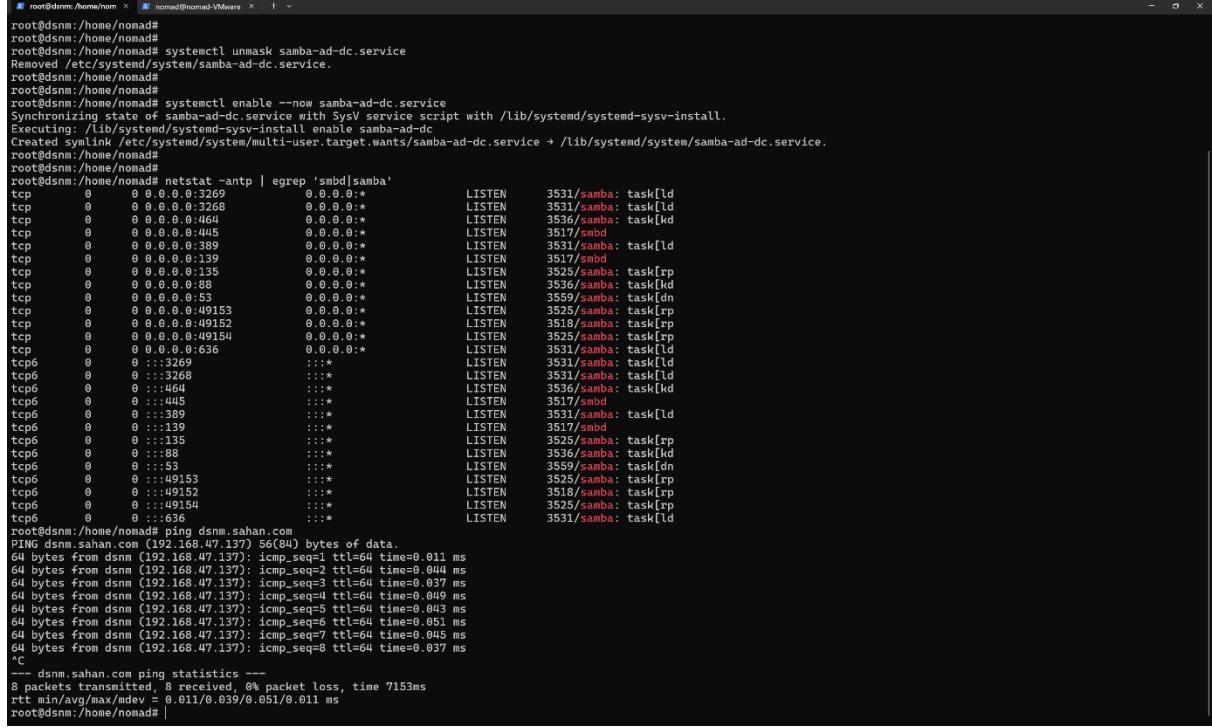


```
root@dsni:/home/nomad# systemctl disable --now smbd nmbd winbind systemd-resolved.service
Synchronizing state of smbd.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install disable smbd
Synchronizing state of nmbd.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install disable nmbd
Synchronizing state of winbind service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install disable winbind
Removed '/etc/systemd/system/multi-user.target.wants/winbind.service'.
Removed '/etc/systemd/system/multi-user.target.wants/nmbd.service'.
Removed '/etc/systemd/system/multi-user.target.wants/systemd-resolved.service'.
Removed '/etc/systemd/system/multi-user.target.wants/smbd.service'.
Removed '/etc/systemd/system/dbus-org.freedesktop.resolve1.service'.
root@dsni:/home/nomad#
root@dsni:/home/nomad#
root@dsni:/home/nomad# systemctl unmask samba-ad-dc.service
Removed '/etc/systemd/system/samba-ad-dc.service'.
root@dsni:/home/nomad#
root@dsni:/home/nomad#
root@dsni:/home/nomad# systemctl enable --now samba-ad-dc.service
Synchronizing state of samba-ad-dc.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable samba-ad-dc
Created symlink /etc/systemd/system/multi-user.target.wants/samba-ad-dc.service → /lib/systemd/system/samba-ad-dc.service.
root@dsni:/home/nomad#
root@dsni:/home/nomad#
root@dsni:/home/nomad# |
```

Figure 10.Prepare system to run samba-AD-DC service

## 1.9 Check if samba is listening for connections

Sudo netstat -antp | egrep 'smbd | samba'



```
root@dsnm:/home/nomad# sudo systemctl enable --now samba-ad-dc.service
root@dsnm:/home/nomad# systemctl unmask samba-ad-dc.service
Removed '/etc/systemd/system/samba-ad-dc.service'.
root@dsnm:/home/nomad#
root@dsnm:/home/nomad# sudo netstat -antp | egrep 'smbd | samba'
Synchronizing state of samba-ad-dc.service with SysV service script with /lib/systemd/systemv-install.
Executing: /lib/systemd/systemd-sysv-install enable samba-ad-dc
Created symlink /etc/systemd/system/multi-user.target.wants/samba-ad-dc.service → /lib/systemd/system/samba-ad-dc.service.
root@dsnm:/home/nomad#
root@dsnm:/home/nomad# sudo netstat -antp | egrep 'smbd | samba'
tcp    0    0    0.0.0.0:3269      0.0.0.0:*          LISTEN   3531/samba: task[ld
tcp    0    0    0.0.0.0:3268      0.0.0.0:*          LISTEN   3531/samba: task[ld
tcp    0    0    0.0.0.0:464       0.0.0.0:*          LISTEN   3536/samba: task[ld
tcp    0    0    0.0.0.0:445       0.0.0.0:*          LISTEN   3517/smbd
tcp    0    0    0.0.0.0:389       0.0.0.0:*          LISTEN   3531/samba: task[ld
tcp    0    0    0.0.0.0:5939     0.0.0.0:*          LISTEN   3525/smbd
tcp    0    0    0.0.0.0:135      0.0.0.0:*          LISTEN   3525/samba: task[rp
tcp    0    0    0.0.0.0:88       0.0.0.0:*          LISTEN   3536/samba: task[ld
tcp    0    0    0.0.0.0:53       0.0.0.0:*          LISTEN   3559/samba: task[ldn
tcp    0    0    0.0.0.0:49153    0.0.0.0:*          LISTEN   3525/samba: task[rp
tcp    0    0    0.0.0.0:49152    0.0.0.0:*          LISTEN   3518/samba: task[rp
tcp    0    0    0.0.0.0:49154    0.0.0.0:*          LISTEN   3525/samba: task[rp
tcp    0    0    0.0.0.0:636      0.0.0.0:*          LISTEN   3531/samba: task[ld
tcp6   0    0    ::1:3269        ::*:               LISTEN   3531/samba: task[ld
tcp6   0    0    ::1:3268        ::*:               LISTEN   3531/samba: task[ld
tcp6   0    0    ::1:464         ::*:               LISTEN   3536/samba: task[ld
tcp6   0    0    ::1:445         ::*:               LISTEN   3517/smbd
tcp6   0    0    ::1:389         ::*:               LISTEN   3531/samba: task[ld
tcp6   0    0    ::1:139         ::*:               LISTEN   3525/smbd
tcp6   0    0    ::1:135         ::*:               LISTEN   3525/samba: task[rp
tcp6   0    0    ::1:88          ::*:               LISTEN   3536/samba: task[ld
tcp6   0    0    ::1:53          ::*:               LISTEN   3559/samba: task[ldn
tcp6   0    0    ::1:49153       ::*:               LISTEN   3525/samba: task[rp
tcp6   0    0    ::1:49152       ::*:               LISTEN   3518/samba: task[rp
tcp6   0    0    ::1:49154       ::*:               LISTEN   3525/samba: task[rp
tcp6   0    0    ::1:636         ::*:               LISTEN   3531/samba: task[ld
root@dsnm:/home/nomad# ping dsmn.sahan.com
PING dsmn.sahan.com (192.168.47.137) 56(84) bytes of data.
64 bytes from dsmn (192.168.47.137): icmp_seq=1 ttl=64 time=0.011 ms
64 bytes from dsmn (192.168.47.137): icmp_seq=2 ttl=64 time=0.044 ms
64 bytes from dsmn (192.168.47.137): icmp_seq=3 ttl=64 time=0.037 ms
64 bytes from dsmn (192.168.47.137): icmp_seq=4 ttl=64 time=0.037 ms
64 bytes from dsmn (192.168.47.137): icmp_seq=5 ttl=64 time=0.043 ms
64 bytes from dsmn (192.168.47.137): icmp_seq=6 ttl=64 time=0.051 ms
64 bytes from dsmn (192.168.47.137): icmp_seq=7 ttl=64 time=0.048 ms
64 bytes from dsmn (192.168.47.137): icmp_seq=8 ttl=64 time=0.037 ms
'C
--- dsmn.sahan.com ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7153ms
rtt min/avg/max/mdev = 0.011/0.039/0.051/0.011 ms
root@dsnm:/home/nomad#
```

Figure 11. Check if samba is listening for connections

## 1.10 Check connection

ping dsnm.sahan.com

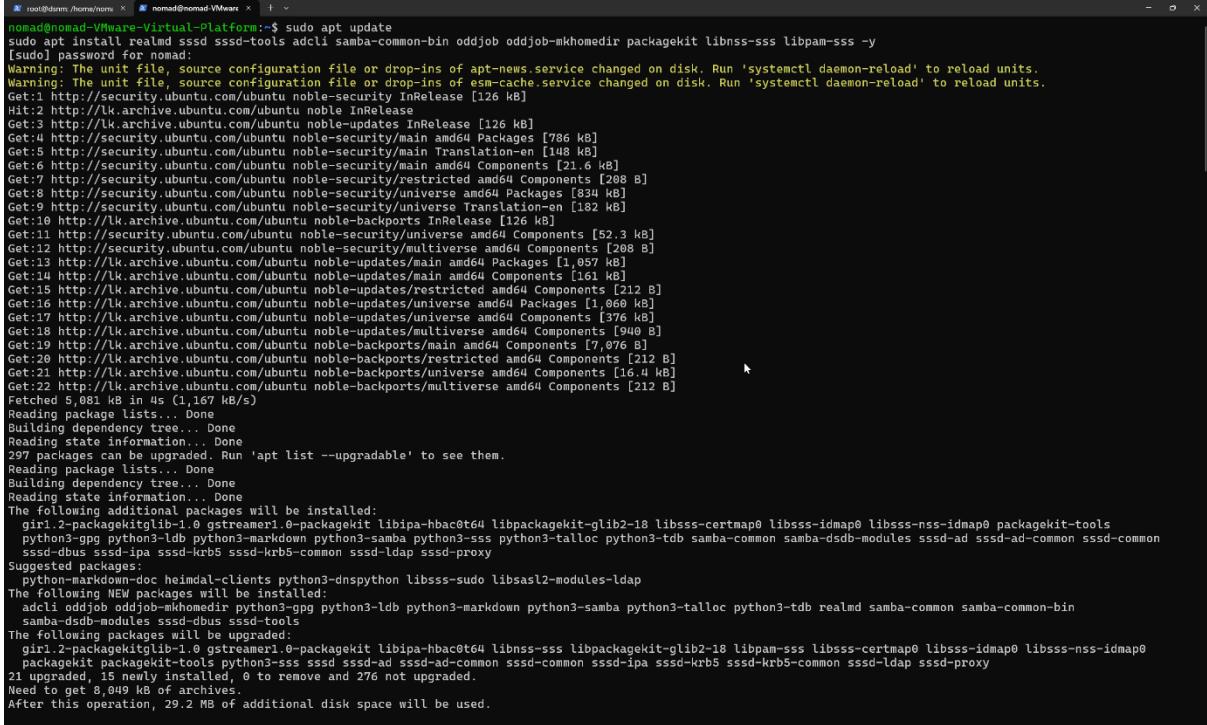
ping google.com

```
nomad@dsnm:~$ ping dsnm.sahan.com
PING dsnm.sahan.com (192.168.47.137) 64(84) bytes of data.
64 bytes from dsnm (192.168.47.137): icmp_seq=1 ttl=64 time=0.011 ms
64 bytes from dsnm (192.168.47.137): icmp_seq=2 ttl=64 time=0.049 ms
64 bytes from dsnm (192.168.47.137): icmp_seq=3 ttl=64 time=0.039 ms
64 bytes from dsnm (192.168.47.137): icmp_seq=4 ttl=64 time=0.350 ms
64 bytes from dsnm (192.168.47.137): icmp_seq=5 ttl=64 time=0.035 ms
64 bytes from dsnm (192.168.47.137): icmp_seq=6 ttl=64 time=0.041 ms
64 bytes from dsnm (192.168.47.137): icmp_seq=7 ttl=64 time=0.069 ms
64 bytes from dsnm (192.168.47.137): icmp_seq=8 ttl=64 time=0.050 ms
64 bytes from dsnm (192.168.47.137): icmp_seq=9 ttl=64 time=0.039 ms
"C"
-- dsnm.sahan.com ping statistics --
9 packets transmitted, 9 received, 0% packet loss, time 8203ms
rtt min/avg/max/mdev = 0.011/0.074/0.356/0.098 ms
nomad@dsnm:~$ ping google.com
PING google.com (172.253.118.113) 56(84) bytes of data.
64 bytes from sl-in-f113.1e100.net (172.253.118.113): icmp_seq=1 ttl=128 time=50.7 ns
64 bytes from sl-in-f113.1e100.net (172.253.118.113): icmp_seq=2 ttl=128 time=47.7 ns
64 bytes from sl-in-f113.1e100.net (172.253.118.113): icmp_seq=3 ttl=128 time=46.9 ns
64 bytes from sl-in-f113.1e100.net (172.253.118.113): icmp_seq=4 ttl=128 time=45.7 ns
64 bytes from sl-in-f113.1e100.net (172.253.118.113): icmp_seq=5 ttl=128 time=46.2 ns
"C"
-- google.com ping statistics --
5 packets transmitted, 5 received, 0% packet loss, time 4039ms
rtt min/avg/max/mdev = 45.684/47.452/50.602/1.752 ms
nomad@dsnm:~$
```

Figure 12. Check connection

## 1.11 On client

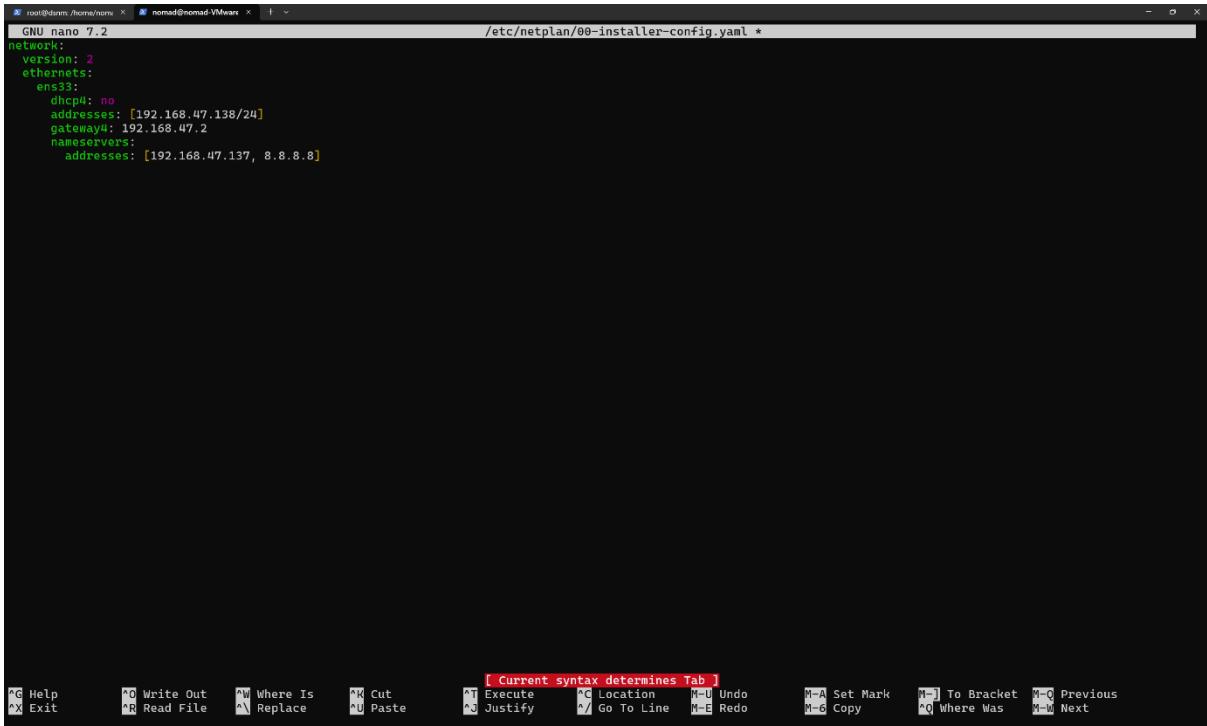
### Sudo apt update



```
root@dnsm /home/nomu  nomad@nomad-VMware ~ [~] f 
nomad@nomad-VMware-virtual-platform:~$ sudo apt update
sudo apt install realmd sssd-tools adcli samba-common-bin oddjob oddjob-mkhomedir packagekit libnss-sss libpam-sss -y
[sudo] password for nomad:
Warning: The unit file, source configuration file or drop-ins of apt-news.service changed on disk. Run 'systemctl daemon-reload' to reload units.
Warning: The unit file, source configuration file or drop-ins of esm-cache.service changed on disk. Run 'systemctl daemon-reload' to reload units.
Get:1 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Hit:2 http://lk.archive.ubuntu.com/ubuntu noble InRelease
Get:3 http://security.ubuntu.com/ubuntu noble-security/main Translation-en [126 kB]
Get:4 http://security.ubuntu.com/ubuntu noble-security/main amd64 Packages [786 kB]
Get:5 http://security.ubuntu.com/ubuntu noble-security/main Translation-en [148 kB]
Get:6 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [21.6 kB]
Get:7 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [208 kB]
Get:8 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Packages [834 kB]
Get:9 http://security.ubuntu.com/ubuntu noble-security/universe Translation-en [182 kB]
Get:10 http://lk.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:11 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.3 kB]
Get:12 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [208 kB]
Get:13 http://lk.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [1,057 kB]
Get:14 http://lk.archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [161 kB]
Get:15 http://lk.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 kB]
Get:16 http://lk.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [1,060 kB]
Get:17 http://lk.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [376 kB]
Get:18 http://lk.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 kB]
Get:19 http://lk.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [7,076 kB]
Get:20 http://lk.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [212 kB]
Get:21 http://lk.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [16.4 kB]
Get:22 http://lk.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 kB]
Fetched 5,081 kB in 45 (1,167 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
297 packages can be upgraded. Run 'apt list --upgradable' to see them.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  gir1.2-packagekitglib-1.0 gstreamer1.0-packagekit libipa-hbac@t64 libpackagekit-glib2-18 libsss-certmap0 libsss-idmap0 libsss-nss-idmap0 packagekit-tools
  python3-gpg python3-lsb python3-markdown python3-samba python3-sss python3-talloc python3-tdb samba-common samba-dsdb-modules sssd-ad sssd-ad-common sssd-common
  sssd-dbus sssd-ipa sssd-krb5 sssd-krb5-common sssd-ldap sssd-proxy
Suggested packages:
  python-markdown-doc heimdal-clients python3-dnspython libsss-sudo libsasl2-modules-ldap
The following NEW packages will be installed:
  adcli oddjob oddjob-mkhomedir python3-gpg python3-lsb python3-markdown python3-samba python3-talloc python3-tdb realmd samba-common samba-common-bin
  samba-dsdb-modules sssd-dbus sssd-tools
The following packages will be upgraded:
  gir1.2-packagekitglib-1.0 gstreamer1.0-packagekit libipa-hbac@t64 libsss-sss libpackagekit-glib2-18 libpam-sss libsss-certmap0 libsss-idmap0 libsss-nss-idmap0
  packagekit packagekit-tools python3-sss sssd sssd-ad sssd-ad-common sssd-common sssd-ipa sssd-krb5 sssd-krb5-common sssd-ldap sssd-proxy
21 upgraded, 15 newly installed, 0 to remove and 276 not upgraded.
Need to get 8,049 kB of archives.
After this operation, 29.2 MB of additional disk space will be used.
```

Figure 13.update package list

### sudo /etc/netplan/00-installer-config.yaml



```
root@dnsm /home/nomu  nomad@nomad-VMware ~ [~] f 
GNU nano 7.2                                     /etc/netplan/00-installer-config.yaml *
network:
  version: 2
  ethernets:
    ens33:
      dhcp4: no
      addresses: [192.168.47.138/24]
      gateway4: 192.168.47.2
      nameservers:
        addresses: [192.168.47.137, 8.8.8.8]
```

Figure 14.edit netplan file

ping dsnm.sahan.com

ping google.com

```
root@dsnm:/home/nomad| nomad@nomad-VMware| | 
;; MSG SIZE  rcvd: 120
nomad@nomad-VMware-Virtual-Platform:/etc/netplan$ sudo nano /etc/resolv.conf
nomad@nomad-VMware-Virtual-Platform:/etc/netplan$ dig _ldap._tcp.dc._msdcs.sahan.com

; <>> DiG 9.18.30-0ubuntu0.24.04.2-Ubuntu <>> _ldap._tcp.dc._msdcs.sahan.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 25359
;; flags: qr aa rd ra ad; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 0

;; QUESTION SECTION:
_ldap._tcp.dc._msdcs.sahan.com.      IN      A

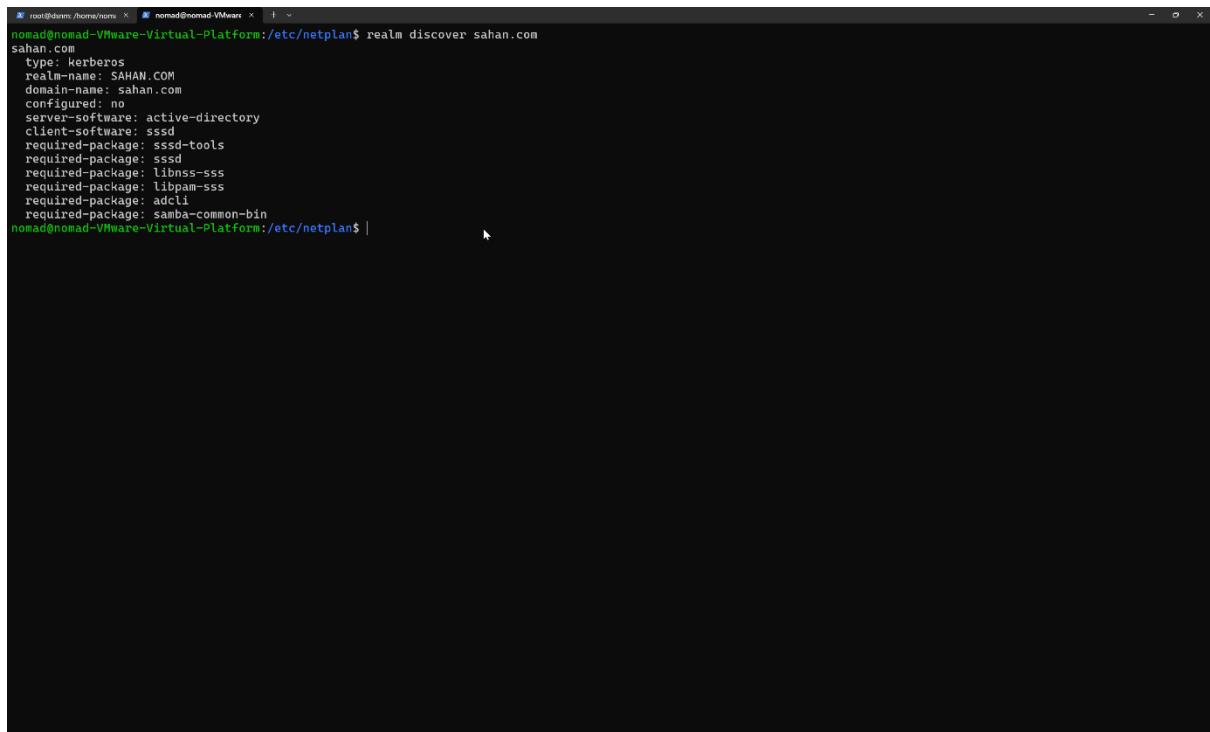
;; AUTHORITY SECTION:
_msdcs.sahan.com.      3600    IN      SOA     dsnm.sahan.com. hostmaster.sahan.com. 1 900 600 86400 3600

;; Query time: 2 msec
;; SERVER: 192.168.47.137#53(192.168.47.137) (UDP)
;; WHEN: Mon May  5 20:03:16 +0530 2025
;; MSG SIZE  rcvd: 100

nomad@nomad-VMware-Virtual-Platform:/etc/netplan$ ping 192.168.47.137
PING 192.168.47.137 (192.168.47.137) 56(84) bytes of data.
64 bytes from 192.168.47.137: icmp_seq=1 ttl=64 time=0.55 ms
^[[A64 bytes from 192.168.47.137: icmp_seq=2 ttl=64 time=0.598 ms
^[[A64 bytes from 192.168.47.137: icmp_seq=3 ttl=64 time=0.457 ms
^C
--- 192.168.47.137 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2073ms
rtt min/avg/max/mdev = 0.457/1.869/4.554/1.898 ms
nomad@nomad-VMware-Virtual-Platform:/etc/netplan$ ping dsnm.sahan.com
PING dsnm.sahan.com (192.168.47.139) 56(84) bytes of data.
64 bytes from 192.168.47.139: icmp_seq=1 ttl=64 time=1.68 ms
64 bytes from 192.168.47.139: icmp_seq=2 ttl=64 time=0.686 ms
64 bytes from 192.168.47.139: icmp_seq=3 ttl=64 time=0.349 ms
64 bytes from 192.168.47.139: icmp_seq=4 ttl=64 time=1.18 ms
64 bytes from 192.168.47.139: icmp_seq=5 ttl=64 time=0.488 ms
64 bytes from 192.168.47.139: icmp_seq=6 ttl=64 time=0.610 ms
64 bytes from 192.168.47.139: icmp_seq=7 ttl=64 time=0.973 ms
64 bytes from 192.168.47.139: icmp_seq=8 ttl=64 time=0.490 ms
64 bytes from 192.168.47.139: icmp_seq=9 ttl=64 time=0.742 ms
64 bytes from 192.168.47.139: icmp_seq=10 ttl=64 time=0.927 ms
64 bytes from 192.168.47.139: icmp_seq=11 ttl=64 time=0.683 ms
64 bytes from 192.168.47.139: icmp_seq=12 ttl=64 time=0.509 ms
^C
--- dsnm.sahan.com ping statistics ---
12 packets transmitted, 12 received, 0% packet loss, time 11265ms
rtt min/avg/max/mdev = 0.349/0.776/1.675/0.353 ms
nomad@nomad-VMware-Virtual-Platform:/etc/netplan$ |
```

Figure 15.check connection

## 1.12 Check Linux system can communicate with and join the domain realm discover sahan.com



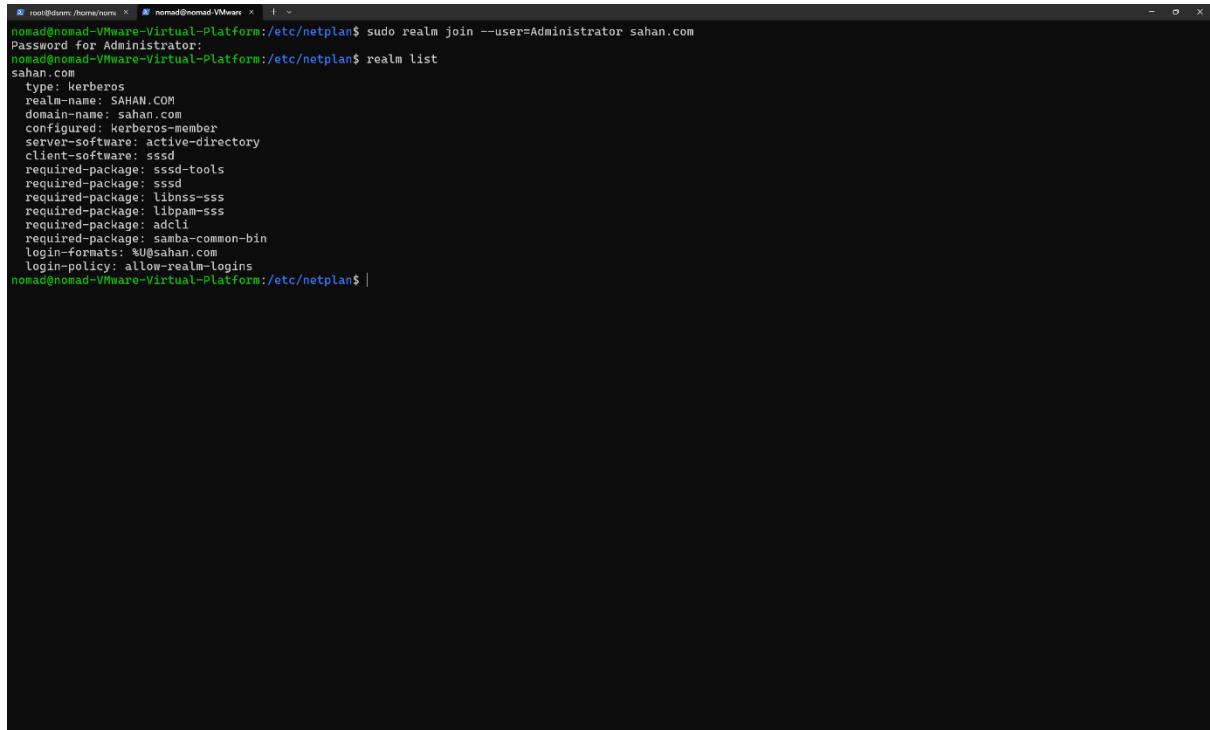
```
root@dfim: /home/nomi | nomad@nomad-VMware | F ~
nomad@nomad-VMware-Virtual-Platform:/etc/netplan$ realm discover sahan.com
sahan.com
  type: kerberos
  realm-name: SAHAN.COM
  domain-name: sahan.com
  configured: no
  server-software: active-directory
  client-software: sssd
  required-package: sssd-tools
  required-package: sssd
  required-package: libnss-sss
  required-package: adcli
  required-package: samba-common-bin
nomad@nomad-VMware-Virtual-Platform:/etc/netplan$ |
```

Figure 16.Check Linux system can communicate with and join the domain

## 1.13 Join the realm

```
sudo realm join --user=Administrator sahan.com
```

```
realm list
```

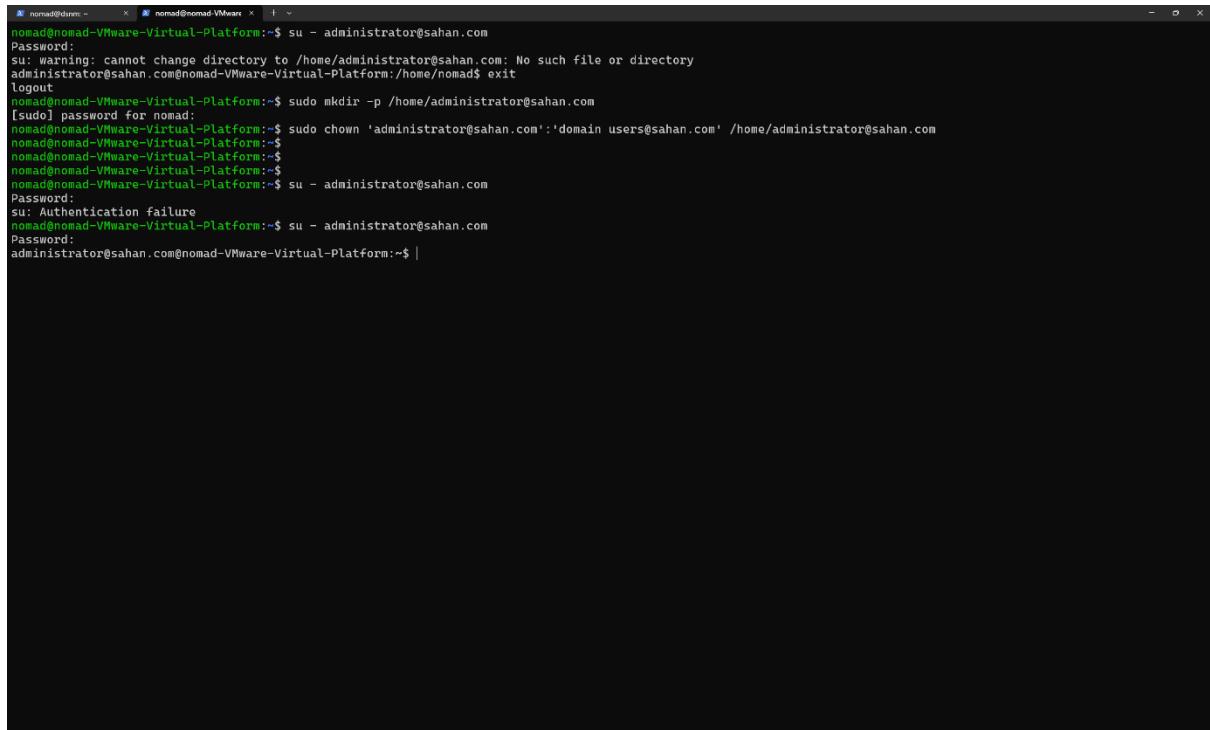


```
root@dam:~# sudo realm join --user=Administrator sahan.com
Password for Administrator:
nomad@nomad-Virtual-Platform:/etc/netplan$ realm list
sahan.com
  type: kerberos
  realm-name: SAHAN.COM
  domain-name: sahan.com
  configured: kerberos-member
  server-software: active-directory
  client-software: sssd
  required-package: sssd-tools
  required-package: sssd
  required-package: libnss-sss
  required-package: libpam-sss
  required-package: adcli
  required-package: samba-common-bin
  login-formats: %U@sahan.com
  login-policy: allow-realm-logins
nomad@nomad-Virtual-Platform:/etc/netplan$ |
```

Figure 17.Join the realm

## 1.14 Swtch to admin account

su – administrator@sahan.com



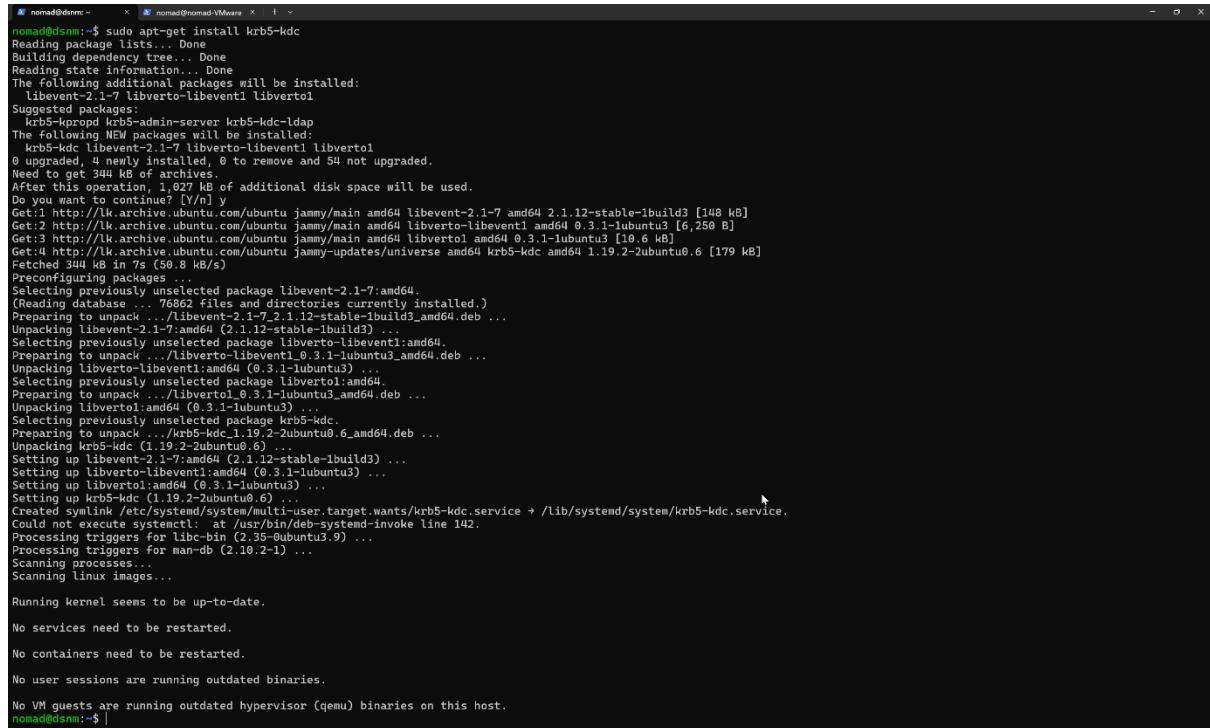
```
nomad@nomad:~ nomad@nomad-VMware:~$ su - administrator@sahan.com
Password:
su: warning: cannot change directory to /home/administrator@sahan.com: No such file or directory
administrator@sahan.com@nomad-VMware-Virtual-Platform:/home/nomad$ exit
logout
nomad@nomad-VMware-Virtual-Platform:~$ sudo mkdir -p /home/administrator@sahan.com
[sudo] password for nomad:
nomad@nomad-VMware-Virtual-Platform:~$ sudo chown 'administrator@sahan.com':'domain users@sahan.com' /home/administrator@sahan.com
nomad@nomad-VMware-Virtual-Platform:~$ 
nomad@nomad-VMware-Virtual-Platform:~$ 
nomad@nomad-VMware-Virtual-Platform:~$ su - administrator@sahan.com
Password:
su: Authentication failure
nomad@nomad-VMware-Virtual-Platform:~$ su - administrator@sahan.com
Password:
administrator@sahan.com@nomad-VMware-Virtual-Platform:~$ |
```

Figure 18.Swtch to admin account

## 2 Kerberos installation and configuration

### 2.1 Install package

```
sudo apt-get install krb5-kdc
```



The screenshot shows a terminal window with the following text:

```
nomad@dsnm:~$ sudo apt-get install krb5-kdc
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libevent-2.1-7 libevent1 libevent0
Suggested packages:
  krb5-kpropd krb5-admin-server krb5-kdc-ldap
The following NEW packages will be installed:
  krb5-kdc libevent-2.1-7 libevent1 libevent0
0 upgraded, 4 newly installed, 0 to remove and 54 not upgraded.
Need to get 344 kB of additional software.
After this operation, 827 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libevent-2.1-7 amd64 2.1.12-stable-1build3 [148 kB]
Get:2 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libevent1 amd64 0.3.1-1ubuntu3 [6,258 B]
Get:3 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libevent0 amd64 0.3.1-1ubuntu3 [10.6 kB]
Get:4 http://lk.archive.ubuntu.com/ubuntu/universe amd64 krb5-kdc amd64 1.19.2-2ubuntu0.6 [179 kB]
Fetched 344 kB in 7s (59.8 kB/s)
Preconfiguring packages...
Selecting previously unselected package libevent-2.1-7:amd64.
(Reading database ... 76862 files and directories currently installed.)
Preparing to unpack .../libevent-2.1-7-2.1.12-stable-1build3_amd64.deb ...
Unpacking libevent-2.1-7:amd64 (2.1.12-stable-1build3) ...
Selecting previously unselected package libevent1:amd64.
Preparing to unpack .../libevent1:amd64_0.3.1-1ubuntu3_amd64.deb ...
Unpacking libevent1:amd64 (0.3.1-1ubuntu3)
Selecting previously unselected package libevent0:amd64.
Preparing to unpack .../libevent0:amd64_0.3.1-1ubuntu3_amd64.deb ...
Unpacking libevent0:amd64 (0.3.1-1ubuntu3) ...
Selecting previously unselected package krb5-kdc.
Preparing to unpack .../krb5-kdc_1.19.2-2ubuntu0.6_amd64.deb ...
Unpacking krb5-kdc (1.19.2-2ubuntu0.6) ...
Setting up libevent-2.1-7:amd64 (2.1.12-stable-1build3) ...
Setting up libevent1:amd64 (0.3.1-1ubuntu3) ...
Setting up libevent0:amd64 (0.3.1-1ubuntu3) ...
Setting up krb5-kdc (1.19.2-2ubuntu0.6) ...
Creating symbolic link /etc/systemd/system/kdc-user.target.wants/krb5-kdc.service → /lib/systemd/system/krb5-kdc.service.
Could not execute systemctl: /usr/bin/deb-systemd-invoke line 142.
Processing triggers for libc-bin (2.35-0ubuntu3.9) ...
Processing triggers for man-db (2.10.2-1) ...
Scanning processes ...
Scanning linux images...

Running kernel seems to be up-to-date.
No services need to be restarted.
No containers need to be restarted.
No user sessions are running outdated binaries.
No VM guests are running outdated hypervisor (qemu) binaries on this host.
nomad@dsnm:~$ |
```

Figure 19. Install package

## 2.2 configure krb5.conf

sudo nano /etc/krb5.conf



```
nomad@dsnm: ~ nomad@nomad-VMware ~ F *
GNU nano 6.2                                     /etc/krb5.conf *

[libdefaults]
    default_realm = SAHAN.COM
    dns_lookup_realm = false
    dns_lookup_kdc = true
    ticket_lifetime = 24h
    renew_lifetime = 7d
    forwardable = true

[realms]
SAHAN.COM = {
    default_domain = sahan.com
    kdc = dsnn.sahan.com
    admin_server = dsnn.sahan.com
}

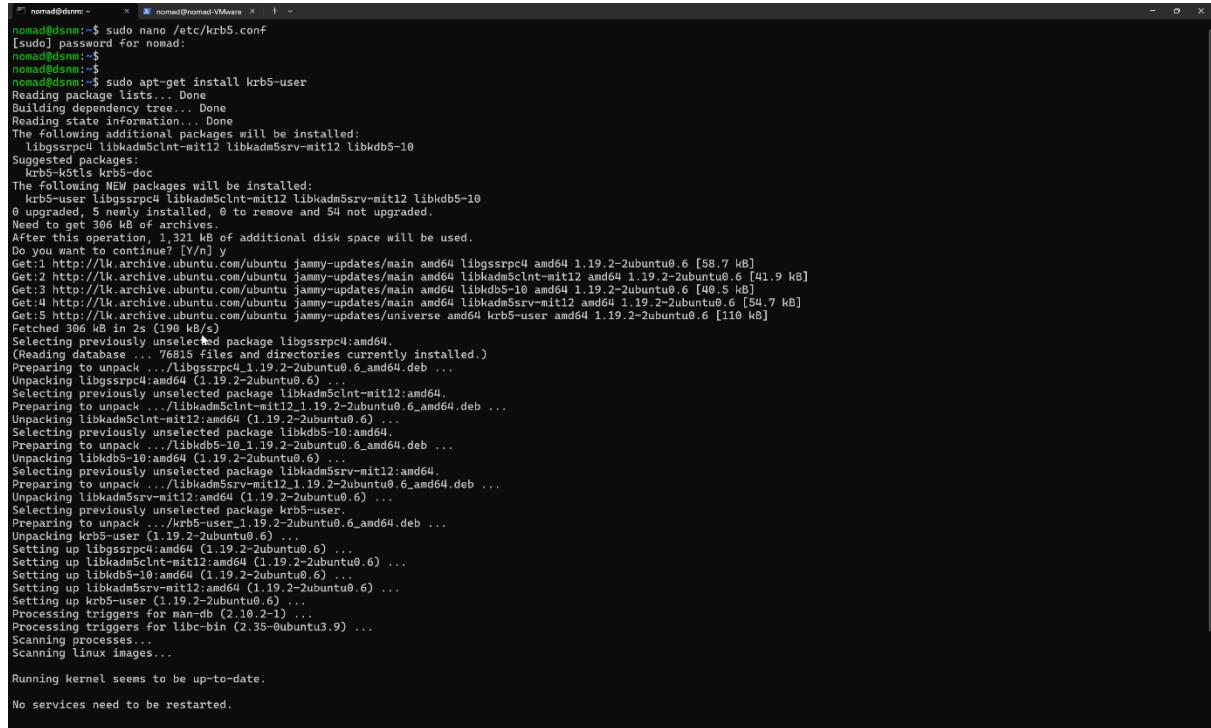
[domain_realm]
.dsnn = SAHAN.COM
.dsnn = SAHAN.COM

File Name to Write: /etc/krb5.conf
^G Help      M-D DOS Format      M-A Append      M-B Backup File
^C Cancel    M-M Mac Format      M-P Prepend    ^T Browse
```

Figure 20.Edit krb5.conf file

## 2.3 Kerberos user package install

```
sudo apt-get install krb5-user
```



```
nomad@dsnm:~$ sudo nano /etc/krb5.conf
[sudo] password for nomad:
nomad@dsnm:~$ nomad@dsnm:~$ sudo apt-get install krb5-user
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libgssrpc4 libkadm5clnt-mit12 libkadm5srv-mit12 libkdb5-10
Suggested packages:
  krb5-k5tts krb5-doc
The following NEW packages will be installed:
  krb5-user libgssrpc4 libkadm5clnt-mit12 libkadm5srv-mit12 libkdb5-10
0 upgraded, 5 newly installed, 0 to remove and 54 not upgraded.
Need to get 306 kB of archives.
After this operation, 1,321 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libgssrpc4 amd64 1.19.2-2ubuntu0.6 [58.7 kB]
Get:2 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libkadm5clnt-mit12 amd64 1.19.2-2ubuntu0.6 [41.9 kB]
Get:3 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libkdb5-10 amd64 1.19.2-2ubuntu0.6 [48.5 kB]
Get:4 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libkadm5srv-mit12 amd64 1.19.2-2ubuntu0.6 [54.7 kB]
Get:5 http://lk.archive.ubuntu.com/ubuntu/universe amd64 krb5-user amd64 1.19.2-2ubuntu0.6 [110 kB]
Fetched 306 kB in 2s (190 kB/s)
Selecting previously unselected package libgssrpc4:amd64.
(Reading database ... 76815 files and directories currently installed.)
Preparing to unpack .../libgssrpc4_1.19.2-2ubuntu0.6_amd64.deb ...
Unpacking libgssrpc4:amd64 (1.19.2-2ubuntu0.6) ...
Selecting previously unselected package libkadm5clnt-mit12:amd64.
Preparing to unpack .../libkadm5clnt-mit12_1.19.2-2ubuntu0.6_amd64.deb ...
Unpacking libkadm5clnt-mit12:amd64 (1.19.2-2ubuntu0.6) ...
Selecting previously unselected package libkdb5-10:amd64.
Preparing to unpack .../libkdb5-10_1.19.2-2ubuntu0.6_amd64.deb ...
Unpacking libkdb5-10:amd64 (1.19.2-2ubuntu0.6) ...
Selecting previously unselected package libkadm5srv-mit12:amd64.
Preparing to unpack .../libkadm5srv-mit12_1.19.2-2ubuntu0.6_amd64.deb ...
Unpacking libkadm5srv-mit12:amd64 (1.19.2-2ubuntu0.6) ...
Selecting previously unselected package krb5-user.
Preparing to unpack .../krb5-user_1.19.2-2ubuntu0.6_amd64.deb ...
Unpacking krb5-user (1.19.2-2ubuntu0.6) ...
Setting up libgssrpc4:amd64 (1.19.2-2ubuntu0.6) ...
Setting up libkadm5clnt-mit12:amd64 (1.19.2-2ubuntu0.6) ...
Setting up libkdb5-10:amd64 (1.19.2-2ubuntu0.6) ...
Setting up libkadm5srv-mit12:amd64 (1.19.2-2ubuntu0.6) ...
Setting up krb5-user (1.19.2-2ubuntu0.6) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.9) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.
No services need to be restarted.
```

Figure 21.Kerberos user package install

## 2.4 Authenticate a user and display Kerberos ticket and Check DNS

```
sudo kinit administrator@SAHAN.COM
```

```
sudo klist
```

```
smbclient -L localhost -U administrator
```

```
host -t SRV _ldap._tcp.sahan.com
```

```
host -t SRV _kerberos._tcp.sahan.com
```

```
host -t A dsnm.sahan.com
```

```

nomad@dsnm:~ x nomad@nomad-VMware x | 
Selecting previously unselected package libgssrpc4:amd64.
(Reading database ... 76815 files and directories currently installed.)
Preparing to unpack .../libgssrpc4_1.19.2-2ubuntu0.6_amd64.deb ...
Unpacking libgssrpc4:amd64 (1.19.2-2ubuntu0.6) ...
Selecting previously unselected package libkadm5clnt-mit12:amd64.
Preparing to unpack .../libkadm5clnt-mit12_1.19.2-2ubuntu0.6_amd64.deb ...
Unpacking libkadm5clnt-mit12:amd64 (1.19.2-2ubuntu0.6) ...
Selecting previously unselected package libkadm5srv-mit12:amd64.
Preparing to unpack .../libkadm5srv-mit12_1.19.2-2ubuntu0.6_amd64.deb ...
Unpacking libkadm5srv-mit12:amd64 (1.19.2-2ubuntu0.6) ...
Selecting previously unselected package krb5-user.
Preparing to unpack .../krb5-user_1.19.2-2ubuntu0.6_amd64.deb ...
Unpacking krb5-user (1.19.2-2ubuntu0.6) ...
Setting up libkadm5clnt-mit12:amd64 (1.19.2-2ubuntu0.6) ...
Setting up libkadm5srv-mit12:amd64 (1.19.2-2ubuntu0.6) ...
Setting up krb5-user (1.19.2-2ubuntu0.6) ...
Processing triggers for man-db (2.18.2-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.9) ...
Scanning processes ...
Scanning linux images...
Running kernel seems to be up-to-date.
No services need to be restarted.
No containers need to be restarted.
No user sessions are running outdated binaries.
No VM guests are running outdated hypervisor (qemu) binaries on this host.
nomad@dsnm:~$ 
nomad@dsnm:~$ 
nomad@dsnm:~$ 
nomad@dsnm:~$ kinit administrator@sahan.com
Password for administrator@sahan.com:
kinit: KDC reply did not match expectations while getting initial credentials
nomad@dsnm:~$ klist
klist: No credentials cache found (filename: /tmp/krb5cc_1000)
nomad@dsnm:~$ kinit administrator@SAHAN.COM
Password for administrator@SAHAN.COM:
Warning: Your password will expire in 41 days on Mon 16 Jun 2025 02:06:38 PM UTC
nomad@dsnm:~$ klist
Ticket cache: FILE:/tmp/krb5cc_1000
Default principal: administrator@SAHAN.COM

Valid starting     Expires            Service principal
05/06/2025 05:44:54  05/06/2025 15:44:54  krbtgt/SAHAN.COM@SAHAN.COM
    renew until 05/13/2025 05:44:48

nomad@dsnm:~$ klist
Ticket cache: FILE:/tmp/krb5cc_1000
Default principal: administrator@SAHAN.COM

Valid starting     Expires            Service principal
05/06/2025 05:44:54  05/06/2025 15:44:54  krbtgt/SAHAN.COM@SAHAN.COM
    renew until 05/13/2025 05:44:48
nomad@dsnm:~$ kinit administrator@SAHAN.COM
Password for administrator@SAHAN.COM:
Warning: Your password will expire in 41 days on Mon 16 Jun 2025 02:06:38 PM UTC
nomad@dsnm:~$ smbclient -L localhost -k -U administrator@SAHAN.COM
WARNING: The option '-k'--kerberos is deprecated!
Kerberos auth with 'administrator@SAHAN.COM' (\administrator@SAHAN.COM) to access 'localhost' not possible
session setup failed: NT_STATUS_ACCESS_DENIED
nomad@dsnm:~$ smbclient -L localhost -U administrator
Password for [SAHAN\administrator]:
      Sharename      Type      Comment
      -----      ----      -----
      sysvol        Disk
      netlogon       Disk
      C$           IPC      IPC Service (Samba 4.15.13-Ubuntu)
SMB1 disabled -- no workgroup available
nomad@dsnm:~$ 
nomad@dsnm:~$ host -t SRV _ldap._tcp.sahan.com
_ldap._tcp.sahan.com has SRV record 0 100 389 dsnm.sahan.com.
nomad@dsnm:~$ host -t SRV _kerberos._tcp.sahan.com
_kerberos._tcp.sahan.com has SRV record 0 100 88 dsnm.sahan.com.
nomad@dsnm:~$ host -t A dsnm.sahan.com
dsnm.sahan.com has address 192.168.47.137
dsnm.sahan.com has address 192.168.47.139
nomad@dsnm:~$ 

```

Figure 22. Authenticate a user

```

nomad@dsnm:~ x nomad@nomad-VMware x | 
nomad@dsnm:~$ klist
Ticket cache: FILE:/tmp/krb5cc_1000
Default principal: administrator@SAHAN.COM

Valid starting     Expires            Service principal
05/06/2025 05:44:54  05/06/2025 15:44:54  krbtgt/SAHAN.COM@SAHAN.COM
    renew until 05/13/2025 05:44:48
nomad@dsnm:~$ klist
Ticket cache: FILE:/tmp/krb5cc_1000
Default principal: administrator@SAHAN.COM

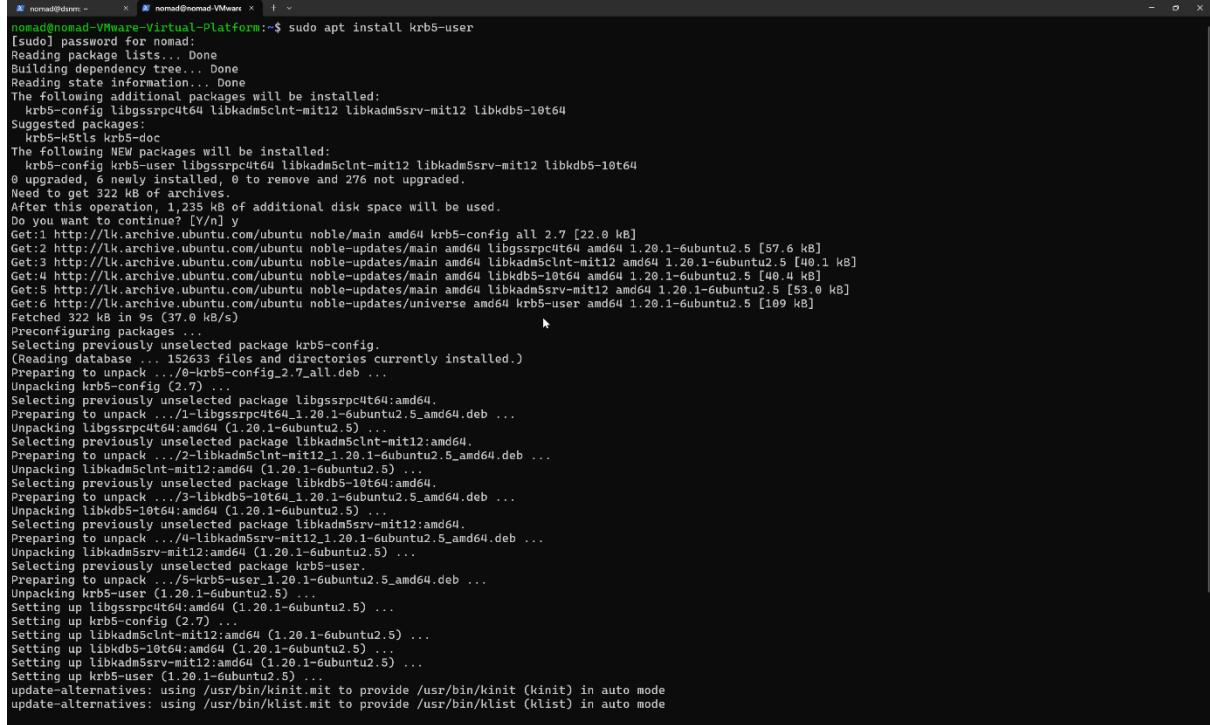
Valid starting     Expires            Service principal
05/06/2025 05:44:54  05/06/2025 15:44:54  krbtgt/SAHAN.COM@SAHAN.COM
    renew until 05/13/2025 05:44:48
nomad@dsnm:~$ kinit administrator@SAHAN.COM
Password for administrator@SAHAN.COM:
Warning: Your password will expire in 41 days on Mon 16 Jun 2025 02:06:38 PM UTC
nomad@dsnm:~$ smbclient -L localhost -k -U administrator@SAHAN.COM
WARNING: The option '-k'--kerberos is deprecated!
Kerberos auth with 'administrator@SAHAN.COM' (\administrator@SAHAN.COM) to access 'localhost' not possible
session setup failed: NT_STATUS_ACCESS_DENIED
nomad@dsnm:~$ smbclient -L localhost -U administrator
Password for [SAHAN\administrator]:
      Sharename      Type      Comment
      -----      ----      -----
      sysvol        Disk
      netlogon       Disk
      C$           IPC      IPC Service (Samba 4.15.13-Ubuntu)
SMB1 disabled -- no workgroup available
nomad@dsnm:~$ 
nomad@dsnm:~$ host -t SRV _ldap._tcp.sahan.com
_ldap._tcp.sahan.com has SRV record 0 100 389 dsnm.sahan.com.
nomad@dsnm:~$ host -t SRV _kerberos._tcp.sahan.com
_kerberos._tcp.sahan.com has SRV record 0 100 88 dsnm.sahan.com.
nomad@dsnm:~$ host -t A dsnm.sahan.com
dsnm.sahan.com has address 192.168.47.137
dsnm.sahan.com has address 192.168.47.139
nomad@dsnm:~$ 

```

Figure 23.display Kerberos ticket and check DNS

## 2.5 On client

```
sudo apt install krb5-user
```



```
nomad@nomad:~ nomad@nomad-Virtual-Platform:~$ sudo apt install krb5-user
[sudo] password for nomad:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  krb5-config libgssrpc4t64 libkadm5clnt-mit12 libkadm5srv-mit12 libkdb5-10t64
Suggested packages:
  krb5-k5ts krb5-doc
The following NEW packages will be installed:
  krb5-config krb5-user libgssrpc4t64 libkadm5clnt-mit12 libkadm5srv-mit12 libkdb5-10t64
0 upgraded, 6 newly installed, 0 to remove and 276 not upgraded.
Need to get 322 kB of archives.
After this operation, 1,235 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://lk.archive.ubuntu.com/ubuntu noble/main amd64 krb5-config all 2.7 [22.0 kB]
Get:2 http://lk.archive.ubuntu.com/ubuntu noble-updates/main amd64 libgssrpc4t64 amd64 1.20.1-6ubuntu2.5 [57.6 kB]
Get:3 http://lk.archive.ubuntu.com/ubuntu noble-updates/main amd64 libkadm5clnt-mit12 amd64 1.20.1-6ubuntu2.5 [40.1 kB]
Get:4 http://lk.archive.ubuntu.com/ubuntu noble-updates/main amd64 libkdb5-10t64 amd64 1.20.1-6ubuntu2.5 [40.4 kB]
Get:5 http://lk.archive.ubuntu.com/ubuntu noble-updates/main amd64 libkadm5srv-mit12 amd64 1.20.1-6ubuntu2.5 [53.0 kB]
Get:6 http://lk.archive.ubuntu.com/ubuntu noble-updates/universe amd64 krb5-user amd64 1.20.1-6ubuntu2.5 [109 kB]
Fetched 322 kB in 9s (37.0 kB/s)
Preconfiguring packages ...
Selecting previously unselected package krb5-config.
(Reading database ... 15263 files and directories currently installed.)
Preparing to unpack .../0-krb5-config_2.7_all.deb ...
Unpacking krb5-config (2.7) ...
Selecting previously unselected package libgssrpc4t64:amd64.
Preparing to unpack .../1-libgssrpc4t64_1.20.1-6ubuntu2.5_amd64.deb ...
Unpacking libgssrpc4t64:amd64 (1.20.1-6ubuntu2.5) ...
Selecting previously unselected package libkadm5clnt-mit12:amd64.
Preparing to unpack .../2-libkadm5clnt-mit12_1.20.1-6ubuntu2.5_amd64.deb ...
Unpacking libkadm5clnt-mit12:amd64 (1.20.1-6ubuntu2.5) ...
Selecting previously unselected package libkdb5-10t64:amd64.
Preparing to unpack .../3-libkdb5-10t64_1.20.1-6ubuntu2.5_amd64.deb ...
Unpacking libkdb5-10t64:amd64 (1.20.1-6ubuntu2.5) ...
Selecting previously unselected package libkadm5srv-mit12:amd64.
Preparing to unpack .../4-libkadm5srv-mit12_1.20.1-6ubuntu2.5_amd64.deb ...
Unpacking libkadm5srv-mit12:amd64 (1.20.1-6ubuntu2.5) ...
Selecting previously unselected package krb5-user.
Preparing to unpack .../5-krb5-user_1.20.1-6ubuntu2.5_amd64.deb ...
Unpacking krb5-user (1.20.1-6ubuntu2.5) ...
Setting up libgssrpc4t64:amd64 (1.20.1-6ubuntu2.5) ...
Setting up krb5-config (2.7) ...
Setting up libkadm5clnt-mit12:amd64 (1.20.1-6ubuntu2.5) ...
Setting up libkdb5-10t64:amd64 (1.20.1-6ubuntu2.5) ...
Setting up libkadm5srv-mit12:amd64 (1.20.1-6ubuntu2.5) ...
Setting up krb5-user (1.20.1-6ubuntu2.5) ...
update-alternatives: using /usr/bin/kinit.mit to provide /usr/bin/kinit (kinit) in auto mode
update-alternatives: using /usr/bin/klist.mit to provide /usr/bin/klist (klist) in auto mode
```

Figure 24.install packages

## 3 Installing and configuring Zabbix

### 3.1 Install Zabbix repository

```
wget https://repo.zabbix.com/zabbix/6.0/ubuntu/pool/main/z/zabbix-release/zabbix-release_6.0-4+ubuntu${lsb_release -rs}_all.deb
```

```
sudo dpkg -i zabbix-release_6.0-4+ubuntu${lsb_release -rs}_all.deb
```

```
sudo apt update
```

```
nomad@nomad:~$ nomad@nomad:~$ sudo wget https://repo.zabbix.com/zabbix/6.0/ubuntu/pool/main/z/zabbix-release/zabbix-release_6.0-4ubuntu5(lsb_release -rs)_all.deb
[downloaded 1 file]
2025-05-06 06:22:37 - https://repo.zabbix.com/zabbix/6.0/ubuntu/pool/main/z/zabbix-release/zabbix-release_6.0-4+ubuntu22.04_all.deb
Resolving repo.zabbix.com (repo.zabbix.com)... 178.128.6.101, 2684:a880:2:2::d001
Connecting to repo.zabbix.com (repo.zabbix.com)[178.128.6.101]:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 30833 (3.0K) [application/octet-stream]
Saving to: 'zabbix_release_6.0-4+ubuntu22.04_all.deb'

zabbix_release_6.0-4+ubuntu22.04_all.deb      100%[=====] 3.59K --.-KB/s   in 0s

2025-05-06 06:22:38 (44.5 MB/s) - 'zabbix-release_6.0-4+ubuntu22.04_all.deb' saved [3676/3676]

nomad@nomad:~$ sudo dpkg -i zabbix-release_6.0-4+ubuntu5(lsb_release -rs)_all.deb
Selecting previously unselected package zabbix-release.
(Reading database ... 76862 files and directories currently installed.)
Preparing to unpack zabbix-release_6.0-4+ubuntu22.04_all.deb ...
Unpacking zabbix-release (1:6.0-4+ubuntu22.04) ...
Setting up zabbix-release (1:6.0-4+ubuntu22.04) ...

nomad@nomad:~$ 
nomad@nomad:~$ sudo apt update
Get:1 https://repo.zabbix.com/zabbix-agent2-plugins/1/ubuntu jammy InRelease [4,952 B]
Get:2 https://repo.zabbix.com/zabbix/6.0/ubuntu jammy InRelease [2,886 B]
Get:3 https://repo.zabbix.com/zabbix-agent2-plugins/1/ubuntu jammy/main Sources [1,002 B]
Get:4 https://repo.zabbix.com/zabbix-agent2-plugins/1/ubuntu jammy/main amd64 Packages [624 B]
Get:5 https://repo.zabbix.com/zabbix/6.0/ubuntu jammy/main Sources [37.2 kB]
Get:6 https://repo.zabbix.com/zabbix/6.0/ubuntu jammy/main all Packages [20.4 kB]
Get:7 https://repo.zabbix.com/zabbix/6.0/ubuntu jammy/universe Sources [106 kB]
Get:8 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]
Get:9 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [2,366 kB]
Hit:10 http://lk.archive.ubuntu.com/ubuntu jammy InRelease
Get:11 http://lk.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Get:12 http://lk.archive.ubuntu.com/ubuntu jammy-security/main Translation-en [351 kB]
Get:13 http://lk.archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]
Get:14 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [2,550 kB]
Get:15 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [3,353 kB]
Get:16 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [451 kB]
Get:17 http://lk.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [203 kB]
Get:18 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [600 kB]
Get:19 http://lk.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [297 kB]
Get:20 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [974 kB]
Get:21 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [210 kB]
Get:22 http://lk.archive.ubuntu.com/ubuntu jammy-security/universe Translation-en [39.6 kB]
Fetched 12.9 MB in 38s (329 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
34 packages can be upgraded. Run 'apt list --upgradable' to see them.
nomad@nomad:~$
```

*Figure 25. Install Zabbix repository*

### 3.2 Install Zabbix server, frontend, and agent

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

*Figure 26. Install Zabbix server, frontend, and agent*

### 3.3 Install MySQL

```
sudo apt install mysql-server
```

```
nomad@dnm: ~ nomad@nomad:~$ nomad apt install mysql-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages will be installed:
  libfcgi-fast-perl libfcgi-pm-perl libclone-perl libcode-locale-perl libevent-pthreads-2.1-7 libfcgi-bin libfcgi-perl libfcgi0ldbl libhtml-parser-perl libhtml-tagset-perl libhtml-template-perl libhttp-date-perl libhttp-message-perl libio-html-perl liblwp-mediatypes-perl libmcab2 libprotobuf-lite23 libtimageate-perl liburi-perl mecab-ipadic mecab-ipadic-utf8 mecab-utils mysql-server 8.0
  mysql-server-core-8.0
Suggested packages:
  libfcgi-sharedcache-perl libbusiness-isbn-perl libwww-perl mailx tinyca
The following NEW packages will be installed:
  libfcgi-fast-perl libfcgi-pm-perl libclone-perl libcode-locale-perl libevent-pthreads-2.1-7 libfcgi-bin libfcgi-perl libfcgi0ldbl libhtml-parser-perl libhtml-tagset-perl libhtml-template-perl libhttp-date-perl libhttp-message-perl libio-html-perl liblwp-mediatypes-perl libmcab2 libprotobuf-lite23 libtimageate-perl liburi-perl mecab-ipadic mecab-ipadic-utf8 mecab-utils mysql-server 8.0
  mysql-server-core-8.0
0 upgraded, 13 new to install, 0 to remove and 54 not upgraded.
Need to get 27.1 MB of archives.
After this operation, 181 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Ign 1 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libevent-pthreads-2.1-7 amd64 2.1.12-stable-1build3
Get: 2 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libmcab2 amd64 0.996-1build9 [199 kB]
Get: 3 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libprotobuf-lite23 amd64 3.12.4-ubuntu7.22.04.2 [209 kB]
Get: 4 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 mysql-server-core-8.0 amd64 8.0.42-0ubuntu0.22.04.1 [17.8 kB]
Get: 5 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 mysql-server-8.0 amd64 8.0.42-0ubuntu0.22.04.1 [1,446 kB]
Get: 6 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libhtml-tagset-perl all 3.26-1 [12.5 kB]
Get: 7 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 liblwp-mediatypes-perl all 1.36-1 [12.5 kB]
Get: 8 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libtimageate-perl amd64 3.76-1build2 [88.4 kB]
Get: 9 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libfcgi-pm-perl all 4.54-1 [188 kB]
Get: 10 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libfcgi0ldbl amd64 2.4.2-2build2 [28.0 kB]
Get: 11 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libfcgi-perl amd64 0.82+ds-1build1 [22.8 kB]
Get: 12 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libfcgi0ldbl amd64 2.4.2-2build2 [28.0 kB]
Get: 13 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libclone-perl amd64 0.45-1build1 [11.8 kB]
Get: 14 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libcode-locale-perl all 1.1.05-1 [11.8 kB]
Get: 15 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libfcgi-bin amd64 2.4.2-2build2 [12.2 kB]
Get: 16 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libhtml-template-perl all 2.97-1 [59.1 kB]
Get: 17 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 liblwp-mediatypes-perl all 1.36-1 [12.5 kB]
Get: 18 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libtimageate-perl all 3.76-1 [12.5 kB]
Get: 19 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libio-html-perl all 1.000-2 [15.4 kB]
Get: 20 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 liblwp-mediatypes-perl all 6.04-1 [19.5 kB]
Get: 21 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libhttp-message-perl all 1.36-1 [76.8 kB]
Get: 22 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 mecab-ipadic all 2.7.0-20070801+min3 [6,718 kB]
Get: 23 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 mecab-ipadic-utf8 all 2.7.0-20070801+min3 [4,384 kB]
Get: 25 http://lk.archive.ubuntu.com/ubuntu jammy-updates/main amd64 mysql-server all 8.0.42-0ubuntu0.22.04.1 [9,462 kB]
Get: 1 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libevent-pthreads-2.1-7 amd64 2.1.12-stable-1build3s [7,642 kB]
Get: 2 http://lk.archive.ubuntu.com/ubuntu jammy/main amd64 libmcab2 amd64 0.996-1build9s [138 kB]
Preconfiguring packages ...
Selecting previously unselected package libevent-pthreads-2.1-7:amd64.
(Reading database ... 79989 files and directories currently installed.)
Preparing to unpack .../0@libevent-pthreads-2.1-7.2.1.12-stable-1build3s_amd64.deb ...
Unpacking libevent-pthreads-2.1-7.2.1.12-stable-1build3s_amd64.deb ...
Selecting previously unselected package libmcab2:amd64.
Preparing to unpack .../0@libmcab2_0.996-1build9s_amd64.deb ...
Unpacking libmcab2:amd64 (0.996-1build9s) ...
Selecting previously unselected package libprotobuf-lite23:amd64.
Preparing to unpack .../0@libprotobuf-lite23_3.12.4-ubuntu7.22.04.2_amd64.deb ...
Unpacking libprotobuf-lite23:amd64 (3.12.4-ubuntu7.22.04.2) ...
Selecting previously unselected package mysql-server-core-8.0.
Preparing to unpack .../0@mysql-server-core-8.0_8.0.42-0ubuntu0.22.04.1_amd64.deb ...
Unpacking mysql-server-core-8.0 (8.0.42-0ubuntu0.22.04.1) ...
Selecting previously unselected package mysql-server-8.0.
```

*Figure 27. Install MySQL*

### 3.4 Set up the database and create database

```
sudo mysql -u root -p
```

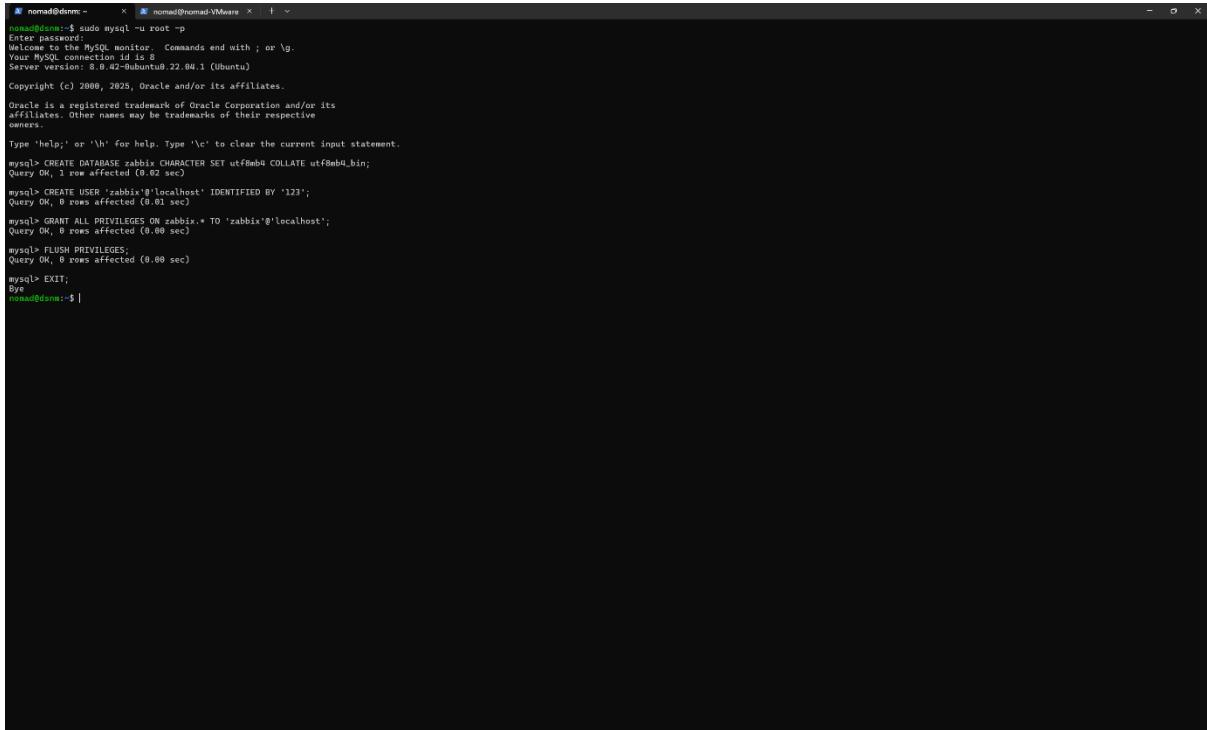
```
CREATE DATABASE zabbix CHARACTER SET utf8mb4 COLLATE  
utf8mb4_bin;
```

```
CREATE USER 'zabbix'@'localhost' IDENTIFIED BY 'password';
```

```
GRANT ALL PRIVILEGES ON zabbix.* TO 'zabbix'@'localhost';
```

```
FLUSH PRIVILEGES;
```

```
EXIT;
```



```
nomad@nomad: ~ nomad@nomad:~$ sudo mysql -u root -p  
Enter password:  
Welcome to the MySQL monitor. Commands end with ; or \g.  
Your MySQL connection id is 8  
Server version: 8.0.42-0ubuntu22.04.3 (Ubuntu)  
  
Copyright (c) 2000, 2025, Oracle and/or its affiliates.  
Oracle is a registered trademark of Oracle Corporation and/or its  
affiliates. Other names may be trademarks of their respective  
owners.  
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.  
mysql> CREATE DATABASE zabbix CHARACTER SET utf8mb4 COLLATE utf8mb4_bin;  
Query OK, 1 row affected (0.02 sec)  
mysql> CREATE USER 'zabbix'@'localhost' IDENTIFIED BY '123';  
Query OK, 0 rows affected (0.01 sec)  
mysql> GRANT ALL PRIVILEGES ON zabbix.* TO 'zabbix'@'localhost';  
Query OK, 0 rows affected (0.00 sec)  
mysql> FLUSH PRIVILEGES;  
Query OK, 0 rows affected (0.00 sec)  
mysql> EXIT;  
Bye  
nomad@nomad: ~ |
```

Figure 28. Set up the database

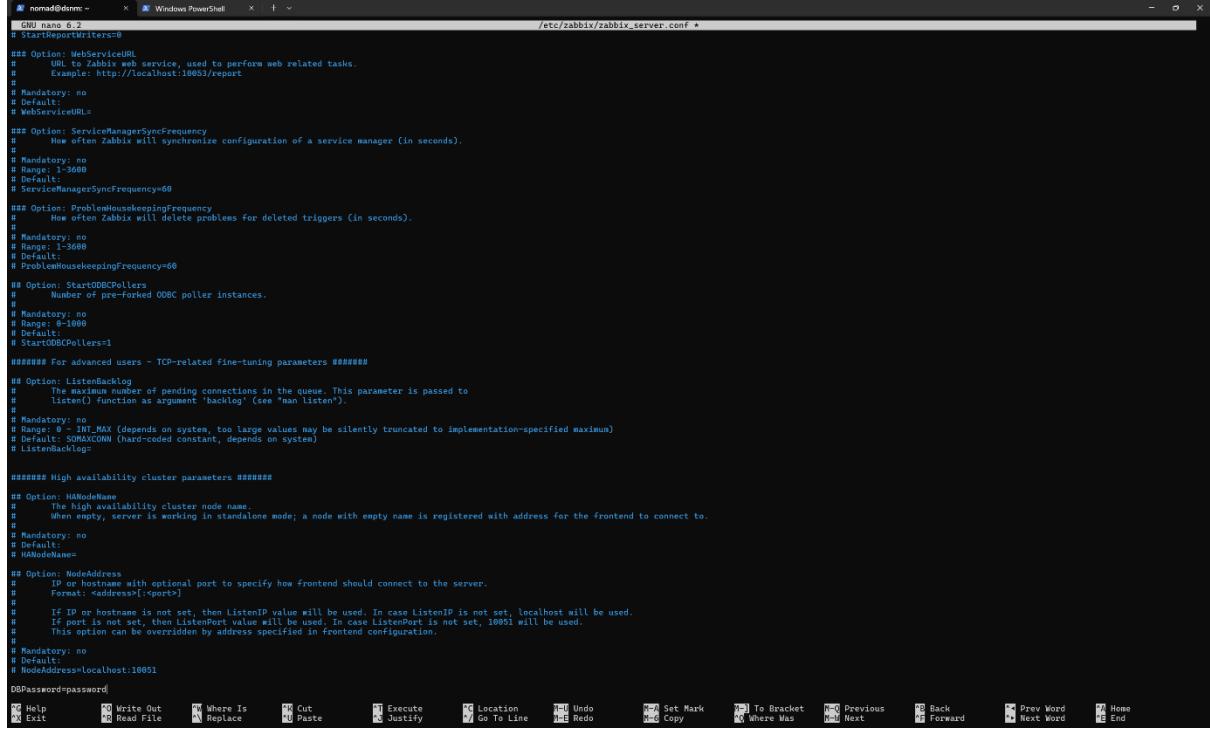
### 3.5 Import initial schema

```
sudo zcat /usr/share/doc/zabbix-sql-scripts/mysql/server.sql.gz | mysql -u zabbix -p zabbix
```

*Figure 29. Import initial schema*

### 3.6 Configure the server

sudo nano /etc/zabbix/zabbix\_server.conf



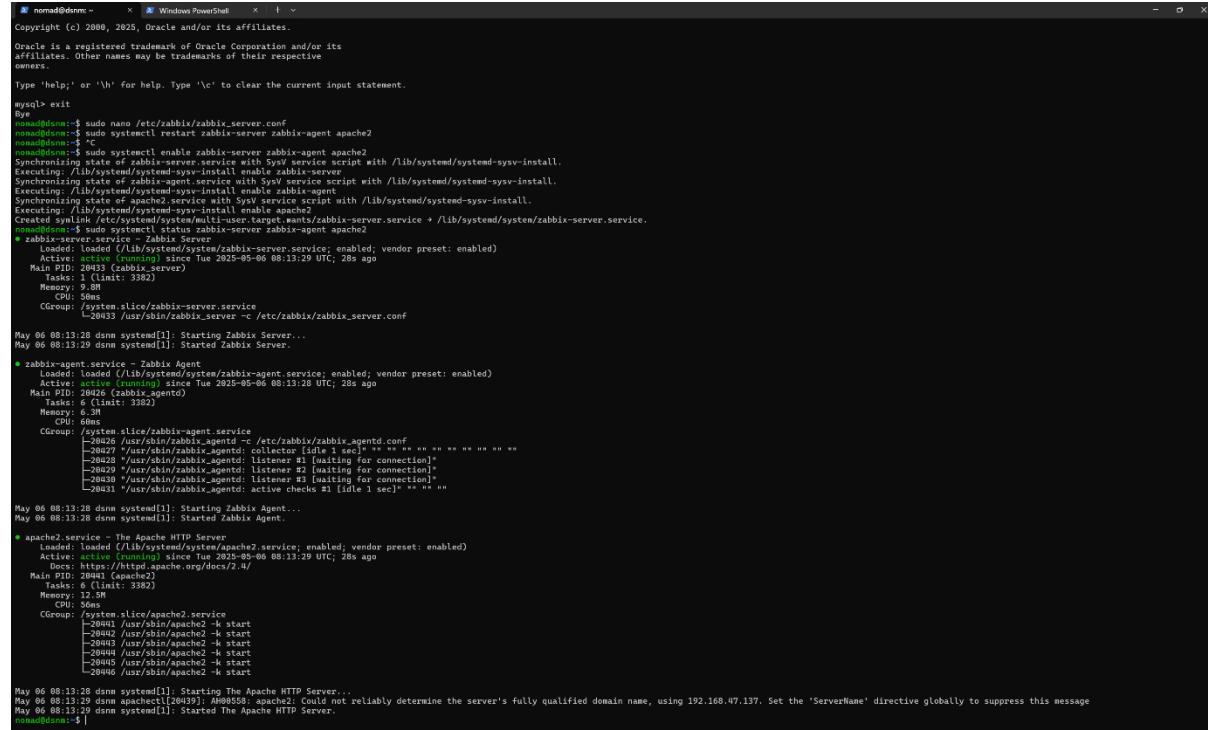
```
nomad@dsync ~ x Windows PowerShell x F v /etc/zabbix/zabbix_server.conf *  
# StartDBPOLLERS=0  
  
## Option: WebServiceURL  
## URL to Zabbix web service, used to perform web related tasks.  
## Example: http://localhost:10853/report  
## Mandatory: no  
## Range: 1-3600  
## Default:  
## WebServiceURL=50  
  
## Option: ServiceManagerSyncFrequency  
## How often Zabbix will synchronize configuration of a service manager (in seconds).  
## Mandatory: no  
## Range: 1-3600  
## Default:  
## ServiceManagerSyncFrequency=60  
  
## Option: ProblemHousekeepingFrequency  
## How often Zabbix will delete problems for deleted triggers (in seconds).  
## Mandatory: no  
## Range: 1-3600  
## Default:  
## ProblemHousekeepingFrequency=60  
  
## Option: StartODBCPOLLERS  
## Number of pre-forked ODBC poller instances.  
## Mandatory: no  
## Range: 0-1000  
## Default:  
## StartODBCPOLLERS=1  
  
##### For advanced users - TCP-related fine-tuning parameters #####  
  
## Option: ListenBacklog  
## The maximum number of pending connections in the queue. This parameter is passed to  
## listen() function as argument "backLog" (see "man listen").  
## Mandatory: no  
## Range: 1-SONAMECONN (depends on system, too large values may be silently truncated to implementation-specified maximum)  
## Default: SONAMECONN (hard-coded constant, depends on system)  
## ListenBacklog  
  
##### High availability cluster parameters #####  
  
## Option: HAModeName  
## The high availability cluster node name.  
## When empty, server is working in standalone mode; a node with empty name is registered with address for the frontend to connect to.  
## Mandatory: no  
## Default:  
## HAModeName=  
  
## Option: NodeAddress  
## IP or hostname with optional port to specify how frontend should connect to the server.  
## Format: address[:port]  
## If IP or hostname is not set, then ListenIP value will be used. In case ListenIP is not set, localhost will be used.  
## If port is not set, then ListenPort value will be used. In case ListenPort is not set, 10851 will be used.  
## This option can be overridden by address specified in frontend configuration.  
## Mandatory: no  
## Default:  
## NodeAddress=localhost:10851  
  
DBPassword=password  
Help Exit Write Out Where Is Cut Paste Execute Justify Location Undo Redo Ext Mark To Bracket Where Was Previous Next Back Forward Prev Word Next Word Home End
```

Figure 30. Configure the server

### 3.7 Restart and enable Zabbix server

```
sudo systemctl restart zabbix-server zabbix-agent apache2
```

```
sudo systemctl enable zabbix-server zabbix-agent apache2
```



```
nomad@dsnc: ~          X  ■ Windows PowerShell  X  |  v
Copyright (c) 2000, 2025, Oracle and/or its affiliates.
Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.
Type 'help;' or '?h' for help. Type '\c' to clear the current input statement.
mysql> exit
Bye
nomad@dsnc:~$ sudo nano /etc/zabbix/zabbix_server.conf
nomad@dsnc:~$ sudo systemctl restart zabbix-server zabbix-agent apache2
nomad@dsnc:~$ `C
nomad@dsnc:~$ sudo systemctl enable zabbix-server zabbix-agent apache2
Synchronizing state of zabbix-server.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable zabbix-server
Synchronizing state of zabbix-agent.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable zabbix-agent
Synchronizing state of apache2.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable apache2
Creating symlink from /etc/systemd/system/multi-user.target.wants/zabbix-server.service to /lib/systemd/system/zabbix-server.service.
nomad@dsnc:~$ sudo systemctl status zabbix-server zabbix-agent apache2
● zabbix-server.service - Zabbix Server
   Active: active (running) since Tue 2025-05-06 08:13:29 UTC; 28s ago
     Main PID: 28043 (zabbix_server)
       CGroup: /system.slice/zabbix-server.service
               └─28043 /usr/sbin/zabbix_server -c /etc/zabbix/zabbix_server.conf

May 06 08:13:28 dsnc systemd[1]: Starting Zabbix Server...
May 06 08:13:29 dsnc systemd[1]: Started Zabbix Server.

● zabbix-agent.service - Zabbix Agent
   Active: active (running) since Tue 2025-05-06 08:13:28 UTC; 28s ago
     Main PID: 28042 (zabbix_agentd)
       CGroup: /system.slice/zabbix-agent.service
               └─28042 /usr/sbin/zabbix_agentd -c /etc/zabbix/zabbix_agentd.conf
                  ├─28276 *"/usr/sbin/zabbix_agentd: collector [idle 1 sec]"
                  ├─28277 *"/usr/sbin/zabbix_agentd: listener #1 [waiting for connection]"
                  ├─28278 *"/usr/sbin/zabbix_agentd: listener #2 [waiting for connection]"
                  ├─28279 *"/usr/sbin/zabbix_agentd: listener #3 [waiting for connection]"
                  ├─28280 *"/usr/sbin/zabbix_agentd: active checks #1 [idle 1 sec]" ...
                  └─28281 *"/usr/sbin/zabbix_agentd: active checks #2 [idle 1 sec]" ...

May 06 08:13:28 dsnc systemd[1]: Starting Zabbix Agent...
May 06 08:13:28 dsnc systemd[1]: Started Zabbix Agent.

● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
     Docs: https://httpd.apache.org/docs/2.4/
   Main PID: 28041 (Apache2)
     CGroup: /system.slice/apache2.service
             ├─28041 /usr/sbin/apache2 -k start
             ├─28042 /usr/sbin/apache2 -k start
             ├─28043 /usr/sbin/apache2 -k start
             ├─28044 /usr/sbin/apache2 -k start
             ├─28045 /usr/sbin/apache2 -k start
             └─28046 /usr/sbin/apache2 -k start

May 06 08:13:28 dsnc systemd[1]: Starting The Apache HTTP Server...
May 06 08:13:29 dsnc apachectl[28043]: AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 192.168.47.137. Set the 'ServerName' directive globally to suppress this message
May 06 08:13:29 dsnc systemd[1]: Started The Apache HTTP Server.
nomad@dsnc:~$
```

Figure 31.Restart and enable Zabbix server

### 3.8 access the Zabbix web interface at <http://your-server-ip/zabbix/>

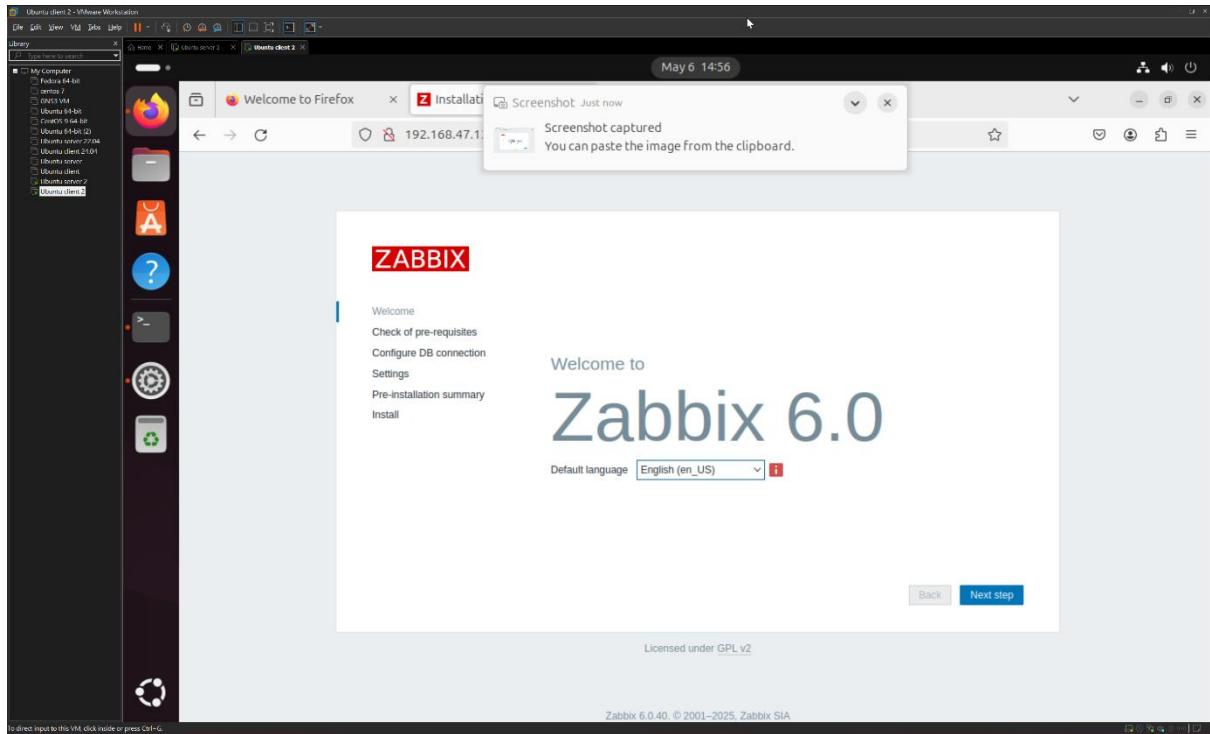


Figure 32.access zabbix interface

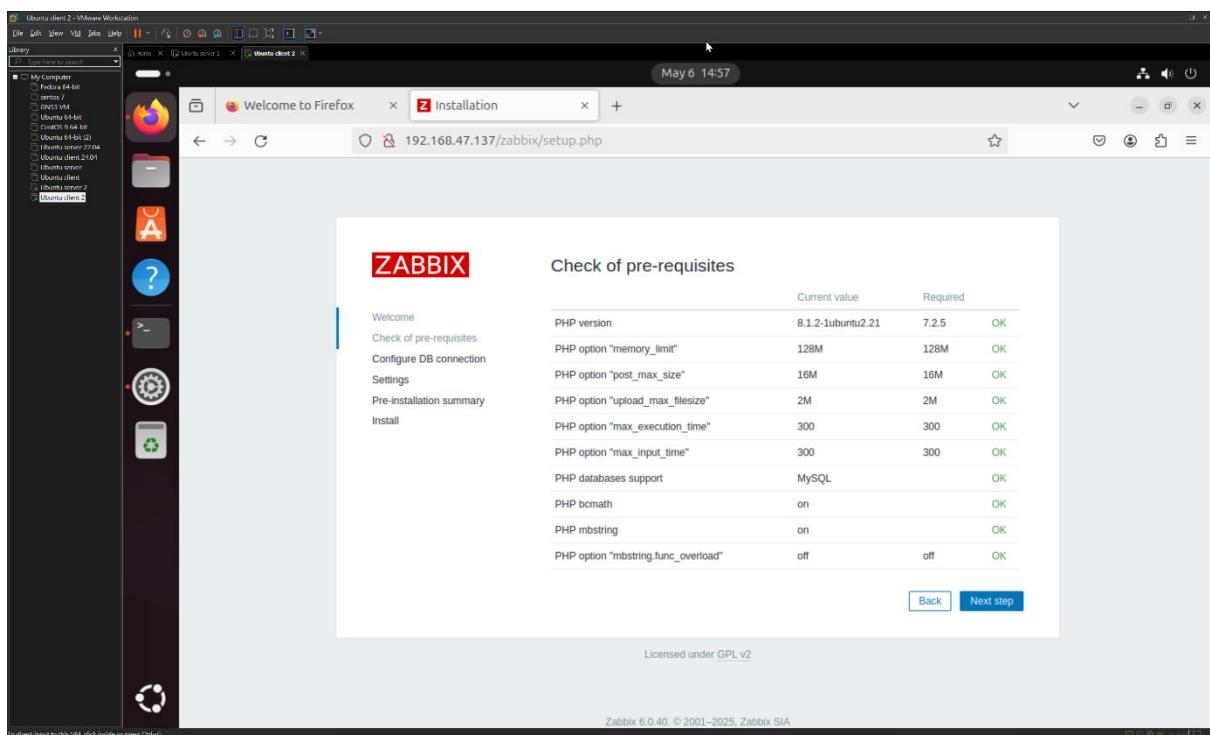


Figure 33.setup Zabbix

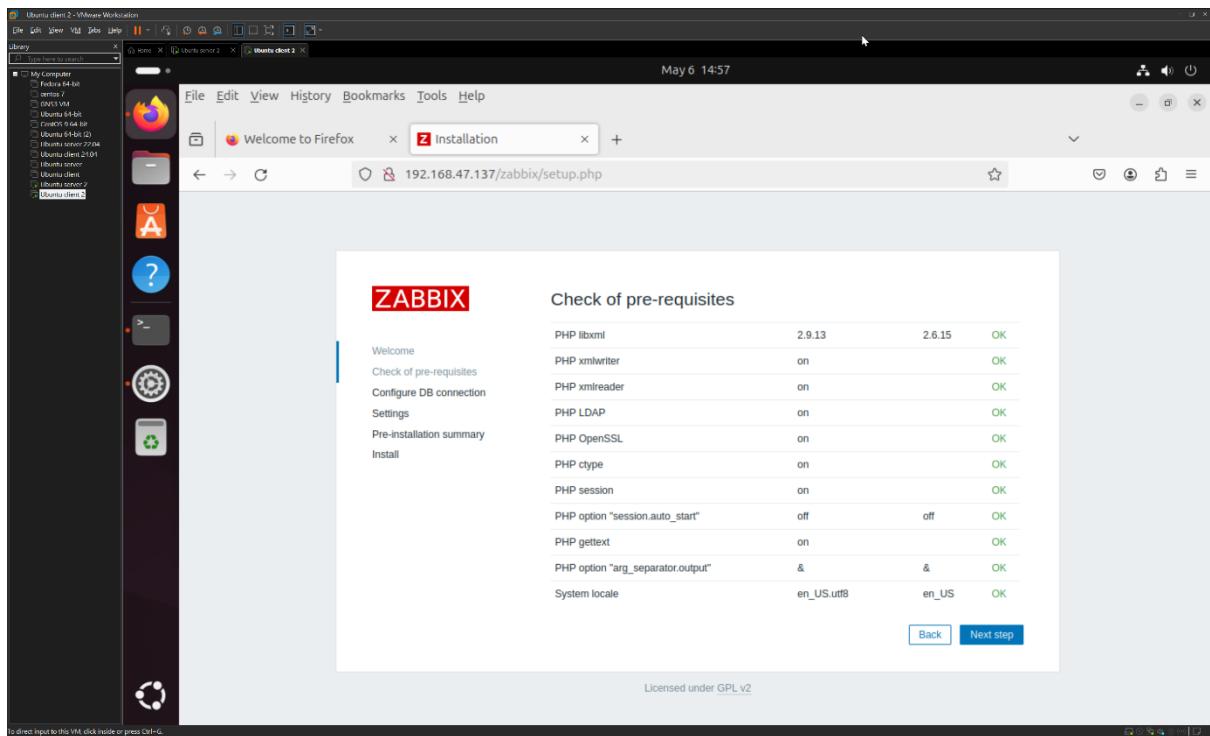


Figure 34.setup Zabbix

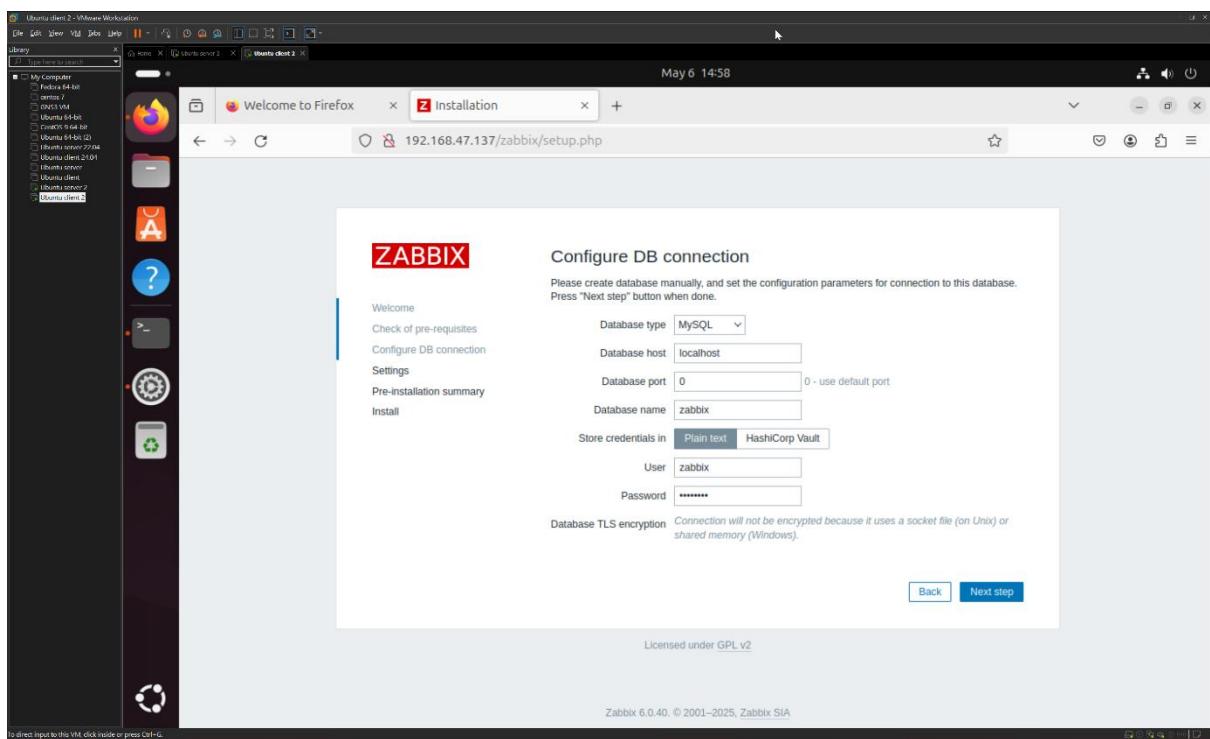


Figure 35.config DB conn

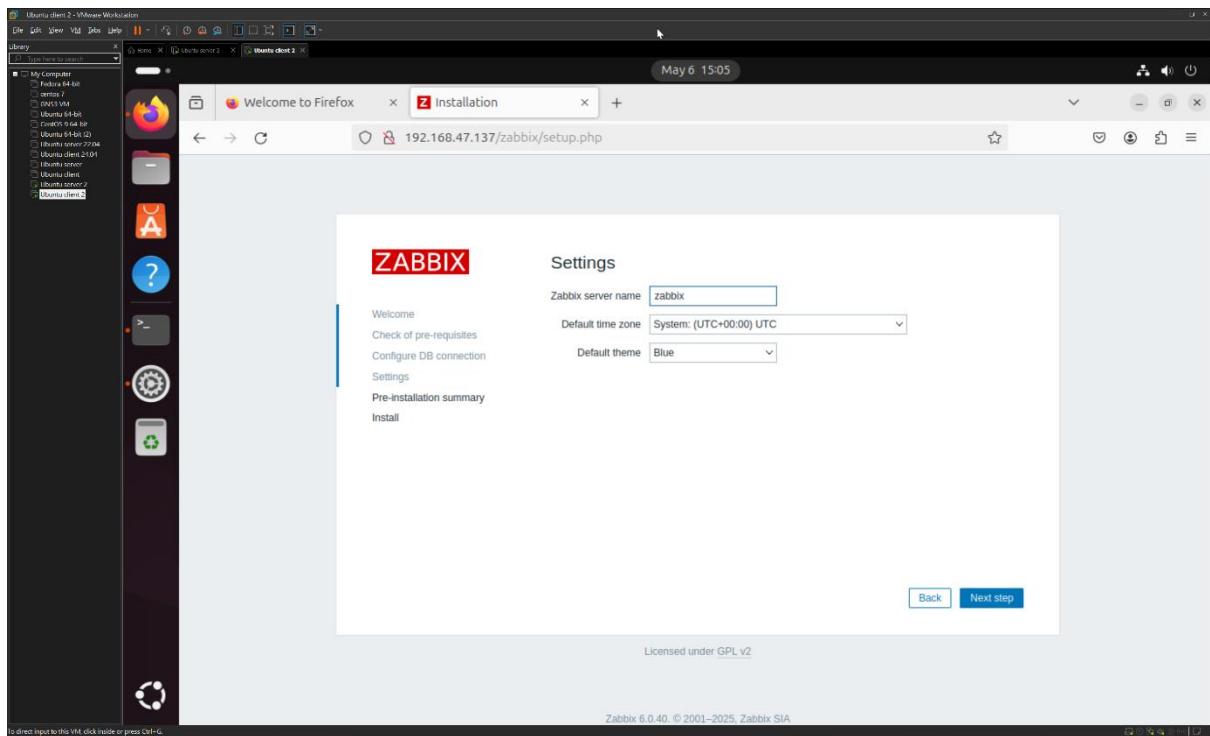


Figure 36.Zabbix setting

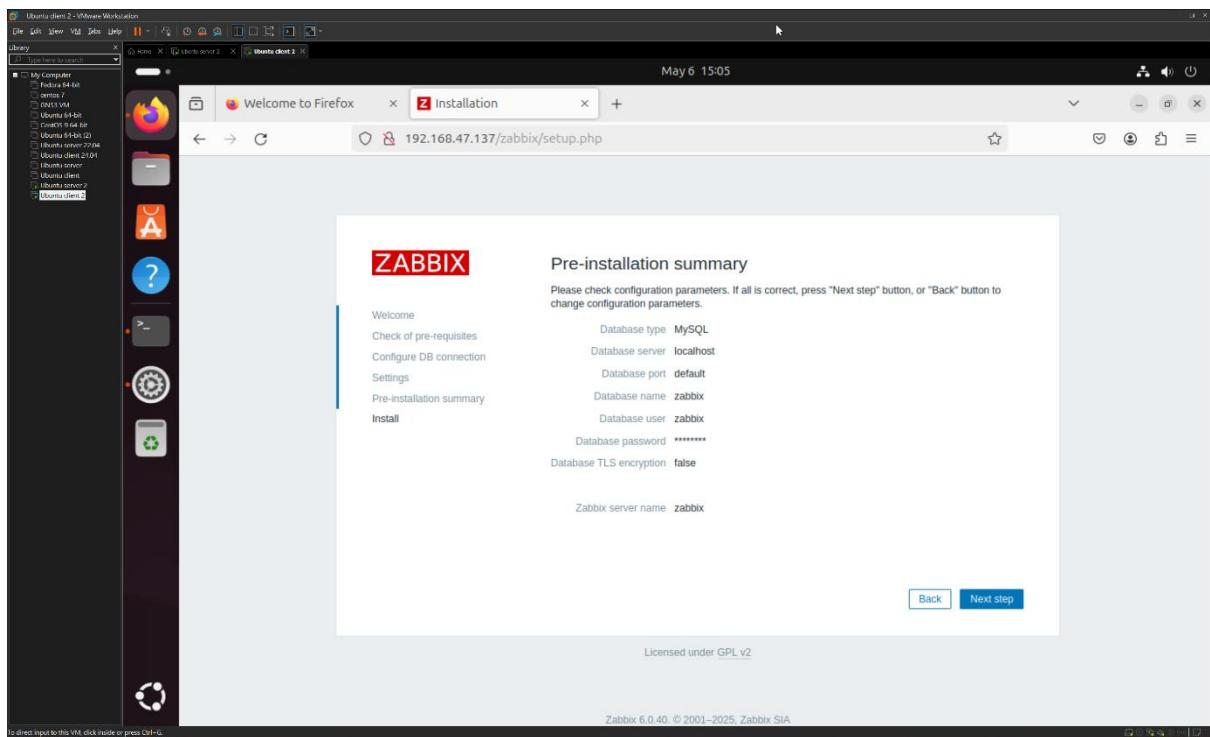


Figure 37.zabbix setup

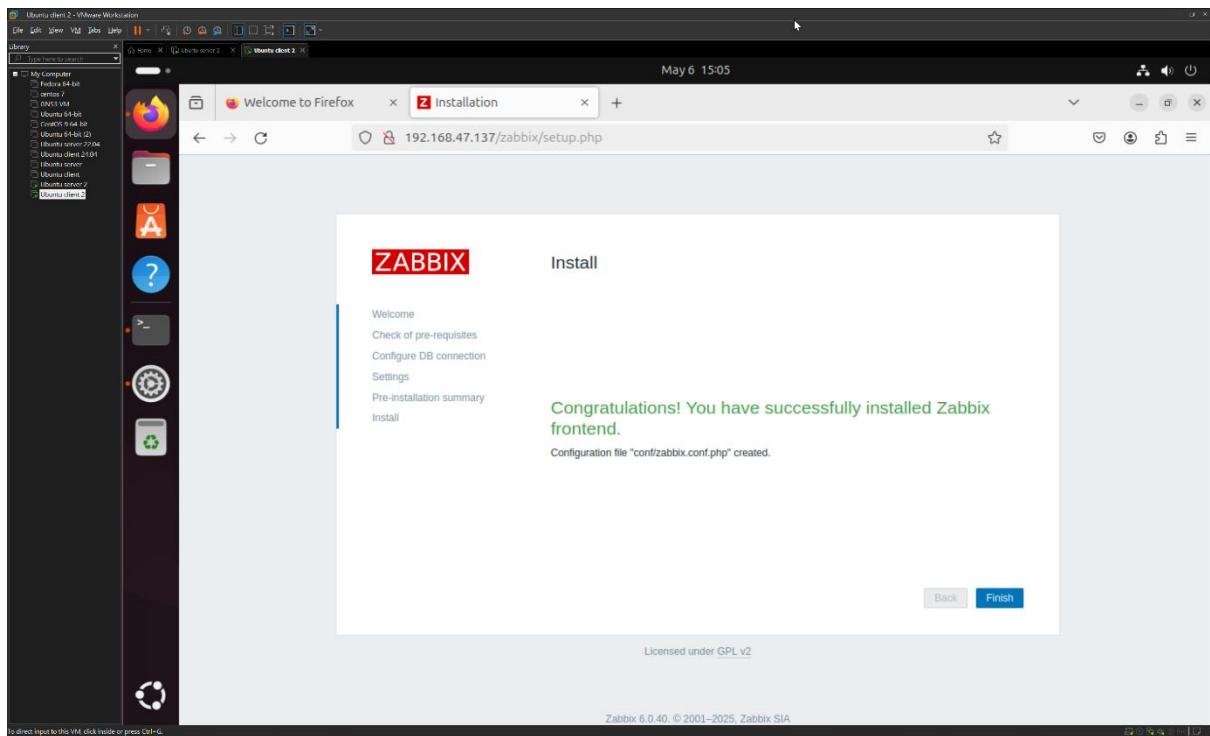


Figure 38.finished installation

Name	Interface	Availability	Tags	Status	Latest data	Problems	Graphs	Dashboards	Web
ubuntu client	192.168.47.140:10050	ZBX	class: os   target: linux	Enabled	Latest data 68	Problems	Graphs 13	Dashboards 2	Web
Zabbix server	127.0.0.1:10050	ZBX	class: os   class: software   target: linux	Enabled	Latest data 126	Problems	Graphs 30	Dashboards 3	Web

Figure 39.hosts

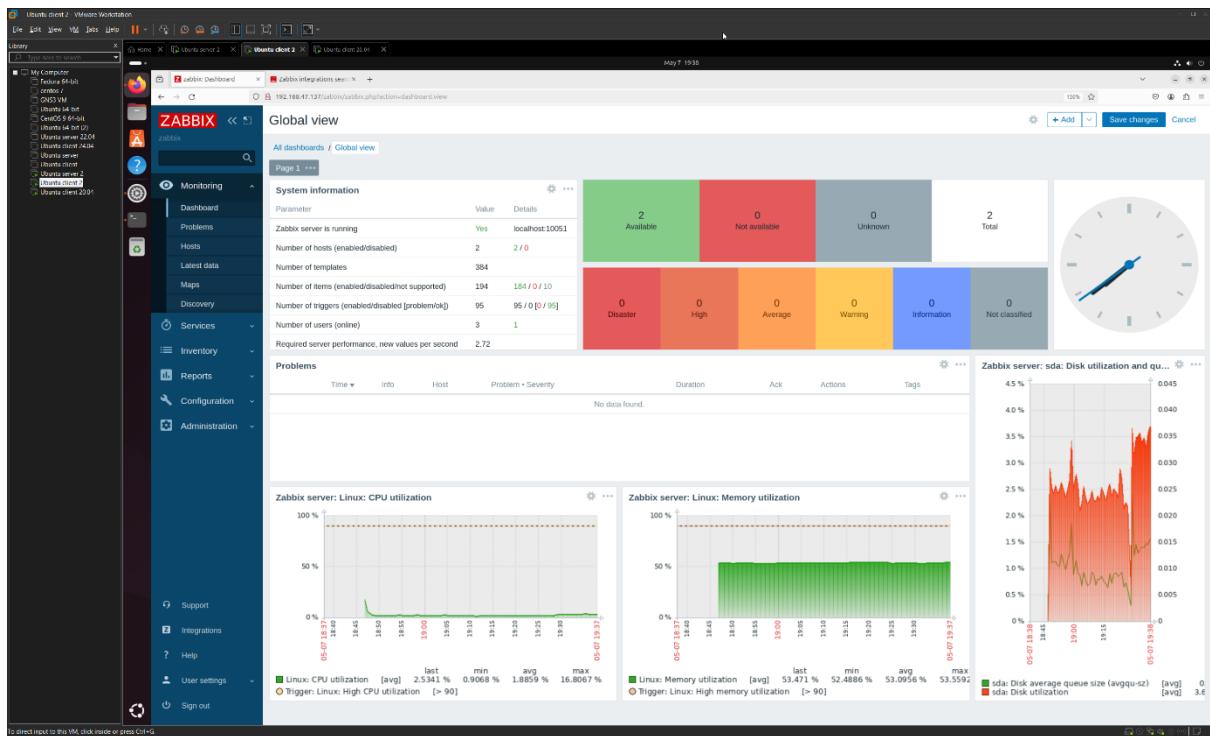


Figure 40.dashboard

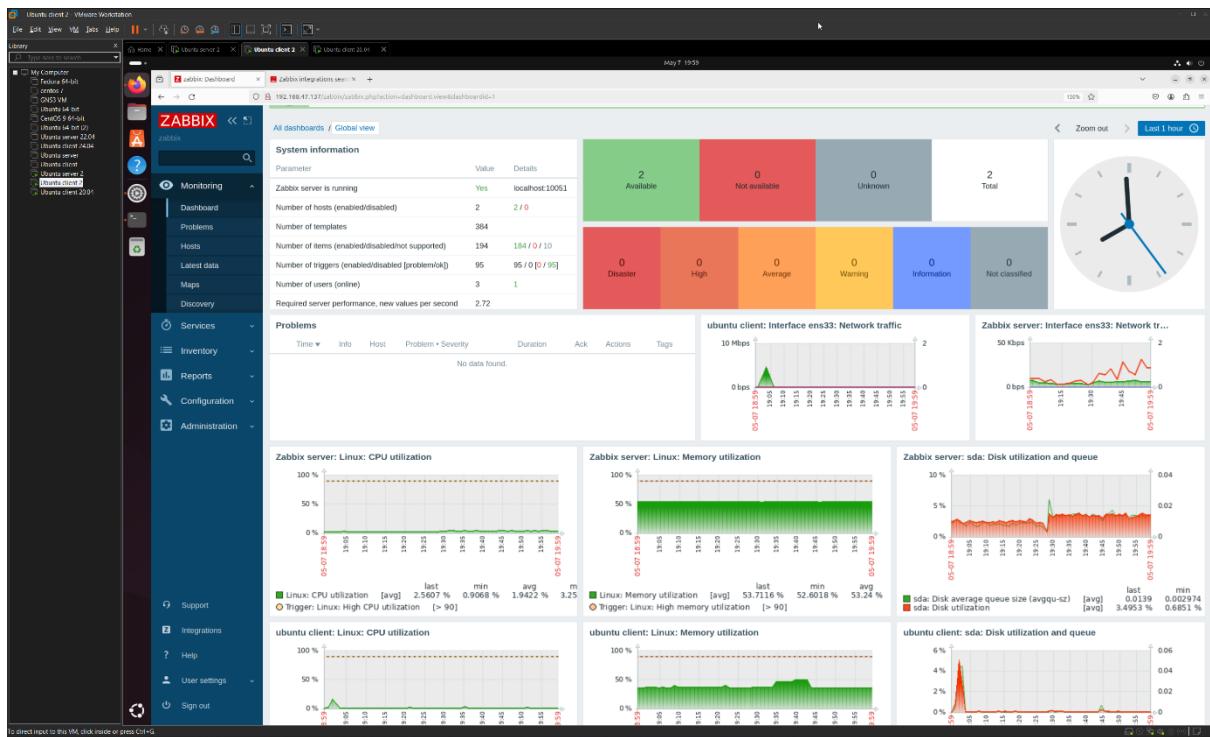


Figure 41.dashboard

## 4 Verify samba AD DC installation and Configurations

## Smbd -V

## Samba -V

```
systemctl status smbd
```

```
systemctl status samba-ad-dc
```

*Figure 42.samba version and check status*

## testparm -V

```
nomad@dsnc:~$ testparm -V
Load smb config files from /etc/samba/smb.conf
Loaded services file OK.
Weak crypto is allowed
Server role: ROLE_ACTIVE_DIRECTORY_DC
Press enter to see a dump of your service definitions

# Global parameters
[global]
abort shutdown script =
add machine command =
additional dns hostnames =
add machine script =
addport command =
addprinter command =
add share command =
add user command =
afs token lifetime = 604800
afs username map =
afs max threads = 100
allow guest = Yes
allow guest auth = No
allow dcerpc auth level connect = No
allow dns updates = secure only
allow insecure wide links = No
allow ntl crypto = No
allow trusted domains = Yes
allow unsafe cluster upgrade = No
apply group policies = No
async dns timeout = 10
async smb echo handler = No
auto map = No
auto services =
bindnfs dir = /var/lib/samba/bind-dns
bind interfaces only = No
browse list = Yes
cache directory = /var/cache/samba
change notify = Yes
change share command =
check password script =
cldap port = 389
client ipc protocol = default
client mnt protocol = default
client ipp signing = default
client lanman auth = No
client ldap sasl wrapping = seal
client ms protocol = default
client nlm protocol = default_02
client NTLMv2 auth = Yes
client plaintext auth = No
client protection = default
client protection = default
client schema = Yes
client signing = default
client smb encrypt = default
client smb3 encryption algorithms = AES-128-GCM, AES-128-CCM, AES-256-GCM, AES-256-CCM
client smb3 signing algorithms = AES-128-GMAC, AES-128-CMAC, HMAC-SHA256
client use kerberos = desired
client use negotiate principal = No
client use spnego = Yes
cluster addresses =
```

Figure 43.check samba version

sudo samba-tool domain info SAHAN.COM

sudo samba-tool domain level show

```
nomad@dsnc:~$ sudo samba-tool domain info SAHAN.COM
Forest      : sahan.com
Domain     : sahan.com
Netbios domain : SAHAN
DC name    : dsna.sahan.com
DC netbios name : DSNA
Server      : 192.168.1.101-Fist-Site-Name
Current site : Default-Fist-Site-Name
nomad@dsnc:~$ sudo samba-tool domain level show
Domain and forest function level for domain 'DC=sahan,DC=com'

Forest Function level: (Windows) 2008 R2
Domain Function level: (Windows) 2008 R2
Lowest Function level of a DC: (Windows) 2008 R2
nomad@dsnc:~$
```

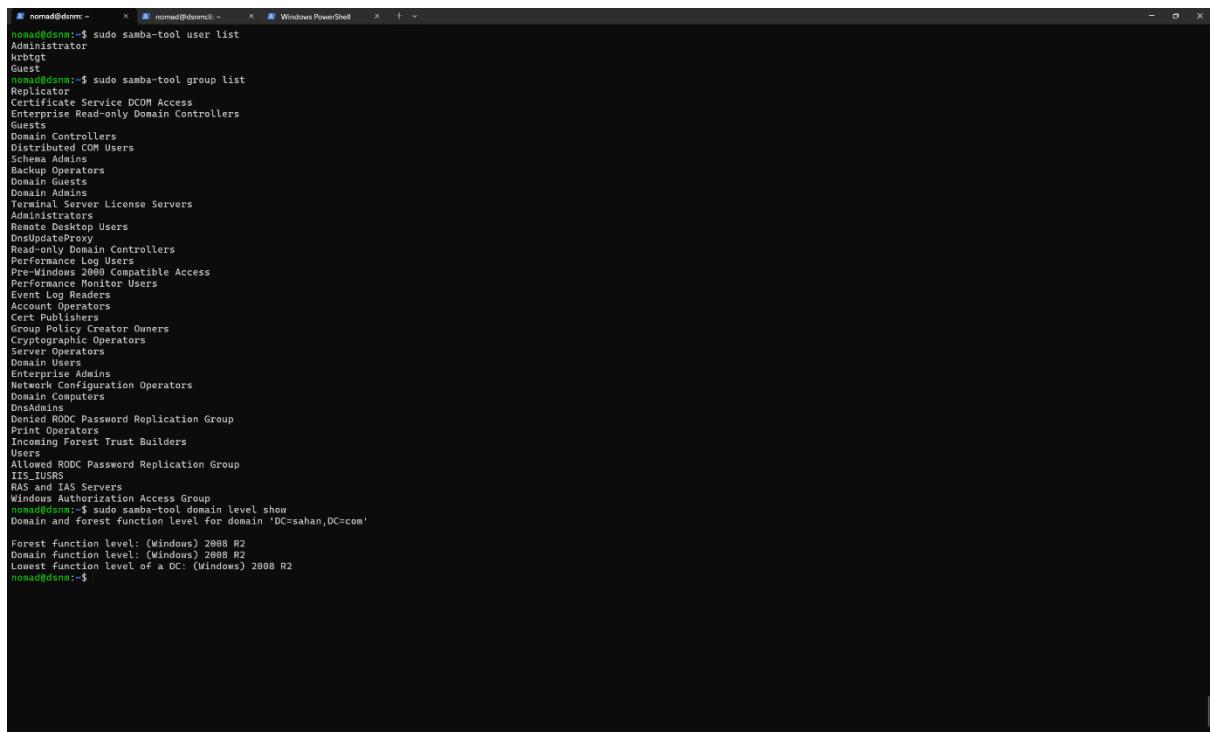
Figure 44.retrieve detailed information about the active directory

## 5 Verify active directory services

sudo samba-tool user list

sudo samba-tool group list

sudo samba-tool domain level show



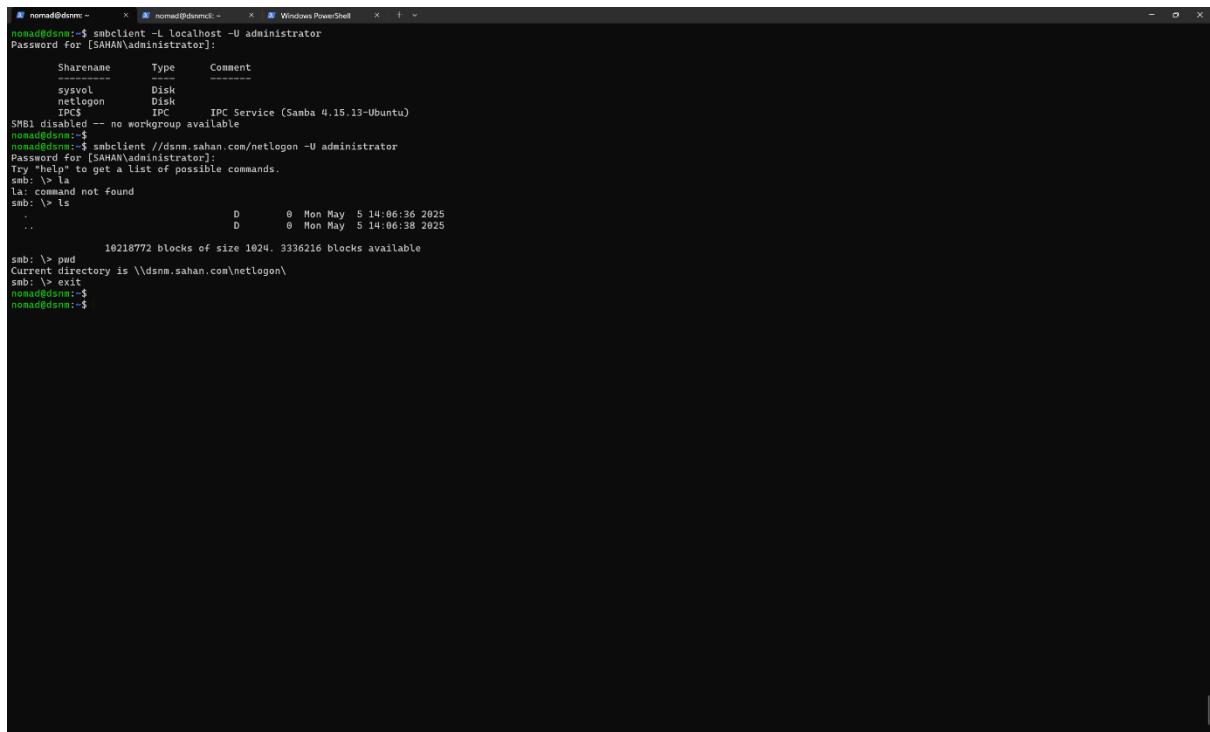
```
nomad@dsnc:~ nomad@dsnc:~ nomad@dsnc:~ Windows PowerShell + nomad@dsnc:~$ sudo samba-tool user list
Administrator
krbtgt
Guest
nomad@dsnc:~$ sudo samba-tool group list
Replicator
Certificate Service DCOM Access
Enterprise Read-only Domain Controllers
Group
Domain Controllers
Distributed COM Users
Schema Admins
Backup Operators
Domain Guests
Domain Admins
Terminal Server License Servers
Administrators
Remote Desktop Users
Distributed Groups
Read-only Domain Controllers
Performance Log Users
Pre-Windows 2000 Compatible Access
Performance Monitor Users
Event Log Readers
Account Operators
Cert Publishers
Group Policy Creator Owners
Cryptographic Operators
Service Operators
Domain Instructors
Enterprise Admins
Network Configuration Operators
Domain Computers
Domain Admins
Domain RODC Password Replication Group
Print Operators
Incoming Forest Trust Builders
Users
Allowed RODC Password Replication Group
IIS_IUSRS
RAS And IAS Servers
Windows Authorization Access Group
nomad@dsnc:~$ sudo samba-tool domain level show
Domain and forest function level for domain 'DC=sahan,DC=com'

Forest function level: (Windows) 2008 R2
Domain function level: (Windows) 2008 R2
Lowest function level of a DC: (Windows) 2008 R2
nomad@dsnc:~$
```

Figure 45.get info about samba domain

```
smbclient -L localhost -U administrator
```

```
smbclient //dnsm.sahan.com/netlogon -U administrator
```



```
nomad@dnsm:~ nomad@dnsm:~ Windows PowerShell + 
nomad@dnsm:~$ smbclient -L localhost -U administrator
Password for [SAMAN\administrator]:
Sharename      Type      Comment
-----        ----      -----
sysvol         Disk
netlogon       Disk
IPC$          IPC      IPC Service (Samba 4.15.13-Ubuntu)
SMB1 disabled -- no workgroup available
nomad@dnsm:~$ 
nomad@dnsm:~$ smbclient //dnsm.sahan.com/netlogon -U administrator
Password for [SAMAN\administrator]:
Type ? to get a list of possible commands.
smb: \> ?
smb: \> ls
l: command not found
smb: \> ls
.
..
D     0 Mon May  5 14:06:36 2025
D     0 Mon May  5 14:06:38 2025
10218772 blocks of size 1024. 3336216 blocks available

smb: \> pwd
Current directory is \\dnsm.sahan.com\netlogon\
smb: \> exit
nomad@dnsm:~$ 
nomad@dnsm:~$
```

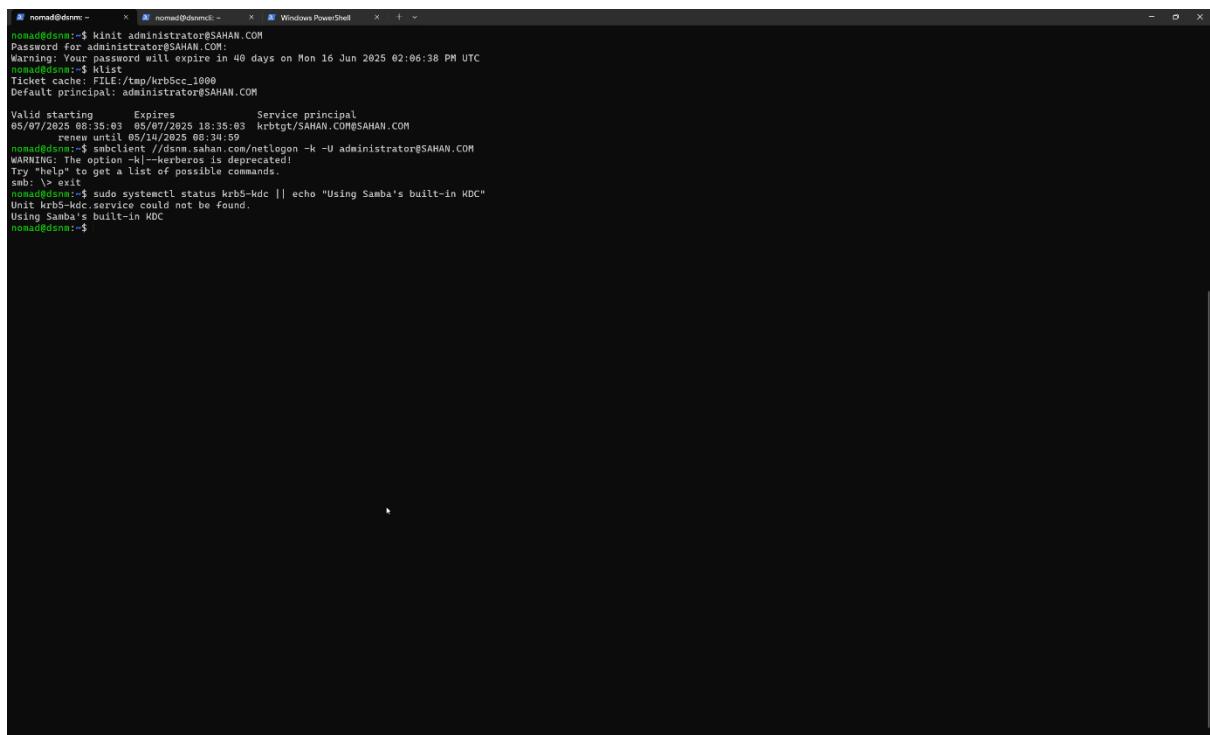
Figure 46.check availability and connect to netlogon share

## 6 Verify Kerberos configurations

kinit [administrator@SAHAN.COM](mailto:administrator@SAHAN.COM)

klist

smbclient //dnsm.sahan.com/netlogon -K -U [administrator@SAHAN.COM](mailto:administrator@SAHAN.COM)



The screenshot shows a Windows PowerShell window titled "Windows PowerShell". The command "klist" is run, displaying a table of Kerberos tickets. The table includes columns for Valid starting, Expires, and Service principal. One entry shows a ticket for krbtgt/SAHAN.COM@SAHAN.COM, valid from 05/07/2025 08:35:03 to 05/07/2025 18:35:03. The command "smbclient" is then run with the "-K" option, which is deprecated. The output shows the user is using Samba's built-in KDC. Finally, "sudo systemctl status krb5-kdc" is run, indicating the service could not be found.

```
Administrator:~$ klist
Ticket cache: FILE:/tmp/krb5cc_1000
Default principal: administrator@SAHAN.COM

Valid starting     Expires            Service principal
05/07/2025 08:35:03 05/07/2025 18:35:03  krbtgt/SAHAN.COM@SAHAN.COM
          renew until 05/14/2025 08:34:59

Administrator:~$ smbclient //dnsm.sahan.com/netlogon -K -U administrator@SAHAN.COM
WARNING: The option -K=kerberos is deprecated!
Type 'help' to get a list of possible commands.
smb: >v exit
Administrator:~$ sudo systemctl status krb5-kdc || echo "Using Samba's built-in KDC"
Unit krb5-kdc.service could not be found.
Using Samba's built-in KDC
Administrator:~$
```

Figure 47.authenticate user and display Kerberos ticket

host dnsm.sahan.com

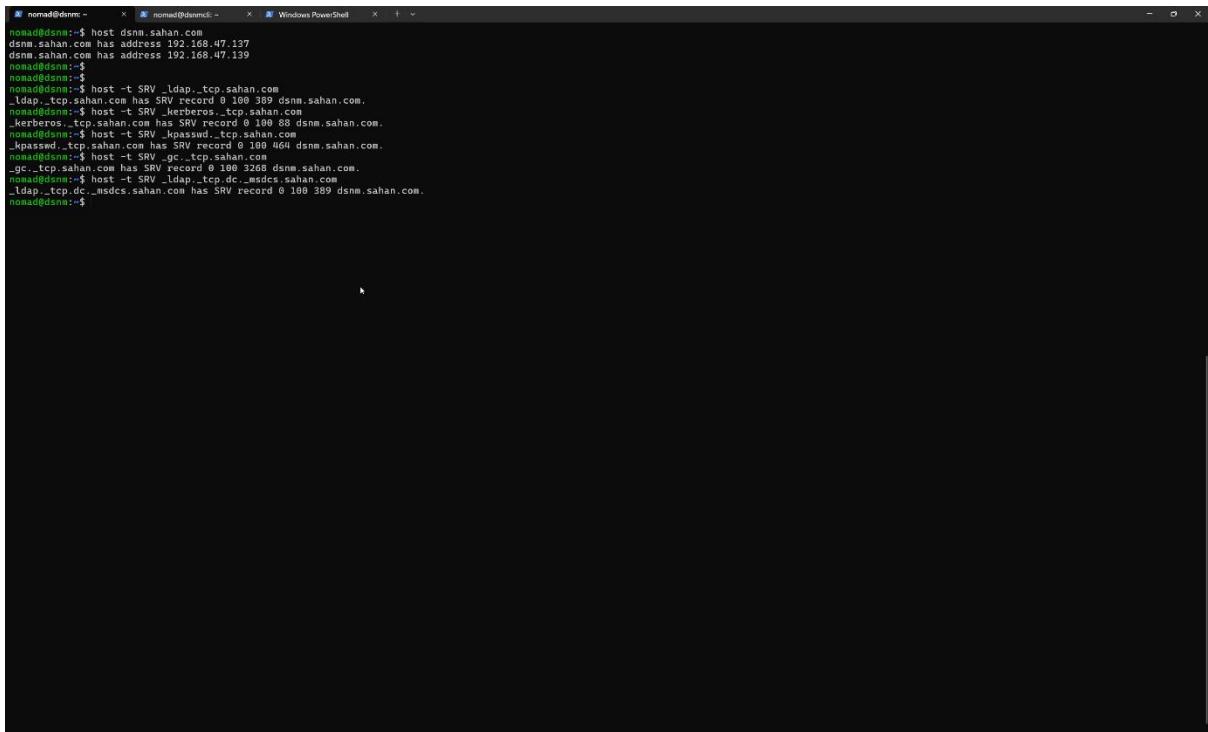
host -t SRV \_ldap.\_tcp.sahan.com

host -t SRV \_kerberos.\_tcp.sahan.com

host -t SRV \_kpasswd.\_tcp.sahan.com

host -t SRV \_gc.\_tcp.sahan.com

host -t SRV \_ldap.\_tcp.dc.\_msdcs.sahan.com



```
nomad@dsnm:~$ host dsnm.sahan.com
dsnm.sahan.com has address 192.168.47.197
dsnm.sahan.com has address 192.168.47.199
nomad@dsnm:~$ 
nomad@dsnm:~$ host -t SRV _ldap._tcp.sahan.com
_ldap._tcp.sahan.com has SRV record 0 100 389 dsnm.sahn.com.
nomad@dsnm:~$ host -t SRV _kerberos._tcp.sahan.com
_kerberos._tcp.sahan.com has SRV record 0 100 89 dsnm.sahn.com.
nomad@dsnm:~$ host -t SRV _kpasswd._tcp.sahan.com
_kpasswd._tcp.sahan.com has SRV record 0 100 464 dsnm.sahn.com.
nomad@dsnm:~$ host -t SRV _gc._tcp.sahan.com
_gc._tcp.sahan.com has SRV record 0 100 3288 dsnm.sahn.com.
nomad@dsnm:~$ host -t SRV _ldap._tcp.dc._msdcs.sahan.com
_ldap._tcp.dc._msdcs.sahan.com has SRV record 0 100 389 dsnm.sahn.com.
nomad@dsnm:~$
```

Figure 48.check host

## On client

realm list

cat /etc/sssd/sssd.conf

sudo systemctl status sssd

```
nomad@dsnc1:~ nomad@dsnc1:~ nomad@dsnc1:~ Windows PowerShell ~ | ~
nomad@dsnc1:~$ sudo realm list
sahan
  type: kerberos
  realm-name: SAHAN.COM
  domain-name: sahan.com
  configured: kerberos-member
 丕配置: 本地目录
  client-software: sssd
  required-package: sssd-tools
  required-package: sssd
  required-package: libnss-sss
  required-package: libpam-sss
  required-package: adcli
  required-package: samba-common-bin
  login-formats: %U@sahan.com
  login-policy: allow-realm-logins
nomad@dsnc1:~$ sudo cat /etc/sssd/sssd.conf

[sssd]
domains = sahan.com
config_file_version = 2
services = nss, pam

[domain/sahan.com]
default_shell = /bin/bash
krb5_store_password_if_offline = True
cache_credentials = True
krb5_realm = SAHAN.COM
realm_tags = manages-system joined-with-adcli
id_provider = ad
ldap_sasl_authid = NOMAD-VMWARE-VI
fallback_krb5_realm = /home/%U@%d
ad_domain = sahan.com
use_fully_qualified_names = True
ldap_id_mapping = True
access_provider = ad
nomad@dsnc1:~$ sudo systemctl status sssd
● sssd.service - System Security Services Daemon
   Loaded: loaded (/usr/lib/systemd/system/sssd.service; enabled; preset: enabled)
     Active: active (running) since Mon 2025-05-05 20:09:24 +0530; 1 day 18h ago
       PID: 13153 (sssd)
      Tasks: 6 (limit: 4551)
     Memory: 15.4M (peak: 91.2M swap: 17.7M swap peak: 17.7M)
        CPU: 5.62%us
       CGroup: /system.slice/sssd.service
           └─13153 /usr/sbin/sssd -i --logger=files
              ├─13154 /usr/libexec/sssd/sssd_be --domain sahan.com --uid 0 --gid 0 --logger=files
              ├─13155 /usr/libexec/sssd/sssd_be --domain sahan.com --uid 0 --gid 0 --logger=files
              ├─13156 /usr/libexec/sssd/sssd_pam --uid 0 --gid 0 --logger=files
              └─13157 /usr/libexec/sssd/sssd_pac --uid 0 --gid 0 --logger=files

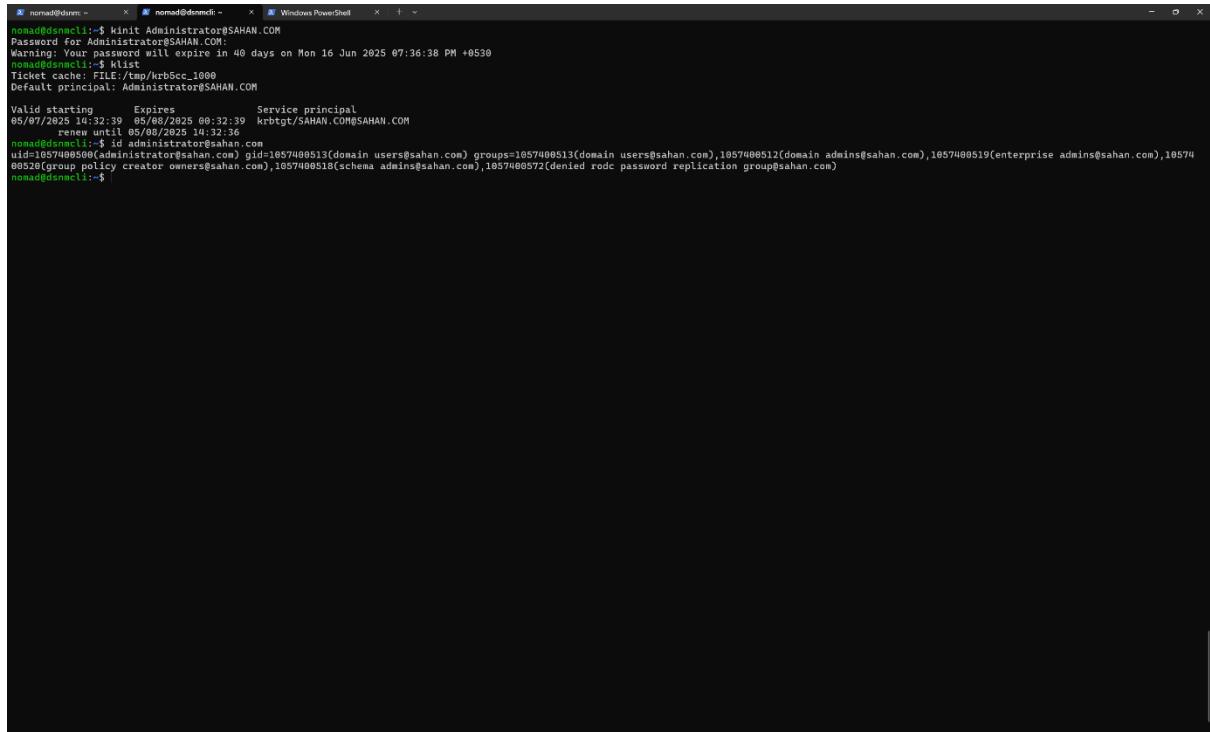
May 06 10:22:51 nomad-VMware-Virtual-Platform krb5_child[13180]: Preauthentication failed
May 06 10:30:03 nomad-VMware-Virtual-Platform krb5_child[13282]: Preauthentication failed
May 06 10:30:03 nomad-VMware-Virtual-Platform krb5_child[13282]: Preauthentication failed
May 06 10:30:03 nomad-VMware-Virtual-Platform krb5_child[13282]: Preauthentication failed
May 06 21:44:32 nomad-VMware-Virtual-Platform sssd[27021]: they query failed: GSSAPI error: Major = Unspecified GSS failure. Minor code may provide more information, Minor = Server not found in Kerberos database
May 06 21:44:32 nomad-VMware-Virtual-Platform sssd[27021]: they query failed: GSSAPI error: Major = Unspecified GSS failure. Minor code may provide more information, Minor = Server not found in Kerberos database
May 06 21:44:32 nomad-VMware-Virtual-Platform sssd[27027]: they query failed: GSSAPI error: Major = Unspecified GSS failure. Minor code may provide more information, Minor = Server not found in Kerberos database
May 06 21:44:32 nomad-VMware-Virtual-Platform sssd[27027]: they query failed: GSSAPI error: Major = Unspecified GSS failure. Minor code may provide more information, Minor = Server not found in Kerberos database
May 06 21:44:32 nomad-VMware-Virtual-Platform sssd[27033]: they query failed: GSSAPI error: Major = Unspecified GSS failure. Minor code may provide more information, Minor = Server not found in Kerberos database
May 06 22:30:03 nomad-VMware-Virtual-Platform sssd_be[13154]: Backend is offline
Lines 1-24/24 [END]
```

Figure 49.check realm list and monitor health of sssd

kinit administrator@SAHAN.COM

klist

id administrator@SAHAN.COM



```
nomad@desmci:~ % nomad@desmci:~ % Windows PowerShell % ~
nomad@desmci:~ % kinit administrator@SAHAN.COM
Password for administrator@SAHAN.COM:
Warning: Your password will expire in 40 days on Mon 16 Jun 2025 07:36:38 PM +0530
nomad@desmci:~ % klist
Ticket cache: FILE:/tmp/krb5cc_1000
Default principal: Administrator@SAHAN.COM

Valid starting     Expires            Service principal
05/07/2025 14:32:39  05/08/2025 00:32:39  krbtgt/SAHAN.COM@SAHAN.COM
    renew until 05/08/2025 14:32:36
nomad@desmci:~ % id administrator@sahan.com
uid=10574008510(administrator@sahan.com) gid=10574008513(domain users@sahan.com) groups=10574008513(domain users@sahan.com),10574008512(domain admins@sahan.com),10574008519(enterprise admins@sahan.com),10574008510(group policy creator owner@sahan.com),10574008510(schema admin@sahan.com),10574008572(denied rdc password replication group@sahan.com)
nomad@desmci:~ %
```

*Figure 50.authenticate user and display Kerberos ticket*

## 7 Reference

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- [2] D. Team, “Install & Configure Samba on Ubuntu 22.04 [7 Main Steps],” *DedicatedCore Blog - Great platform to start your startup journey*, Sep. 25, 2023. <https://www.dedicatedcore.com/blog/install-samba-ubuntu/> (accessed May 07, 2025).
- [3] root tech, “How to Install and Manage Samba Active Directory in Ubuntu Linux,” *YouTube*, Jun. 08, 2022. [https://www.youtube.com/watch?v=tgBuvA6J-\\_8](https://www.youtube.com/watch?v=tgBuvA6J-_8) (accessed May 07, 2025).
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- [5] “Setting up Samba as an Active Directory Domain Controller - SambaWiki,” *Samba.org*, 2016. [https://wiki.samba.org/index.php/Setting\\_up\\_Samba\\_as\\_an\\_Active\\_Directory\\_Domain\\_Controller](https://wiki.samba.org/index.php/Setting_up_Samba_as_an_Active_Directory_Domain_Controller)