

# Setting Up and Managing Network Connections Using NetworkManager

## WHAT?

NetworkManager is a dynamic network control and configuration tool that enables you to keep network devices up and running.

## WHY?

This article provides a complete overview of NetworkManager and how to configure, manage, monitor and edit network connections using NetworkManager.

## EFFORT

It takes 15 minutes to install and configure NetworkManager. You need up to an hour to fully understand the NetworkManager concept and functionalities.

## GOAL

Basic understanding of managing network connections.

## REQUIREMENTS

- Root access to install and manage NetworkManager

- A package manager to install NetworkManager

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# 1 The NetworkManager concept

NetworkManager is a tool that enables managing network connections and devices. NetworkManager allows you to create, configure and manage network connections and devices.

On SLE HA, NetworkManager has been designed to be fully automatic by default. It is enabled by default and is shipped with all necessary service unit files for managing primary network connection and other network interfaces. NetworkManager supports state-of-the-art encryption types and standards for network connections, including connections to 802.1X protected networks. 802.1X is the IEEE Standard for Local and Metropolitan Area Networks—Port-Based Network Access Control.

You can switch between wired or wireless networks seamlessly, as NetworkManager automatically connects to known wireless networks and manages several network connections in parallel. You can also manually switch between available networks.

NetworkManager typically consists of the following parts:

- NetworkManager daemon—you can interact with the daemon using standard systemd commands
- the nmcli command-line interface
- the ncurses interface nmtui
- NetworkManager libraries
- configuration files.

## 2 Installing and Configuring NetworkManager

On SUSE Linux Enterprise High Availability, NetworkManager is installed and enabled by default and thus runs out of the box. Usually, you do not have to reinstall it or change the configuration, but if such an action is needed, these sections provide guidance.

## 2.1 Installing NetworkManager

You can install NetworkManager using **zypper**. Once you install, you can enable NetworkManager to start automatically at boot time.

Install NetworkManager:

```
> sudo zypper install NetworkManager
```

Enable NetworkManager:

```
> sudo systemctl enable NetworkManager
```

Once NetworkManager is enabled, the change persists across reboots.

## 2.2 Configuring NetworkManager behavior

The behavior of NetworkManager is defined in its central configuration file /etc/NetworkManager/NetworkManager.conf.

It is the primary location for configuring behavior and settings of NetworkManager, including logging, connection management, and network device handling.

The file consists of sections of key-value pairs. Each key-value pair must belong to a section. A section starts with a name enclosed in `[ ]`. Lines beginning with a `#` are considered comments. A common configuration includes the `[main]` section with the `plugins` value, `[logging]`, and `[connectivity]`:

```
[main] ❶
plugins=keyfile ❷
dhcp=dhclient

[connectivity] ❸
uri=http://name.org

[logging] ❹
level=INFO
domains=ALL
```

- ❶ Controls the general settings for NetworkManager.
- ❷ Manages how the connection profiles are stored. The `[keyfile]` plug-in supports all the connection types and capabilities of NetworkManager.

- ③ Defines connection defaults and options and specifies the URI to check the network connection.
- ④ Manages the NetworkManager logging levels and domains.

#### PROCEDURE 1: CONFIGURING NETWORKMANAGER.CONF

Ensure that you take a backup of the existing configuration file before modifying the file.

1. Open the configuration file:

```
> sudo vi /etc/NetworkManager/NetworkManager.conf
```

2. Stop the NetworkManager service:

```
>
sudo
systemctl stop network
```

3. Modify the sections.

4. Save the changes

5. Start NetworkManager:

```
> sudo systemctl start network
```

6. View the existing configuration and settings:

```
>
sudo
nmcli general show
```

## 3 Managing the NetworkManager daemon

The NetworkManager daemon is a standard systemd service so you can use the **systemctl** command to manage the daemon.

You can use any of the following commands to manage the NetworkManager daemon:

### Checking status

To check if the NetworkManager daemon is running and thus the network should be active:

```
> systemctl status network
```

## Restarting the daemon

For example, in cases of networking problem, you can try to restart the NetworkManager Daemon by using the following command:

```
> sudo systemctl restart network
```

## Stopping the daemon

You can stop NetworkManager during network configuration changes or to switch to manual control. You can also stop the service for troubleshooting or debugging network issues. Stopping NetworkManager prevents it from automatically managing the interface or changing your manual configuration. You can also stop NetworkManager to manually address specific requirements for network interfaces.

To stop the NetworkManager daemon:

```
> sudo systemctl stop network
```

## Starting the NetworkManager daemon

If you stopped the daemon, you need to start it again to manage all network connections:

```
> sudo systemctl start NetworkManager
```

# 4 Creating network connections

You can create a network connection profile using the **nmcli** command.

NetworkManager stores all network configurations as a connection profile, which is a collection of data that describes how to create or connect to a network. These connection profiles are stored as files in the /etc/NetworkManager/system-connections/ directory by default. Each network connection profile (Wi-Fi, Ethernet, VPN) is represented by a separate file in this directory.

A connection is an instance of a particular connection profile that is active when a particular device uses the connection. The device may have more than one connection profile configured. The other connections can be used to fast switch from one connection to another. For example, if the active connection is not available, NetworkManager tries to connect the device to another configured connection.

The NetworkManager daemon manages network connections. You can interact with it using a command-line interface: **nmcli** or ncurses interface: **nmtui**.

## 4.1 Creating an Ethernet connection

Configure the Ethernet connection using the **nmcli** command and proceed as follows:

1. List available devices to get the exact device name:

```
> nmcli device
```

2. View the list of connections to make sure the profile name you want to use is not already taken:

```
nmcli connection show
```

The NetworkManager creates a profile for each Network Interface Controller (NIC). To connect the NIC to networks with different settings, you must create separate profiles for each network.

3. Create a new connection profile:

```
> sudo nmcli connection add con-name CONNECTION_NAME ifname DEVICE_NAME type ethernet
```

4. View the existing network settings of the new connection profile:

```
> nmcli connection show CONNECTION_NAME
```

5. Configure the connection profile. The generic command syntax is the following:

```
> sudo nmcli connection modify CONNECTION_NAME SETTING VALUE
```

For example, automatic IP addresses assignment (DHCP or SLAAC) is enabled by default, and you may want to configure a static IP address:

- for IPv4

```
> sudo nmcli connection modify CONNECTION_NAME ipv4.method manual  
ipv4.addresses 192.0.2.1/24 ipv4.gateway 192.0.2.254 ipv4.dns 192.0.2.200  
ipv4.dns-search example.com
```

- for IPv6

```
> sudo nmcli connection modify INTERNAL-LAN ipv6.method manual ipv6.addresses  
2001:db8:1::fffe/64 ipv6.gateway 2001:db8:1::fffe ipv6.dns 2001:db8:1::ffbb  
ipv6.dns-search example.com
```

## 6. Activate the profile:

```
> sudo nmcli connection up CONNECTION_NAME
```

## 7. Verify the configurations:

### a. Verify the IP settings of the NIC:

```
> ip address show HOSTNAME
```

### b. Verify the default IPv4 gateway:

```
> ip route show default
```

### c. Verify the default IPv6 gateway:

```
> ip -6 route show default
```

### d. View the DNS settings:

```
> cat /etc/resolv.conf
```

## 4.2 Creating a Wi-Fi connection profile

You can connect to a Wi-Fi using the **nmcli** command. The NetworkManager creates a new connection profile when you connect to a Wi-Fi for the first time. You can configure the profile after connecting to the Wi-Fi.

### 1. Enable the Wi-Fi radio:

```
> sudo nmcli radio wifi on
```

### 2. View the list of available devices:

```
> sudo nmcli device
```

### 3. Connect to Wi-Fi:

```
> sudo nmcli device wifi connect WI-FI_CONNECTION_NAME  
    PASSWORD
```



4. View the existing network settings of the new connection profile:

```
> sudo nmcli connection show CONNECTION_NAME
```

5. Configure the connection profile as needed, using the command:

```
> sudo nmcli connection modify CONNECTION_NAME  
    SETTING VALUE
```

For example, to configure a static IPv4:

```
> sudo nmcli connection modify WI-FI_CONNECTION_NAME ipv4.method manual  
    ipv4.addresses IP_ADDRESS/SUBNET_MASK
```

To configure a static IPv6 address

```
> sudo nmcli connection modify WI-FI_CONNECTION_NAME ipv6.method manual  
    ipv6.addresses IP_ADDRESS/SUBNET_MASK
```

6. Restart the connection:

```
> sudo nmcli connection up WI-FI_CONNECTION_NAME
```

7. Verify the connection using the command: .

```
>  
nmcli connection show --active
```

The list of available active connections appears.

## 4.3 Creating a network bond

A network bond combines physical and virtual network interfaces and provides a logical interface. You can create network bonds on Ethernet devices, Virtual LANs, and so on.

You must have two or more physical or virtual networks installed on the server.

- To use Ethernet devices for network bonding, you must install the physical or virtual Ethernet devices on the server.
- When using network teams, bridges or VLAN devices as ports for a bond, you can create them either during the bond creation process or beforehand.

## PROCEDURE 2: CREATING A NETWORK BOND

### 1. Create a bond interface:

```
> sudo nmcli connection add type bond con-name NWBOND ifname NWBOND bond.options "mode=active-backup"
```

A network bond, *NETWORK\_BOND* that uses active-backup mode is created.

### 2. View the list of network interfaces:

```
> nmcli device status
```

DEVICE	TYPE	STATE	CONNECTION
wlan0	wifi	connected	Vision
virbr0	bridge	connected (externally)	virbr0
p2p-dev-wlan0	wifi-p2p	disconnected	--
eth0	ethernet	unavailable	--
lo	loopback	unmanaged	--

The list of available network interfaces appears. You can also add devices that are not configured to the bond. In the given list, p2p-dev-wlan0 is not configured, while virbr0 is configured and has a connection profile.

### 3. To configure p2p-dev-wlan0 as a port, create a connection profile:

```
> sudo nmcli connection add type wifi-p2p slave-type bond con-name bond0-port1 ifname p2p-dev-wlan0 master bond0
```

A new profile is created for p2p-dev-wlan0 and added to the bond0 connection. The name of the bond is bond0.

### 4. To assign virbr0 to a bond:

```
> sudo nmcli connection modify virbr0 master bond0
```

The connection profile for virbr0 is added to the bond0 connection.

### 5. Activate the connection:

```
> sudo nmcli connection up virbr0
```

## 6. Configure the IPv4 settings:

- To use bond0 as a port for other devices:

```
> sudo nmcli connection modify bond0 ipv4.method disabled
```

- To use DHCP, no configuration is required.
- To configure a static IPv4 address, network mask, default gateway and DNS server to the bond0 connection:

```
> sudo nmcli connection modify bond0 ipv4.addresses '192.0.2.1/24'  
    ipv4.gateway '192.0.2.254' ipv4.dns '192.0.2.253' ipv4.dns-search  
    'example.com' ipv4.method manual
```

## 7. Configure the IPv6 settings:

- To use this bond device as a port of other devices:

```
> sudo nmcli connection modify bond0 ipv6.method disabled
```

- To use stateless address autoconfiguration (SLAAC), no action is required.
- To set a static IPv6 address, network mask, default gateway and DNS server to the bond0 connection:

```
> sudo nmcli connection modify bond0 ipv6.addresses '2001:db8:1::1/64'  
    ipv6.gateway '2001:db8:1::ffffe' ipv6.dns '2001:db8:1::ffffd' ipv6.dns-search  
    'example.com' ipv6.method manual
```

## 8. Activate the connection:

```
> sudo nmcli connection up bond0
```

## 9. View and verify the connections:

```
> nmcli device
```

The list of connections appears.

## 4.4 Configuring a network team

Network teaming combines physical and virtual networks and provides a logical interface with higher efficiency. Configure network teams using **nmcli**.

### REQUIREMENTS

- Install the **teamd** and **NetworkManager-team** packages:

```
> sudo zypper install teamd
> sudo zypper install NetworkManager-team
```

- Install two or more physical or virtual devices on the server:
- To use Ethernet devices as ports of the team, the physical or virtual Ethernet devices must be installed on the server and connected to a switch.
- To use bond, bridge or VLAN devices as ports of the team, create them in advance or when you create the team.

### PROCEDURE 3: CREATING A NETWORK TEAM

1. Create a team interface:

```
> sudo nmcli connection add type team con-name CONNECTION_NAME ifname TEAM_NAME
team.runner RUNNER-TYPE
```

For example, to create a network team **team0** with the **activebackup** runner, run:

```
> sudo nmcli connection add type team con-name team0 ifname team0 team.runner
active.backup
```

2. View the list of network interfaces:

```
> nmcli device status
```

DEVICE	TYPE	STATE	CONNECTION
wlan0	wifi	connected	Vision
virbr0	bridge	connected (externally)	virbr0
p2p-dev-wlan0	wifi-p2p	disconnected	--
eth0	ethernet	unavailable	--
lo	loopback	unmanaged	--

You can add the listed devices to the team. The following examples use **p2p-dev-wlan0** and **virbr0**. Note that **p2p-dev-wlan0** is not configured, while **virbr0** has a connection profile.

### 3. Configure port interfaces to the team:

```
> sudo nmcli connection add type wifi-p2p slave-type team con-name team0-port1  
ifname p2p-dev-wlan0 master team0
```

A new profile is created for p2p-dev-wlan0 and added to the team0 connection.

### 4. Assign the existing connection to the team:

```
> sudo nmcli connection modify bond0 master team0
```

The connection profile for bond0 is added to the team0 connection.

### 5. Activate the connection:

```
> sudo nmcli connection up bond0
```

### 6. Configure the IPv4 settings:

- To use the team device as a port of other devices:

```
> sudo nmcli connection modify team0 ipv4.method disabled
```

- To use DHCP, no configuration is required.
- To configure a static IPv4 address, network mask, default gateway and DNS server to the bond0 connection, run the command:

```
> sudo nmcli connection modify team0 ipv4.addresses '192.0.2.1/24'  
ipv4.gateway '192.0.2.254' ipv4.dns '192.0.2.253' ipv4.dns-search  
'example.com' ipv4.method manual
```

## 7. Configure the IPv6 settings:

- To use this team device as a port of other devices:

```
> sudo nmcli connection modify team0 ipv6.method disabled
```

- To use stateless address autoconfiguration (SLAAC), no action is required.
- To set a static IPv6 address, network mask, default gateway and DNS server to the team0 connection:

```
> sudo nmcli connection modify team0 ipv6.addresses '2001:db8:1::1/64'  
ipv6.gateway '2001:db8:1::ffff' ipv6.dns '2001:db8:1::fffd' ipv6.dns-search  
'example.com' ipv6.method manual
```

## 8. Activate the connection:

```
> sudo nmcli connection up team0
```

## 9. To view the status of the team:

```
> sudo teamdctl team0 state
```

## 4.5 Configuring a network bridge

A network bridge is a device that facilitates communication between two or more network segments, creating a single network from multiple segments

To configure a network bridge, ensure the following:

- Install two or more physical or virtual devices on the server.
- To use Ethernet devices as ports for the bridge, ensure the server has physical or virtual Ethernet devices installed and connected to a switch.
- When using team, bond or VLAN devices as ports for the bridge, you can create these devices either during bridge creation or beforehand.

### PROCEDURE 4: CREATING A NETWORK BRIDGE

#### 1. Create a bridge interface:

```
> sudo nmcli connection add type bridge con-name CONNECTION_NAME ifname BRIDGE_NAME
```

For example, we created a bridge: bridge0 by running the command:

```
> sudo nmcli connection add type bridge con-name bridge0 ifname bridge0
```

2. View the list of network interfaces to verify that bridge0 is created:

```
> nmcli device status
```

DEVICE	TYPE	STATE	CONNECTION
wlan0	wifi	connected	Vision
virbr0	bridge	connected (externally)	virbr0
p2p-dev-wlan0	wifi-p2p	disconnected	--
eth0	ethernet	unavailable	--
lo	loopback	unmanaged	--
bridge0	bridge	connecting (getting IP configuration)	bridge0

The bridge is in the state *getting IP configuration*, because you have not assigned interfaces to it yet. Later you will assign the interfaces: p2p-dev-wlan0 (not configured) and virbr0 (configured with a connection profile).

3. Add interfaces to the bridge:

```
> sudo nmcli connection add type wifi-p2p slave-type bridge con-name bridge0-port1  
ifname p2p-dev-wlan0 master bridge0
```

A new profile is created for p2p-dev-wlan0 and added to the bridge0 connection.

4. To assign an existing connection to the bridge:

```
> sudo nmcli connection modify bond0 master bridge0
```

The connection profile for bond0 is added to the bridge0 connection.

5. Restart the connection:

```
> sudo nmcli connection up bond0
```

## 6. Configure the IPv4 settings:

- To use the bridge device as a port of other devices:

```
> sudo nmcli connection modify bridge0 ipv4.method disabled
```

- To use DHCP, no configuration is required.
- To configure a static IPv4 address, network mask, default gateway and DNS server to the bridge0 connection:

```
> sudo nmcli connection modify bridge0 ipv4.addresses '192.0.2.1/24'  
ipv4.gateway '192.0.2.254' ipv4.dns '192.0.2.253' ipv4.dns-search  
'example.com' ipv4.method manual
```

## 7. Configure the IPv6 settings:

- To use this bridge device as a port of other devices:

```
> sudo nmcli connection modify bridge0 ipv6.method disabled
```

- To use stateless address autoconfiguration (SLAAC), no action is required.
- To set a static IPv6 address, network mask, default gateway and DNS server to the bridge0 connection:

```
> sudo nmcli connection modify bridge0 ipv6.addresses '2001:db8:1::1/64'  
ipv6.gateway '2001:db8:1::fffe' ipv6.dns '2001:db8:1::fffd' ipv6.dns-search  
'example.com' ipv6.method manual
```

## 8. Activate the connection:

```
> sudo nmcli connection up bridge0
```

## 9. Verify the connection:

```
> nmcli device
```

When you activate any port of the connection, NetworkManager also activates the bridge, but not the other ports of it.

Enable all ports automatically when the bridge is enabled:

```
> sudo nmcli connection modify bridge0 connection.autoconnect-slaves 1
```

## 10. View the link status of Ethernet devices that are ports of a specific bridge.



```
> sudo ip link show master bridge0
```

11. View the status of Ethernet devices that are ports of any bridge device.

```
> sudo bridge link show
```

## 4.6 Configuring a VPN connection

A VPN (Virtual Private Network) connection is a secure, encrypted tunnel between your device and another network over the Internet.

You can configure a VPN connection using the `nmcli` command.

### PROCEDURE 5: INSTALLING AND CONFIGURING A VPN CONNECTION

1. Install OpenVPN:

```
> sudo zypper install networkmanager-openvpn
```

2. Create a VPN connection:

```
> sudo nmcli connection add type vpn con-name MyOpenVPN ifname -- vpn-type openvpn
```

3. Configure the settings:

```
> sudo nmcli connection modify MyOpenVPN vpn.data "remote=VPN-SERVER-  
ADDRESS,username=YOUR-USERNAME"
```

```
> sudo nmcli connection modify MyOpenVPN vpn.secrets "password=YOUR-PASSWORD"
```

4. Configure DNS settings:

```
> sudo nmcli connection modify MyOpenVPN ipv4.dns "8.8.8.8 8.8.4.4"
```

5. Add routes:

```
> sudo nmcli connection modify MyOpenVPN ipv4.routes "192.168.1.0/24 192.168.1.1"
```

6. Activate the VPN connections:

```
> sudo nmcli connection up MyOpenVPN
```

7. Verify if the configured connection is active:

```
> nmcli connection show --active
```

## 5 Modifying network connections

You can use the **nmcli connection modify** command to modify network connections. The generic syntax of the command follows:

```
>
sudo
nmcli connection modify
CONNECTION-NAME PROPERTY VALUE
```

To obtain the value of *CONNECTION-NAME*, list connections using the command: **nmcli connection show**. Available properties and their possible values are described in the following section.

### 5.1 Connections attributes

This section lists and describes attributes you can modify on connections:

TABLE 1: CONNECTIONS DETAILS

Property	Description	Values
ipv4.method	It defines how the interface obtains and handles its IPv4 address configuration	<ul style="list-style-type: none"><li>• <u>auto</u>—the default value used to allocate IP addresses dynamically using DHCP</li><li>• <u>manual</u>—to configure a static IP address</li></ul>

Property	Description	Values
		<ul style="list-style-type: none"> <li>• <u>link-local</u>—to use IPv4 link-local addressing only (169.254.0.0/16)</li> <li>• <u>shared</u>—to share the connection with other computers</li> <li>• <u>disabled</u>—to disable IPv4.</li> </ul>
ipv4.dns	A space separated list of DNS IP addresses	For example, "8.8.8.8 8.8.4.4"
ipv4.gateway	The property is the router address that your system uses to reach networks beyond your local network	An IP address of the gateway
connection.id	It renames the connection	a string representing the new connection name
802-11-wireless.ssid	The property renames a Wi-Fi network	A string representing the new Wi-Fi SSID
connection.autoconnect	Toggles on/off automatic connection when the device is online	<u>on</u> or <u>off</u>

## 6 Establishing and terminating network connections

Enable the network connection to access and connect devices and resources.

## 6.1 Enabling network connections

Particular connections may be disabled, or all of the connections may be disabled. To activate all connections, run the command:

```
>
sudo
nmcli networking on
```

Bear in mind that the command does not activate manually disabled connections. To activate such a connection, proceed as described in the following procedure:

### PROCEDURE 6: ACTIVATING AN EXISTING CONNECTION

1. View the list of existing connections:

```
>
sudo
nmcli connection show
```

2. Enable a connection using the name or UUID:

```
>
sudo
nmcli connection up uuid CONNECTION-UUID
```

3. Check the connection status:

```
>
sudo
nmcli connection show --active
```

## 6.2 Disabling network connections

You can temporarily disconnect your system from external networks using the **nmcli** command to disable your network connection.

To disable a particular connection, proceed as described in the following procedure:

1. View the list of active connections:

```
> sudo nmcli connection show --active
```

NAME	UUID	TYPE	DEVICE
------	------	------	--------

Wired connection 2	7b0c32ee-851e-3015-a658-f4372b426273	ethernet	enp6s0f3u1u4
lo	8041ed2a-e4ae-4bf7-a0db-d4b513b9d745	loopback	lo
virbr0	1bec1271-4bb6-46a7-a50a-4b329fa318d3	bridge	virbr0
vnet0	ac196c81-0505-49f0-9328-b78e1746b4a9	tun	vnet0

2. Terminate a specific connection:

```
>
sudo
nmcli connection down CONNECTION-NAME/CONNECTION-UUID
```

For example:

```
>
sudo
nmcli connection down virbr0
```

To disable **all** connections temporarily, run:

```
>
sudo
nmcli networking off
```



### Note: Temporal changes only

In both cases, the changes persist only till the system reboots. After reboot, NetworkManager and connections are active again.

## 7 Monitoring network connections

Use the **nmcli** command to view the status, activity and details of network connections managed by NetworkManager.

The following list provides commands for basic monitoring of network connections.

View the list of active connections

```
>
nmcli connection show --active
```

View the status of NetworkManager

```
>
```

```
nmcli monitor
```

The real-time updates about the network states and connections appear.

View details of a specific network connection

```
>
nmcli connection monitor CONNECTION-NAME
```

Each time the connection changes, NetworkManager prints a line.

Monitor the status of network devices

```
>
nmcli device monitor
```

The list of all network devices with device name, type, state and connection name appears.

View the signal strength of Wi-Fi connections

```
>
nmcli device wifi list
```

The list of available Wi-Fi networks with SSID, signal strength (in %) and security type appears.

## 8 NetworkManager logging

NetworkManager activities are logged by the `journald` system logging mechanism. The NetworkManager logs are saved in `/var/log/syslog`, and you can access the details using the `journalctl` command.

The type of logged NetworkManager activities differs according to the current logging level. Available levels are described below:

- *ERR*—logs only error messages. For example, connection failures.
- *WARN*—logs warnings and errors. For example, authentication issues.
- *INFO*—logs informational messages. That is the default level for all logging domains.
- *DEBUG*—logs detailed debugging information. For example, detailed DHCP negotiations
- *TRACE*—logs very detailed, usually unimportant events. For example, packet-level details.

To check the current logging level, run:

```
> nmcli general logging
```

```
INFO
```

```
PLATFORM,RFKILL,ETHER,WIFI,BT,MB,DHCP4,DHCP6,PPP,IP4,IP6,AUTOIP4,DNS,VPN,SHARING,SUPPLICANT,AGENTS,SET
```

The output shows that the logging level is INFO for all domains—that is the default setting. You can modify logging levels on particular domains and then the command outputs only the modified domains.

To change the logging level on all domains, run:

```
>
sudo
general logging level LEVEL domains ALL
```

For example, to revert changes to the default setting:

```
>
sudo
nmcli general logging level INFO domains ALL
```

To change a logging level on particular domains, for example, to set DEBUG on DNS and FIREWALL, run:

```
>
sudo
nmcli general logging level DEBUG domains FIREWALL,DNS
```

The following list provides commands to manage NetworkManager logs using journald.

## MANAGING NETWORKMANAGER LOGS

### Viewing logs

To view the NetworkManager logs

```
>
sudo
journalctl -u NetworkManager
```

To view the NetworkManager logs in real time:

```
>
```

```
sudo
journalctl -u NetworkManager -f
```

To view only specific logs, use **grep** to filter the **journalctl** output. For example, for log related to DHCP, run:

```
>
sudo
journalctl -u NetworkManager | grep DHCP
```

### Saving logs

To save NetworkManager logs to a file, for example, to `networkmanager.log`:

```
>
sudo
journalctl -u NetworkManager > networkmanager.log
```

To save the NetworkManager logs of a specific time to a file, for example, to `networkmanager_timerange.log`:

```
>
sudo
journalctl -u NetworkManager --since "YYYY-MM-DD HH:MM:SS" --until
"YYYY-MM-DD HH:MM:SS" > networkmanager_timerange.log
```

To save the NetworkManager logs with real-time monitoring and save them as and when generated:

```
>
sudo
journalctl -u NetworkManager -f >> live_networkmanager.log
```

## 9 The **nmcli** command reference

This section provides a summary of options and subcommands of the **nmcli** command you can use to interact with NetworkManager daemon to manage the network.

The **nmcli** command has the following generic syntax:

```
# nmcli OPTIONSSUBCOMMANDSUBCOMMAND_ARGUMENTS
```



where *OPTIONS* are described in [Section 9.1, “The nmcli command options”](#) and *SUBCOMMAND* can be any of the following:

#### **connection**

enables you to configure your network connection. For details, refer to [Section 9.2, “The connection subcommand”](#).

#### **device**

used for network device management. For details, refer to [Section 9.3, “The device subcommand”](#).

#### **general**

shows status and permissions. For details refer to [Section 9.4, “The general subcommand”](#).

#### **monitor**

monitors activity of NetworkManager and watches for changes in the state of connectivity and devices. This subcommand does not take any arguments.

#### **networking**

queries the networking status. For details, refer to [Section 9.5, “The networking subcommand”](#).

## 9.1 The nmcli command options

Besides the subcommands and their arguments, the **nmcli** command can take the following options:

#### **-a | --ask**

The command stops its run to ask for any missing arguments, for example, for a password to connect to a network.

#### **-c | --color {yes|no|auto}**

controls the color output: yes to enable the colors, no to disable them, and auto creates color output only when the standard output is directed to a terminal.

#### **-m | --mode {tabular|multiline}**

switches between tabular (each line describes a single entry, columns define particular properties of the entry) and multiline (each entry comprises more lines, each property is on its own line). tabular is the default value.

-h|--help

prints help.

-w|--wait seconds

sets a time-out period for which to wait for NetworkManager to finish operations. Using this option is recommended for commands that might take longer to complete, for example, connection activation.

## 9.2 The **connection** subcommand

The **connection** command enables you to manage connections or view any information about particular connections. The **nmcli connection** provides the following commands to manage your network connections:

### show

to list connections:

```
>
nmcli connection show
```

You can also use this command to show details about a specified connection:

```
>
nmcli connection show CONNECTION_ID
```

where *CONNECTION\_ID* is any of the identifiers: *a connection name, UUID or a path*

### up

to activate the provided connection. Use the command to reload a connection. Also run this command after you perform any change to the connection.

```
>
sudo
nmcli connection up [--active] [CONNECTION_ID]
```

When *--active* is specified, only the active profiles are displayed. The default is to display both active connections and static configuration.

### down

to deactivate a connection.

```
>
sudo
nmcli connection down CONNECTION_ID
```

where: CONNECTION\_ID is any of the identifiers: *a connection name, UUID or a path*

If you deactivate the connection, it will not reconnect later even if it has the autoconnect flag.

## modify

to change or delete a property of a connection.

```
>
sudo
nmcli connection modify CONNECTION_ID SETTING.PROPERTY PROPERTY_VALUE
```

where:

- CONNECTION\_ID is any of the identifiers: *a connection name, UUID, or a path*
- SETTING.PROPERTY is the name of the property, for example, ipv4.addresses
- PROPERTY\_VALUE is the desired value of SETTING.PROPERTY

The following example deactivates the autoconnect option on the ethernet1 connection:

```
>
sudo
nmcli connection modify ethernet1 connection.autoconnect no
```

## add

to add a connection with the provided details. The command syntax is similar to the modify command:

```
>
sudo
nmcli connection add CONNECTION_ID save YES|
NO SETTING.PROPERTY PROPERTY_VALUE
```

You should at least specify a connection.type or use type. The following example adds an Ethernet connection tied to the eth0 interface with DHCP and disables the connection's autoconnect flag:

```
>
sudo
```

```
nmcli connection add type ethernet autoconnect no ifname eth0
```

### edit

to edit an existing connection using an interactive editor.

```
>  
sudo  
nmcli connection edit CONNECTION_ID
```

### clone

to clone an existing connection. The minimal syntax follows:

```
>  
sudo  
nmcli connection clone CONNECTION_ID NEW_NAME
```

where CONNECTION\_ID is the connection to be cloned.

### delete

to delete an existing connection:

```
>  
sudo  
nmcli connection delete CONNECTION_ID
```

### monitor

to monitor the provided connection. Each time the connection changes, NetworkManager prints a line.

```
>  
sudo  
nmcli connection monitor CONNECTION_ID
```

### reload

to reload all connection files from the disk. As NetworkManager does not monitor changes performed to the connection files, you need to use this command whenever you make changes to the files. This command does not take any further subcommands.

### load

to load/reload a particular connection file, run:

```
>  
sudo  
nmcli connection load CONNECTION_FILE
```

For details about the above-mentioned commands, refer to the [nmcli documentation \(https://developer-old.gnome.org/NetworkManager/stable/nmcli.html\)](https://developer-old.gnome.org/NetworkManager/stable/nmcli.html) ↗.

### 9.3 The **device** subcommand

The **device** subcommand enables you to show and manage network interfaces. The **nmcli device** command recognizes the following commands:

#### **status**

to print the status of all devices.

```
>  
nmcli device status
```

#### **show**

shows detailed information about a device. If no device is specified, all devices are displayed.

```
>  
nmcli device show [DEVICE_NAME]
```

#### **connect**

to connect a device. NetworkManager tries to find a suitable connection to activate. If there is no compatible connection, a new profile is created.

```
>  
sudo  
nmcli device connect DEVICE_NAME
```

#### **modify**

performs temporary changes to the configuration that is active on the particular device. The changes are not stored in the connection profile.

```
>  
sudo  
nmcli device modify DEVICE_NAME [+|-] SETTING.PROPERTY VALUE
```

For possible *SETTING.PROPERTY* values, refer to *nm-settings-nmcli(5)*.

The example below starts the IPv4 shared connection sharing on the device con1.

```
>
```

```
sudo
nmcli dev modify con1 ipv4.method shared
```

### disconnect

disconnects a device and prevents the device from automatically activating further connections without manual intervention.

```
>
sudo
nmcli device disconnect DEVICE_NAME
```

### delete

to delete the interface from the system. You can use the command to delete only software devices like bonds and bridges. You cannot delete hardware devices with this command.

```
>
sudo
nmcli device delete DEVICE_NAME
```

### wifi

lists all available access points.

```
>
nmcli device wifi
```

### wifi connect

connects to a Wi-Fi network specified by its SSID or BSSID. The command takes the following options:

- password - password for secured networks
- ifname - interface used for activation
- name - you can give the connection a name

```
>
sudo
nmcli device wifi connect SSID [password PASSWORD_VALUE]
[ifname INTERFACE_NAME]
```

To connect to a Wi-Fi *GUESTWiFi* with a password pass\$word2#@@, run:

```
>
sudo
```

```
nmcli device wifi connect GUESTWiFi password pass$word2#@@
```

## 9.4 The **general** subcommand

You can use this command to view NetworkManager status and permissions, and change the host name and logging level. The **nmcli general** recognizes the following commands:

### **status**

displays the overall status of NetworkManager. Whenever you do not specify a command to the **nmcli general** command, status is used by default.

```
>  
nmcli general status
```

### **hostname**

if you do not provide a new host name as an argument, the current host name is displayed. If you specify a new host name, the value is used to set a new host name.

```
>  
sudo  
nmcli general hostname [HOSTNAME]
```

For example, to set MyHostname, run:

```
>  
sudo  
nmcli general hostname MyHostname
```

### **permissions**

shows your permission for NetworkManager operations like enabling or disabling networking, modifying connections, etc.

```
>  
nmcli general permissions
```

### **logging**

shows and changes NetworkManager logging levels and domains. Without any arguments, the command displays current logging levels and domains.

```
>  
sudo
```

```
nmcli general logging [level LEVEL domains DOMAIN]
```

*LEVEL* is any of the values: OFF, ERR, WARN, INFO, DEBUG, or TRACE.

*DOMAIN* is a list of values that can be as follows: PLATFORM, RFKILL, ETHER, WIFI, BT, MB, DHCP4, DHCP6, PPP, WIFI\_SCAN, IP4, IP6, AUTOIP4, DNS, VPN, SHARING, SUPPLICANT, AGENTS, SETTINGS, SUSPEND, CORE, DEVICE, OLPC, WIMAX, INFINIBAND, FIREWALL, ADSL, BOND, VLAN, BRIDGE, DBUS\_PROPS, TEAM, CONCHECK, DCB, DISPATCH, AUDIT, SYSTEMD, VPN\_PLUGIN, PROXY.

## 9.5 The **networking** subcommand

The subcommand enables you to query the status of the network. Also, by using this command, you can enable or disable networking. The **nmcli networking** command takes the following commands:

### **on/off**

enables or disables networking. The **off** command deactivates all interfaces managed by NetworkManager.

```
>
sudo
nmcli networking on
```

### **connectivity**

displays the network connectivity state. If **check** is used, NetworkManager performs a new check of the state. Otherwise, the last detected state is displayed.

```
>
nmcli networking connectivity
```

Possible states are the following:

- *none* - the host is not connected to any network.
- *portal* - the host is behind a captive portal and cannot reach the full Internet.
- *limited* - the host is connected to a network, but it has no access to the Internet.
- *full* - the host is connected to a network and has full access to the Internet.
- *unknown* - NetworkManager could not determine the network state.



## 10 Troubleshooting

Learn how to debug and troubleshoot NetworkManager installation and configuration issues.

### 10.1 Network is not running

If the network is not working, this may be caused by NetworkManager itself. To check that, proceed as follows:

1. Check that NetworkManager is enabled and active:

```
>  
sudo  
systemctl status network
```

2. If NetworkManager is disabled, enable it:

```
>  
sudo  
systemctl enable NetworkManager
```

3. If NetworkManager is inactive, restart it:

```
>  
sudo  
restart NetworkManager
```

### 10.2 Wi-Fi connectivity issue

If you are experiencing problems with Wi-Fi connectivity, proceed as described below:

1. View the list of Wi-Fi connections:

```
>  
sudo  
nmcli device wifi list
```

2. If a particular device is listed, make sure its Wi-Fi connection is active:

```
>
```

```
sudo
nmcli connection show --active
```

3. If the Wi-Fi connection is not listed, verify the Wi-Fi status:

```
>
sudo
nmcli device status
```

- a. If the status is disconnected, activate the connection.

```
>
sudo
nmcli connection up CONNECTION_NAME
```

- b. If the status is unavailable, restart NetworkManager:

```
>
sudo
systemctl restart NetworkManager
```

4. Inspect the NetworkManager logs for error messages.

```
>
sudo
journalctl -u NetworkManager -n 100
```

5. The Wi-Fi device may be blocked:

- a. Check if the device is blocked:

```
> sudo rfkill list

phy0: Wireless LAN
Soft blocked: yes
Hard blocked: no
```

- b. Unblock the device:

```
>
sudo
rfkill unblock all
```

6. IPv4 static address may be configured incorrectly, to check that, reset to use DHCP:

```
>
```

```
sudo
nmcli connection modify SSID ipv4.method auto
```

7. Try to activate the connection again:

```
>
sudo
nmcli connection up SSID
```


8. Try to reconnect to the Wi-Fi network:

```
>
sudo
nmcli device wifi connect SSID password PASSWORD
```

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