

Configuring networks using NetworkManager

WHAT?

The article covers the basics of NetworkManager and the usage of the CLI tool to configure the network.

WHY?

You are using NetworkManager, and you want to configure your network.

EFFORT

It takes approx. 15 minutes to go through this article.

GOAL

You will have a better understanding of how NetworkManager works and how network connections can be configured.

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1 About NetworkManager

NetworkManager is a program that manages the primary network connection and other connection interfaces. NetworkManager has been designed to be fully automatic by default. NetworkManager is handled by `systemd` and is shipped with all necessary service unit files.

NetworkManager stores all network configurations as a connection, which is a collection of data that describes how to create or connect to a network. These connections are stored as files in the `/etc/NetworkManager/system-connections/` directory.

A connection is active when a particular device uses the connection. The device may have more than one connection configured, but only one can be active at a given time. 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.

To manage connections, use the `nmcli` command, described in the [Section 4, “Managing the network using NetworkManager”](#).

2 The NetworkManager.conf configuration file

The main configuration file for the NetworkManager is `/etc/NetworkManager/NetworkManager.conf`. This file can be used to configure the behavior of NetworkManager.

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. The minimal configuration needs to include the `[main]` section with the `plugins` value:

```
[main]
plugins=keyfile
```

The `keyfile` plug-in supports all the connection types and capabilities of NetworkManager.

The default configuration file contains the `connectivity` section that specifies the URI to check the network connection.

On SUSE Linux Enterprise Micro, you can also use other sections. For details, refer to [networkmanager.conf\(5\)](https://linux.die.net/man/5/networkmanager.conf) (<https://linux.die.net/man/5/networkmanager.conf>) or [Gnome's developer guide](https://developer-old.gnome.org/NetworkManager/stable/NetworkManager.conf.html) (<https://developer-old.gnome.org/NetworkManager/stable/NetworkManager.conf.html>).

3 Starting and stopping NetworkManager

As NetworkManager is a `systemd` service, you can use common `systemd` commands to start, stop, or restart NetworkManager.

To start NetworkManager:

```
# systemctl start network
```

To restart NetworkManager:

```
# systemctl restart network
```

To stop NetworkManager:

```
# systemctl stop network
```

4 Managing the network using NetworkManager

4.1 The `nmcli` command

NetworkManager provides a CLI interface to manage your connections. By using the `nmcli` interface, you can connect to a particular network, edit a connection, edit a device, etc. The generic syntax of the `nmcli` is as follows:

```
# nmcli OPTIONS SUBCOMMAND SUBCOMMAND_ARGUMENTS
```

where `OPTIONS` are described in [Section 4.1.1, “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 4.1.2, “The `connection` subcommand”](#).

`device`

For details, refer to [Section 4.1.3, “The `device` subcommand”](#).

`general`

shows status and permissions. For details refer to [Section 4.1.4, “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 4.1.5, “The **networking** subcommand”](#).

4.1.1 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 table (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.

4.1.2 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.

```
# 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.

```
# 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.

```
# 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:

```
# 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:

```
# 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:

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

edit

to edit an existing connection using an interactive editor.

```
# nmcli connection edit CONNECTION_ID
```

clone

to clone an existing connection. The minimal syntax follows:

```
# nmcli connection clone CONNECTION_ID NEW_NAME
```

where `CONNECTION_ID` is the connection to be cloned.

delete

to delete an existing connection:

```
# nmcli connection delete CONNECTION_ID
```

monitor

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

```
# 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:

```
# 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).

4.1.3 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 that will be activated. If there is no compatible connection, a new profile is created.

```
# 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.

```
# 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`.

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


disconnect

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

```
# 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.

```
# nmcli device 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

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

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

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

4.1.4 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.

```
# nmcli general hostname [HOSTNAME]
```

For example, to set `MyHostname`, run:

```
# 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.

```
# 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`.

4.1.5 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.

```
# 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.

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