Networking

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Network info from google

n Red Hat Enterprise Linux (RHEL) 10, manage basic networking primarily using nmcli (command-line) or nmtui (text interface) to control NetworkManager. Key changes include the removal of `ifcfg` file support, favoring key files in `/etc/NetworkManager/system-connections/`. The `dhclient` tool is also replaced by an internal DHCP client.

Key Networking Commands and Tasks (RHEL 10)

- **View Network Status:**
  - `ip a`: View IP addresses and interface status.
  - `nmcli device status`: Check device states.
  - `nmcli connection show`: List active network profiles.
- **Configure Networking (DHCP):**
  - `nmtui`: Open the text-based user interface to edit connections.
  - `nmcli con add type ethernet con-name <name> ifname <interface>`: Create a new DHCP connection.
- **Configure Static IP:**
  - `nmcli con mod <connection> ipv4.addresses <ip/mask> ipv4.gateway <gateway> ipv4.method manual`: Sets static IP.
  - `nmcli con mod <connection> ipv4.dns "8.8.8.8"`: Sets DNS servers.
  - `nmcli con up <connection>`: Apply changes.
- **Troubleshooting:**
  - `ping <host>`: Test connectivity.
  - `ip route`: View routing table.
  - `nmcli dev connect <interface>`: Reconnect an interface.
- **Hostname:**
  - `hostnamectl set-hostname <new_name>`: Change the system hostname.

RHEL 10 fully deprecates the older `/etc/sysconfig/network-scripts/` format. Always use `nmcli` or `nmtui` to ensure configurations are properly saved in the new key file format.

Reh Hat docs on networking

https://docs.redhat.com/en/documentation/red_hat_enterprise_linux/10/html/configuring_and_managing_networking/index

Configuring an Ethernet connection by using nmcli

2.1. Configuring an Ethernet connection by using nmcli

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If you connect a host to the network over Ethernet, you can manage the connection's settings on the command line by using the `nmcli` utility.

Prerequisites

- A physical or virtual Ethernet Network Interface Controller (NIC) exists in the server's configuration.

Procedure

1. List the NetworkManager connection profiles:

```
# nmcli connection show
NAME                UUID                                  TYPE      DEVICE
Wired connection 1  a5eb6490-cc20-3668-81f8-0314a27f3f75  ethernet  enp1s0
```

   By default, NetworkManager creates a profile for each NIC in the host. If you plan to connect this NIC only to a specific network, adapt the automatically-created profile. If you plan to connect this NIC to networks with different settings, create individual profiles for each network.
2. If you want to create an additional connection profile, enter:

```
# nmcli connection add con-name <connection-name> ifname <device-name> type ethernet
```

   Skip this step to modify an existing profile.
3. Optional: Rename the connection profile:

```
# nmcli connection modify "Wired connection 1" connection.id "Internal-LAN"
```

On hosts with multiple profiles, a meaningful name makes it easier to identify the purpose of a profile.

4. Display the current settings of the connection profile:

```
# nmcli connection show Internal-LAN
...
connection.interface-name:     enp1s0
connection.autoconnect:        yes
ipv4.method:                   auto
ipv6.method:                   auto
...
```

5. Configure the IPv4 settings:
   - To use DHCP, enter:

     ```
     # nmcli connection modify Internal-LAN ipv4.method auto
     ```

     Skip this step if `ipv4.method` is already set to `auto` (default).
   - To set a static IPv4 address, network mask, default gateway, DNS servers, and search domain, enter:

     ```
     # nmcli connection modify Internal-LAN 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
     ```

6. Configure the IPv6 settings:
   - To use stateless address autoconfiguration (SLAAC), enter:

     ```
     # nmcli connection modify Internal-LAN ipv6.method auto
     ```

     Skip this step if `ipv6.method` is already set to `auto` (default).
   - To set a static IPv6 address, network mask, default gateway, DNS servers, and search domain, enter:

     ```
     # 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
     ```

7. To customize other settings in the profile, use the following command:

```
# nmcli connection modify <connection-name> <setting> <value>
```

Enclose values with spaces or semicolons in quotes.

For details about which settings you can modify, see the `nm-settings(5)` man page on your system.

8. Activate the profile:

```
# nmcli connection up Internal-LAN
```

Verification

1. Display the IP settings of the NIC:

```
# ip address show enp1s0
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group
default qlen 1000
    link/ether 52:54:00:17:b8:b6 brd ff:ff:ff:ff:ff:ff
    inet 192.0.2.1/24 brd 192.0.2.255 scope global noprefixroute enp1s0
       valid_lft forever preferred_lft forever
    inet6 2001:db8:1::fffe/64 scope global noprefixroute
       valid_lft forever preferred_lft forever
```

2. Display the IPv4 default gateway:

```
# ip route show default
default via 192.0.2.254 dev enp1s0 proto static metric 102
```

3. Display the IPv6 default gateway:

```
# ip -6 route show default
default via 2001:db8:1::fffe dev enp1s0 proto static metric 102 pref medium
```

4. Display the DNS settings:

```
# cat /etc/resolv.conf
search example.com
nameserver 192.0.2.200
nameserver 2001:db8:1::ffbb
```

If multiple connection profiles are active at the same time, the order of `nameserver` entries depend on the DNS priority values in these profiles and the connection types.

5. Use the `ping` utility to verify that this host can send packets to other hosts:

```
# ping <host-name-or-IP-address>
```

Troubleshooting

- Verify that the network cable is plugged-in to the host and a switch.

- Check whether the link failure exists only on this host or also on other hosts connected to the same switch.
- Verify that the network cable and the network interface are working as expected. Perform hardware diagnosis steps and replace defective cables and network interface cards.
- If the configuration on the disk does not match the configuration on the device, starting or restarting NetworkManager creates an in-memory connection that reflects the configuration of the device. For further details and how to avoid this problem, see the Red Hat Knowledgebase solution NetworkManager duplicates a connection after restart of NetworkManager service.

Configuring an Ethernet connection by using nmtui

If you connect a host to an Ethernet network, you can manage the connection's settings in a text-based user interface. Use the `nmtui` application to create new profiles and to update existing ones on a host without a graphical interface.

Note

In `nmtui`:

- Navigate by using the cursor keys.
- Press a button by selecting it and hitting `Enter`.
- Select and clear checkboxes by using `Space`.
- To return to the previous screen, use `ESC`.

Prerequisites

- A physical or virtual Ethernet Network Interface Controller (NIC) exists in the server's configuration.

Procedure

1. If you do not know the network device name you want to use in the connection, display the available devices:

```
# nmcli device status
DEVICE     TYPE      STATE                   CONNECTION
enp1s0     ethernet  unavailable             --
...
```

2. Start `nmtui`:

```
# nmtui
```

3. Select **Edit a connection**, and press `Enter`.
4. Choose whether to add a new connection profile or to modify an existing one:
   - To create a new profile:
     1. Press **Add**.
     2. Select **Ethernet** from the list of network types, and press `Enter`.

- To modify an existing profile, select the profile from the list, and press `Enter`.

5. Optional: Update the name of the connection profile.
   On hosts with multiple profiles, a meaningful name makes it easier to identify the purpose of a profile.
6. If you create a new connection profile, enter the network device name into the **Device** field.
7. Depending on your environment, configure the IP address settings in the `IPv4 configuration` and `IPv6 configuration` areas accordingly. For this, press the button next to these areas, and select:
   - **Disabled**, if this connection does not require an IP address.
   - **Automatic**, if a DHCP server dynamically assigns an IP address to this NIC.
   - **Manual**, if the network requires static IP address settings. In this case, you must fill further fields:
     1. Press **Show** next to the protocol you want to configure to display additional fields.
     2. Press **Add** next to **Addresses**, and enter the IP address and the subnet mask in Classless Inter-Domain Routing (CIDR) format.
        If you do not specify a subnet mask, NetworkManager sets a `/32` subnet mask for IPv4 addresses and `/64` for IPv6 addresses.
     3. Enter the address of the default gateway.
     4. Press **Add** next to **DNS servers**, and enter the DNS server address.
     5. Press **Add** next to **Search domains**, and enter the DNS search domain.

   Figure 2.1. Example of an Ethernet connection with static IP address settings
   Static IP address settings in `nmtui`
8. Press **OK** to create and automatically activate the new connection.
9. Press **Back** to return to the main menu.
10. Select **Quit**, and press `Enter` to close the `nmtui` application.

Verification

1. Display the IP settings of the NIC:

```
# ip address show enp1s0
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group
default qlen 1000
    link/ether 52:54:00:17:b8:b6 brd ff:ff:ff:ff:ff:ff
    inet 192.0.2.1/24 brd 192.0.2.255 scope global noprefixroute enp1s0
       valid_lft forever preferred_lft forever
    inet6 2001:db8:1::fffe/64 scope global noprefixroute
       valid_lft forever preferred_lft forever
```

2. Display the IPv4 default gateway:

```
# ip route show default
default via 192.0.2.254 dev enp1s0 proto static metric 102
```

3. Display the IPv6 default gateway:

```
# ip -6 route show default
default via 2001:db8:1::fffe dev enp1s0 proto static metric 102 pref medium
```

4. Display the DNS settings:

```
# cat /etc/resolv.conf
search example.com
nameserver 192.0.2.200
nameserver 2001:db8:1::ffbb
```

   If multiple connection profiles are active at the same time, the order of `nameserver` entries depend on the DNS priority values in these profiles and the connection types.

5. Use the `ping` utility to verify that this host can send packets to other hosts:

```
# ping <host-name-or-IP-address>
```

Troubleshooting

- Verify that the network cable is plugged-in to the host and a switch.
- Check whether the link failure exists only on this host or also on other hosts connected to the same switch.
- Verify that the network cable and the network interface are working as expected. Perform hardware diagnosis steps and replace defective cables and network interface cards.
- If the configuration on the disk does not match the configuration on the device, starting or restarting NetworkManager creates an in-memory connection that reflects the configuration of the device. For further details and how to avoid this problem, see the Red Hat Knowledgebase solution NetworkManager duplicates a connection after restart of NetworkManager service.

Configuring an Ethernet connection by using control-center

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If you connect a host to the network over Ethernet, you can manage the connection's settings with a graphical interface by using the GNOME Settings menu.

Note that `control-center` does not support as many configuration options as the `nmcli` utility.

Prerequisites

- A physical or virtual Ethernet Network Interface Controller (NIC) exists in the server's configuration.
- GNOME is installed.

Procedure

1. Press the Super key, enter `Settings`, and press `Enter`.
2. Select **Network** in the navigation on the left.
3. Choose whether to add a new connection profile or to modify an existing one:
    - To create a new profile, click the + button next to the **Ethernet** entry.
    - To modify an existing profile, click the gear icon next to the profile entry.
4. Optional: On the **Identity** tab, update the name of the connection profile.
   On hosts with multiple profiles, a meaningful name makes it easier to identify the purpose of a profile.
5. Depending on your environment, configure the IP address settings on the **IPv4** and **IPv6** tabs accordingly:
    - To use DHCP or IPv6 stateless address autoconfiguration (SLAAC), select `Automatic (DHCP)` as method (default).
    - To set a static IP address, network mask, default gateway, DNS servers, and search domain, select `Manual` as method, and fill the fields on the tabs:
      Static IP address settings in `control-center`
6. Depending on whether you add or modify a connection profile, click the Add or Apply button to save the connection.

The GNOME `control-center` automatically activates the connection.

Verification

1. Display the IP settings of the NIC:

```
# ip address show enp1s0
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group
default qlen 1000
    link/ether 52:54:00:17:b8:b6 brd ff:ff:ff:ff:ff:ff
    inet 192.0.2.1/24 brd 192.0.2.255 scope global noprefixroute enp1s0
       valid_lft forever preferred_lft forever
    inet6 2001:db8:1::fffe/64 scope global noprefixroute
       valid_lft forever preferred_lft forever
```

2. Display the IPv4 default gateway:

```
# ip route show default
default via 192.0.2.254 dev enp1s0 proto static metric 102
```

3. Display the IPv6 default gateway:

```
# ip -6 route show default
default via 2001:db8:1::fffe dev enp1s0 proto static metric 102 pref medium
```

4. Display the DNS settings:

```
# cat /etc/resolv.conf
search example.com
nameserver 192.0.2.200
nameserver 2001:db8:1::ffbb
```

   If multiple connection profiles are active at the same time, the order of `nameserver` entries depend on the DNS priority values in these profiles and the connection types.

5. Use the `ping` utility to verify that this host can send packets to other hosts:

```
# ping <host-name-or-IP-address>
```

Troubleshooting steps

- Verify that the network cable is plugged-in to the host and a switch.
- Check whether the link failure exists only on this host or also on other hosts connected to the same switch.
- Verify that the network cable and the network interface are working as expected. Perform hardware diagnosis steps and replace defective cables and network interface cards.

- If the configuration on the disk does not match the configuration on the device, starting or restarting NetworkManager creates an in-memory connection that reflects the configuration of the device. For further details and how to avoid this problem, see the Red Hat Knowledgebase solution NetworkManager duplicates a connection after restart of NetworkManager service.

Configuring an Ethernet connection with a static IP address by using nmstatectl with an interface name

You can use the declarative Nmstate API to configure an Ethernet connection with static IP addresses, gateways, and DNS settings, and assign them to a specified interface name. Nmstate ensures that the result matches the configuration file or rolls back the changes.

Prerequisites

- A physical or virtual Ethernet Network Interface Controller (NIC) exists in the server's configuration.
- The `nmstate` package is installed.

Procedure

1. Create a YAML file, for example `~/create-ethernet-profile.yml`, with the following content:

```
---
interfaces:
- name: enp1s0
  type: ethernet
  state: up
  ipv4:
    enabled: true
    address:
    - ip: 192.0.2.1
      prefix-length: 24
    dhcp: false
  ipv6:
    enabled: true
    address:
    - ip: 2001:db8:1::1
```

```
      prefix-length: 64
    autoconf: false
    dhcp: false
routes:
  config:
  - destination: 0.0.0.0/0
    next-hop-address: 192.0.2.254
    next-hop-interface: enp1s0
  - destination: ::/0
    next-hop-address: 2001:db8:1::fffe
    next-hop-interface: enp1s0
dns-resolver:
  config:
    search:
    - example.com
    server:
    - 192.0.2.200
    - 2001:db8:1::ffbb
```

These settings define an Ethernet connection profile for the `enp1s0` device with the following settings:

- A static IPv4 address - `192.0.2.1` with the `/24` subnet mask
- A static IPv6 address - `2001:db8:1::1` with the `/64` subnet mask
- An IPv4 default gateway - `192.0.2.254`
- An IPv6 default gateway - `2001:db8:1::fffe`
- An IPv4 DNS server - `192.0.2.200`
- An IPv6 DNS server - `2001:db8:1::ffbb`
- A DNS search domain - `example.com`

2. Optional: You can define the `identifier: mac-address` and `mac-address: <mac_address>` properties in the `interfaces` property to identify the network interface card by its MAC address instead of its name, for example:

```
---
interfaces:
- name: <profile_name>
  type: ethernet
  identifier: mac-address
  mac-address: <mac_address>
  ...
```

3. Apply the settings to the system:

```
# nmstatectl apply ~/create-ethernet-profile.yml
```

Verification

1. Display the current state in YAML format:

```
# nmstatectl show enp1s0
```

2. Display the IP settings of the NIC:

```
# ip address show enp1s0
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group
default qlen 1000
    link/ether 52:54:00:17:b8:b6 brd ff:ff:ff:ff:ff:ff
    inet 192.0.2.1/24 brd 192.0.2.255 scope global noprefixroute enp1s0
       valid_lft forever preferred_lft forever
    inet6 2001:db8:1::fffe/64 scope global noprefixroute
       valid_lft forever preferred_lft forever
```

3. Display the IPv4 default gateway:

```
# ip route show default
default via 192.0.2.254 dev enp1s0 proto static metric 102
```

4. Display the IPv6 default gateway:

```
# ip -6 route show default
default via 2001:db8:1::fffe dev enp1s0 proto static metric 102 pref medium
```

5. Display the DNS settings:

```
# cat /etc/resolv.conf
search example.com
nameserver 192.0.2.200
nameserver 2001:db8:1::ffbb
```

   If multiple connection profiles are active at the same time, the order of `nameserver` entries depend on the DNS priority values in these profiles and the connection types.

6. Use the `ping` utility to verify that this host can send packets to other hosts:

```
# ping <host-name-or-IP-address>
```