

Implementing Wireless Networking on Linux on the ThinkEdge SE360 V2

Planning / Implementation

The ThinkEdge SE360 V2 edge server optionally supports wireless LAN (WLAN) to enable connectivity to Wi-Fi as clients. Red Hat, SUSE, and Ubuntu Enterprise OSes are supported on the ThinkEdge SE360 V2 server. However, the wireless setting guide is in the different Linux OS distribution document. This article consolidates all different Linux OS distribution setting methods and provides the customer with the practice of setting wireless function in all supported Linux OS distributions.



Figure 1. Lenovo ThinkEdge SE360 V2 with wireless LAN functionality

This article contains three sections. The first one introduces the wireless network devices provided by the SE360 V2 system. The second one lists wireless network connection methods used by different Linux OSes. The last one includes all the wireless setting examples of different Linux OSes to enable users to quickly configure wireless network settings.

Prerequisites

Before setting up a wireless network, make sure that the system includes the wireless network module. See the SE360 V2 product guide for detailed information about the server for reference:

<https://lenovopress.lenovo.com/lp1677-thinkedge-se360-v2-server>

The SE360 V2 WLAN solution is equipped with Intel AX210 module. For Intel AX210 wireless solution, user can refer to Intel website for more information:

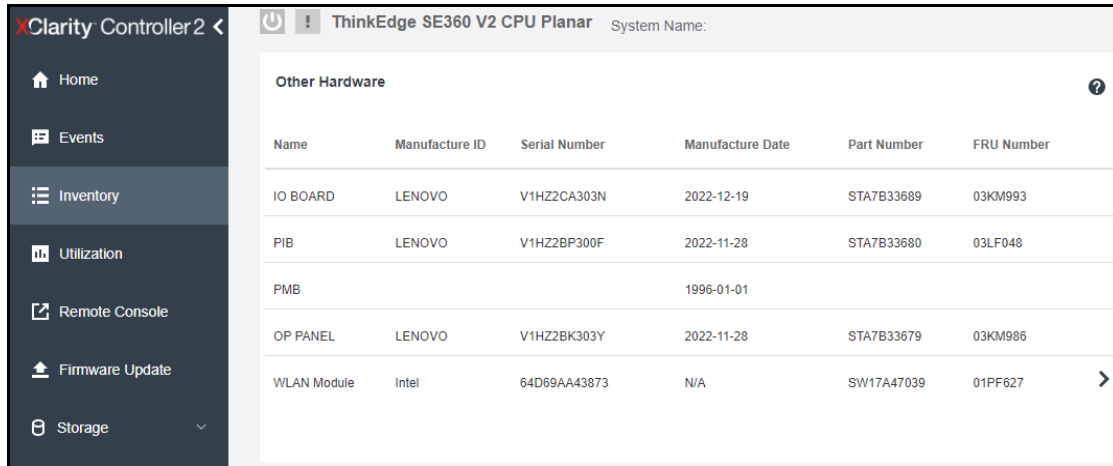
<https://www.intel.com/content/www/us/en/support/articles/000005511/wireless.html>

Before you set up the system, you can refer to the Lenovo OS interoperability guide to get the latest support information:

<https://lenovopress.lenovo.com/osig>

Firmware settings

Make sure the wireless chip is listed on the system via XCC browser interface, as shown in the following figure.



Name	Manufacture ID	Serial Number	Manufacture Date	Part Number	FRU Number
IO BOARD	LENOVO	V1HZ2CA303N	2022-12-19	STA7B33689	03KM993
PIB	LENOVO	V1HZ2BP300F	2022-11-28	STA7B33680	03LF048
PMB			1996-01-01		
OP PANEL	LENOVO	V1HZ2BK303Y	2022-11-28	STA7B33679	03KM986
WLAN Module	Intel	64D69AA43873	N/A	SW17A47039	01PF627

Figure 2. Check wireless device via XCC interface

Refer to the XCC manual for all other XCC configuration details:

https://pubs.lenovo.com/xcc2/iot_servers

OS driver checking

Before you proceed with the wireless connection settings, ensure that the AX210 device is visible in your operating system and that the driver iwlwifi is being used for it.

1. Check the device is existed in OS.

```
# root@se360v2:/home/conie# lspci |grep -i ax210
0000:05:00.0 Network controller: Intel Corporation Wi-Fi 6 AX210/AX211/AX411 16
0MHz (rev 1a)
```

2. Check the driver in use:

```
root@se360v2:/home/conie# lspci -s 0000:05:00.0 -vvv|grep -i kernel
Kernel driver in use: iwlwifi
Kernel modules: iwlwifi
```

3. Check the device via command “ip a” as shown in the following figure.

```
root@se360v2:/home/conie# ip a
```

```
[root@localhost ~]# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
8: wlan0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether 64:d6:9a:a4:38:73 brd ff:ff:ff:ff:ff:ff
    altname wlp5s0
    inet 10.132.228.102/23 brd 10.132.229.255 scope global dynamic noprefixroute wlan0
        valid_lft 1792sec preferred_lft 1792sec
    inet6 fe80::3e4:9a5e:bd31:6955/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
```

Figure 3. Check wireless device

NetworkManager wireless software

NetworkManager is a software tool that can manage both wired and wireless network interfaces, including Wi-Fi and ethernet. It also provides users with multiple options for manually configuring their network connections, based on their specific requirements. These options include using the graphical interface or the command-line interface.

To use NetworkManager, you need to start it. Currently, most Linux operating systems employ the systemd service to launch NetworkManager. Once NetworkManager is enabled and started, it will also initiate other required services, such as WPA and 802.1x.

Details about NetworkManager in key Linux distributions:

- **SUSE**

The SLES operating system includes NetworkManager for connecting to wireless networks. You can find more detailed information in the below official documentation:

<https://documentation.suse.com/sles/15-SP5/single-html/SLES-gnome-user/index.html#sec-gnomeuser-start-network-connect>

For more SUSE NetworkManager information, please also check SUSE document:

<https://documentation.suse.com/sles/15-SP5/single-html/SLES-administration/#cha-nm>

- **Red Hat**

Red Hat Linux Enterprise Server OS introduces various NetworkManager methods to configure the NetworkManager connection. It includes:

- nmcli: Network configuration via command line
- nmtui: Network configuration via text-based user interface
- nmstatectl: Network configuration via nmstatectl API
- RHEL System Roles: Use RHEL System Roles to automate the configuration of connections on one or multiple hosts.

For details, see the following page:

https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/9/html-single/configuring_and_managing_networking/index#configuring-an-ethernet-connection_configuring-and-managing-networking

- **Ubuntu and Debian**

Ubuntu document introduces NetworkManager as a tool for wireless configuration. Ubuntu also introduces NetworkManager along with nmcli, for the practice, we will use the nmcli command as the wireless setting example:

<https://help.ubuntu.com/community/NetworkManager?action=show&redirect=WifiDocs%2FNetworkManager>

Wireless configuration steps for RHEL

To configure wireless on Red Hat, use the following steps. We used RHEL 8.6 and nmcli in our lab.

1. Check the wireless device by running the 'lspci' command and make sure the wireless device is displayed in OS.

```
[root@localhost ~]# lspci -vvv|grep ax210
[root@localhost ~]# lspci -vvv|grep -i ax210
0000:05:00.0 Network controller: Intel Corporation Wi-Fi 6 AX210/AX211/AX411 160MHz (rev 1a)
Subsystem: Intel Corporation Wi-Fi 6 AX210 160MHz
[root@localhost ~]#
```

Figure 4. Check network device

2. Enable Wi-Fi function and list Wi-Fi access point.

```
[root@localhost ~]# nmcli r wifi on
[root@localhost ~]# nmcli d wifi list
```

```
[root@localhost ~]# nmcli d
DEVICE          TYPE      STATE      CONNECTION
eth4             ethernet  connected  eth4
eth2             ethernet  connected  eth2
eth5             ethernet  connected  eth5
usb0             ethernet  connected  usb0
virbr0           bridge    connected (externally) virbr0
eth0             ethernet  disconnected --
eth1             ethernet  disconnected --
eth3             ethernet  disconnected --
wlan0            wifi      disconnected --
wlp-udev-wlan0   wifi-p2p  disconnected --
lo               loopback  unmanaged  --
```

wireless device

```
[root@localhost ~]# nmcli r wifi on
[Enable WiFi Function]
[root@localhost ~]# nmcli d wifi list
[List available WiFi access point]
```

IN-USE	BSSID	SSID	MODE	CHAN	RATE	SIGNAL
	D0:15:A6:CA:43:34	lenovo-IoT	Infra	112	405 Mbit/s	89
	D0:15:A6:CA:43:33	lenovo-5G	Infra	112	405 Mbit/s	85
	E0:CB:4E:DC:E2:D6	WL520GU	Infra	1	0 Mbit/s	84
	D0:15:A6:CA:43:31	lenovo-guest	Infra	112	405 Mbit/s	84
	D0:15:A6:CA:43:32	lenovo-internet	Infra	112	405 Mbit/s	84
	D0:15:A6:CA:43:30	lenovo	Infra	112	405 Mbit/s	84
	D0:15:A6:CA:43:10	lenovo	Infra	6	195 Mbit/s	82
	D0:15:A6:CA:43:12	lenovo-internet	Infra	6	195 Mbit/s	82
	D0:15:A6:CA:43:11	lenovo-guest	Infra	6	195 Mbit/s	82
	D0:15:A6:CA:43:13	lenovo-IoT	Infra	6	195 Mbit/s	77
	1C:60:DE:63:4B:B0	MQTTtest	Infra	13	270 Mbit/s	77
	D0:15:A6:CA:20:32	lenovo-internet	Infra	1	195 Mbit/s	72
	D0:15:A6:CA:20:31	lenovo-guest	Infra	1	195 Mbit/s	70
	D0:15:A6:CA:20:30	lenovo	Infra	1	195 Mbit/s	70
	D0:15:A6:CA:20:54	lenovo-IoT	Infra	132	405 Mbit/s	64

Figure 5. Check network device, turn on the wireless radio, and list all access point

3. Connect to AP and check the connectivity.

```
[root@localhost ~]# nmcli d wifi connect lenovo-internet password [password]
[root@localhost ~]# ip a
```

```
[root@localhost ~]# nmcli d wifi connect lenovo-internet password [password]
Device 'wlan0' successfully activated with '01611be6-20fa-45e7-9a47-08436e5dca69'.
```

Figure 6. Connect to lenovo-internet AP

```
[root@localhost ~]# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    valid lft forever preferred lft forever
9: wlan0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether 64:d6:9a:a4:38:73 brd ff:ff:ff:ff:ff:ff
    inet 10.132.228.102/23 brd 10.132.229.255 scope global dynamic noprefixroute wlan0
        valid lft 1793sec preferred lft 1793sec
    inet6 fe80::e177:7b89:b2a5:6831/64 scope link noprefixroute
    valid lft forever preferred lft forever
```

Figure 7. Check the wireless, such as wlan0, by command "ip a"

4. Disable all wired network and only leave wireless network, and then check again the connection by ping command.

```
[root@localhost ~]# ip a|grep -i 241
    inet 10.241.99.247/24 brd 10.241.99.255 scope global dynamic noprefixroute eth2
[root@localhost ~]# ip a|grep -i 241
[root@localhost ~]# ping www.google.com
PING www.google.com (142.250.207.68) 56(84) bytes of data.
64 bytes from hkg12s32-in-f4.1e100.net (142.250.207.68): icmp_seq=1 ttl=56 time=20.3 ms
64 bytes from hkg12s32-in-f4.1e100.net (142.250.207.68): icmp_seq=2 ttl=56 time=22.1 ms
64 bytes from hkg12s32-in-f4.1e100.net (142.250.207.68): icmp_seq=3 ttl=56 time=18.9 ms
64 bytes from hkg12s32-in-f4.1e100.net (142.250.207.68): icmp_seq=4 ttl=56 time=19.8 ms
64 bytes from hkg12s32-in-f4.1e100.net (142.250.207.68): icmp_seq=5 ttl=56 time=28.2 ms
64 bytes from hkg12s32-in-f4.1e100.net (142.250.207.68): icmp_seq=6 ttl=56 time=21.4 ms
^C

```

Figure 8. Check the wireless by command “ip a”

5. If there is not any requirement to use Wi-Fi function, we can disable the wireless connection.

```
#nmcli r wifi off
```

Wireless configuration steps for SLES

In the SLES OS document, it suggests using NetworkManager applet to configure the wireless connection. To set up the wireless connection, follow the steps below:

<https://documentation.suse.com/sles/15-SP5/html/SLES-all/cha-network.html#sec-network-yast-netcard-global>

1. Install the NetworkManager

When installing the SLES OS, such as SLES15 SP5, ensure that NetworkManager is included in the OS's installation list before proceeding with the installation. Make sure to check if the SUSE Enterprise Workstation Extension is listed in the software. If it's not listed, add it to the installation list.

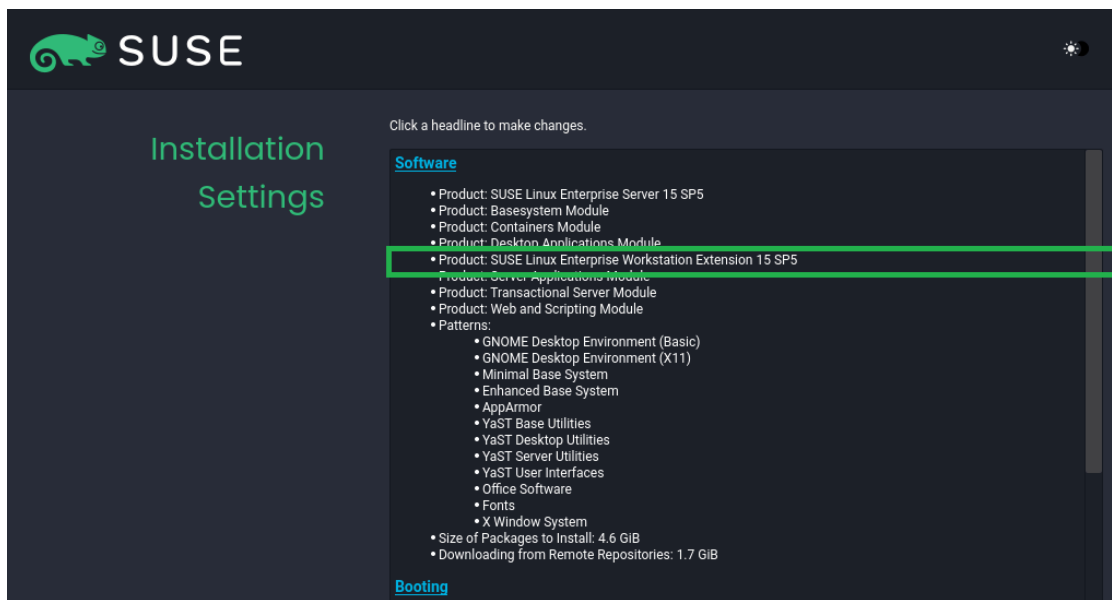


Figure 9. SUSE Enterprise Workstation Extension listed in Software

Make sure the NetworkManager software is in the Software Selection and System Tasks list.

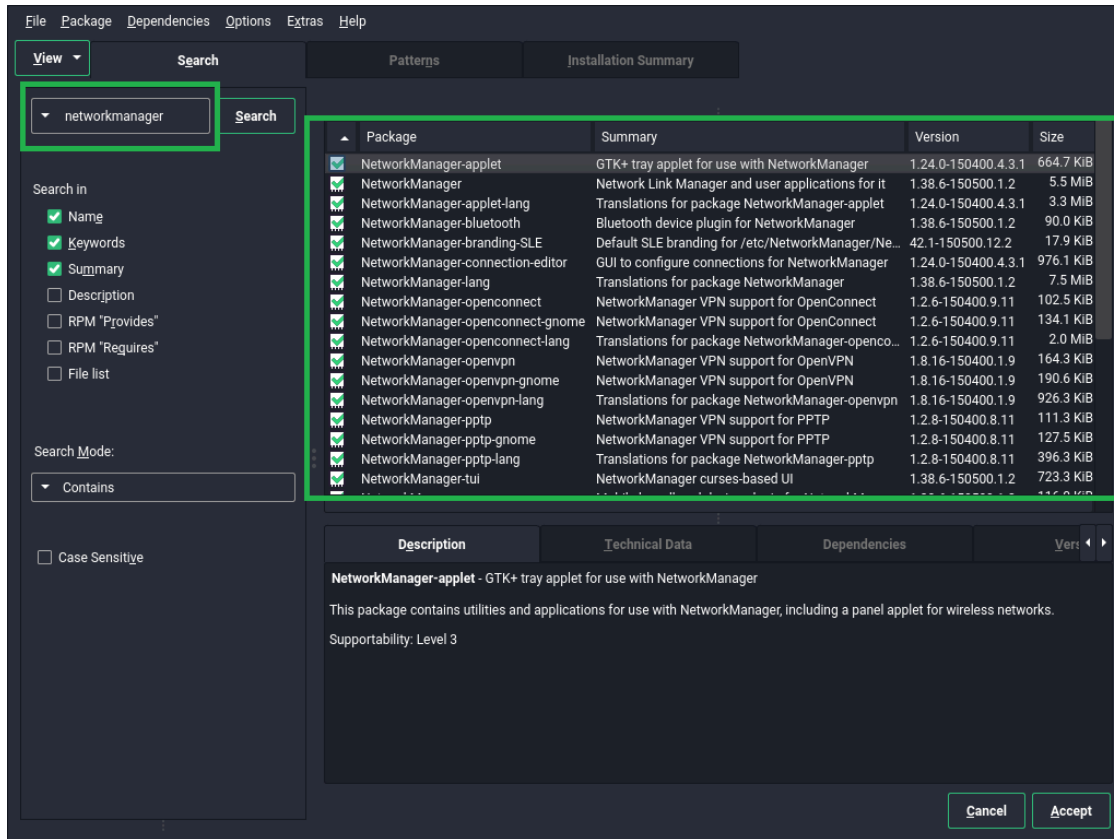


Figure 10. NetworkManager in the Software Selection and System Tasks list

If SLES OS is installed, but NetworkManager software is not installed yet:

- Install NetworkManager and make sure the NetworkManager installed in OS using SUSE yast2 tool.

```
#yast2 sw_single
```

- Locate the SLES-workstation repository as shown in the figure below. Follow the instructions in the SLES network document to install NetworkManager. Refer to preceding figure for an example.

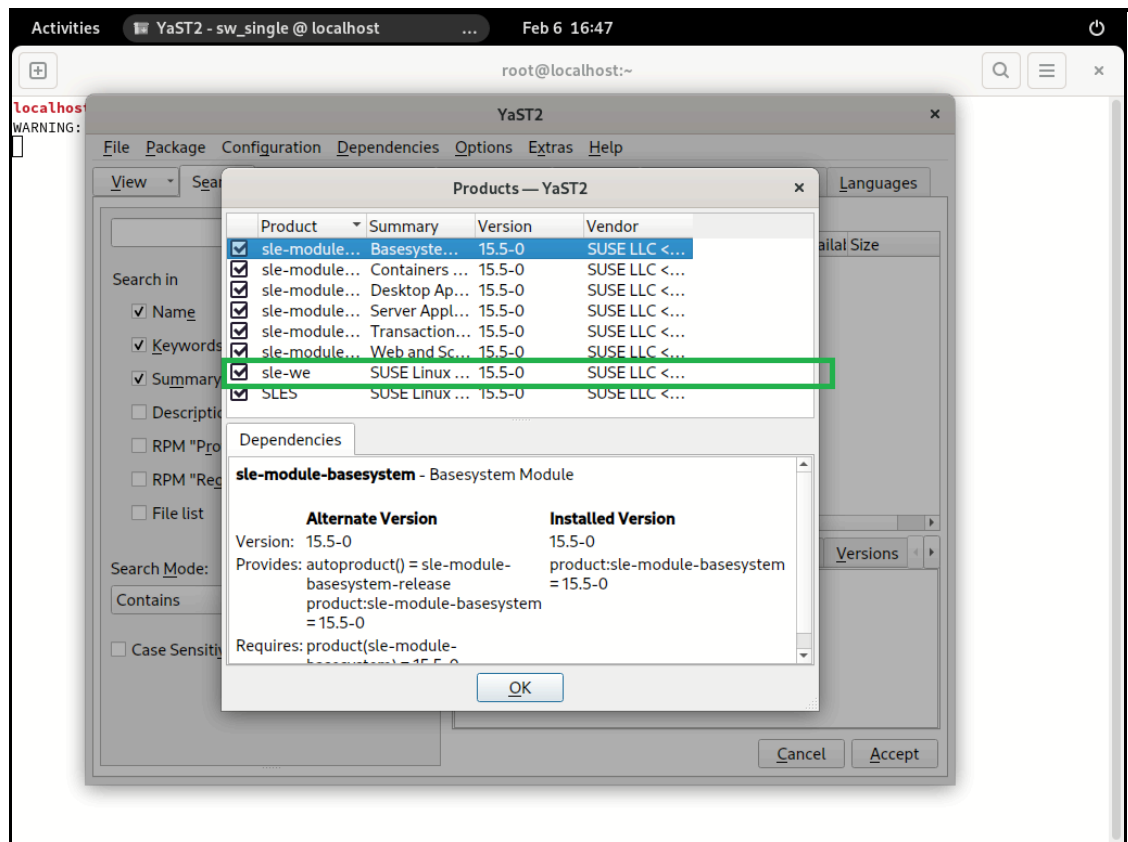


Figure 11. Find the repository SLES-workstation

2. After completing NetworkManager installation, configure wireless setting of NetworkManager
 - a. Open the network setting via yast2 tool and make sure NetworkManager is being used.

```
#yast2 lan
```

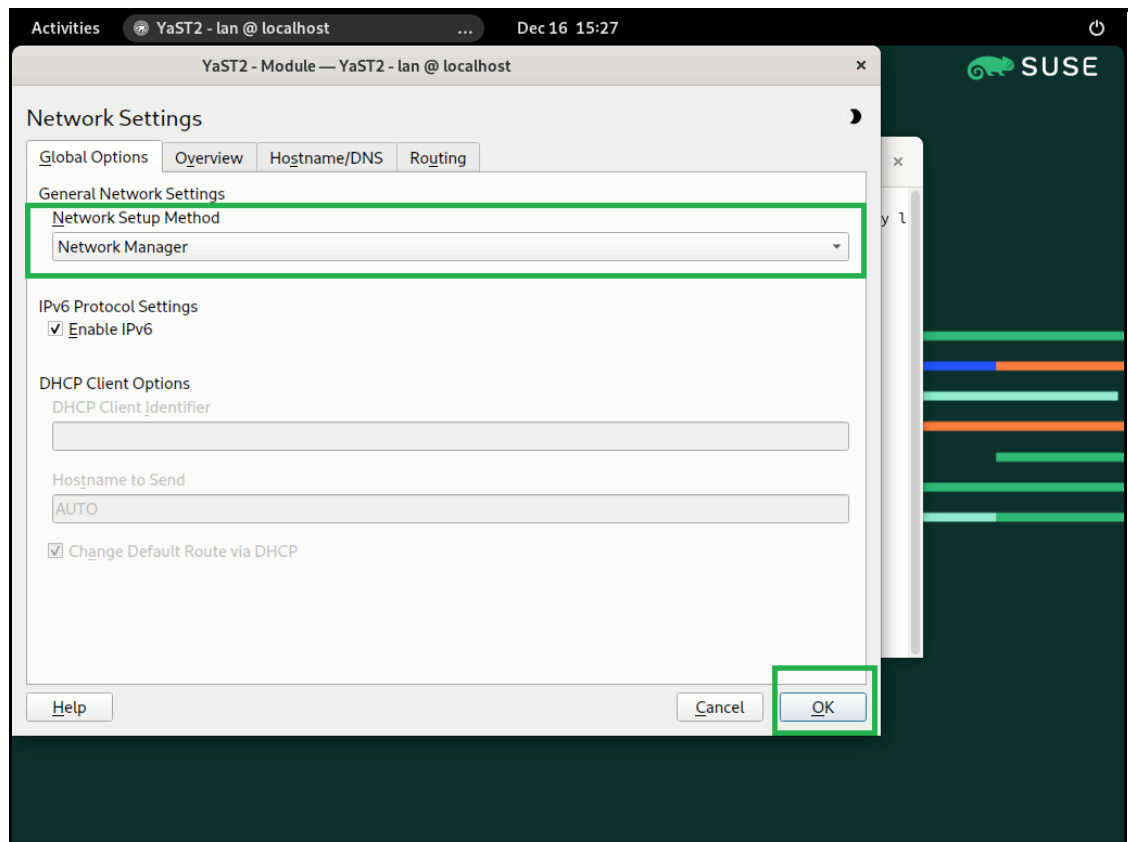


Figure 12. Check the NetworkManager is being used via yast2 lan

- b. The warning message appears. And then press “ok” to close the dialog.

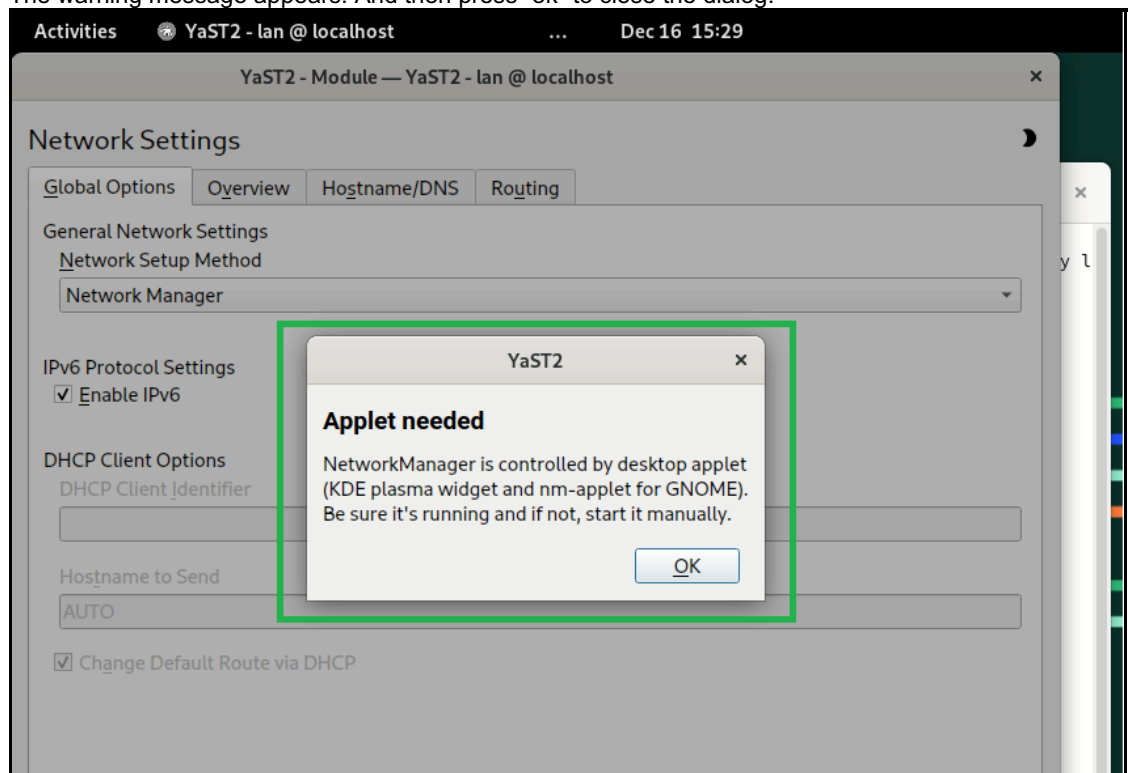
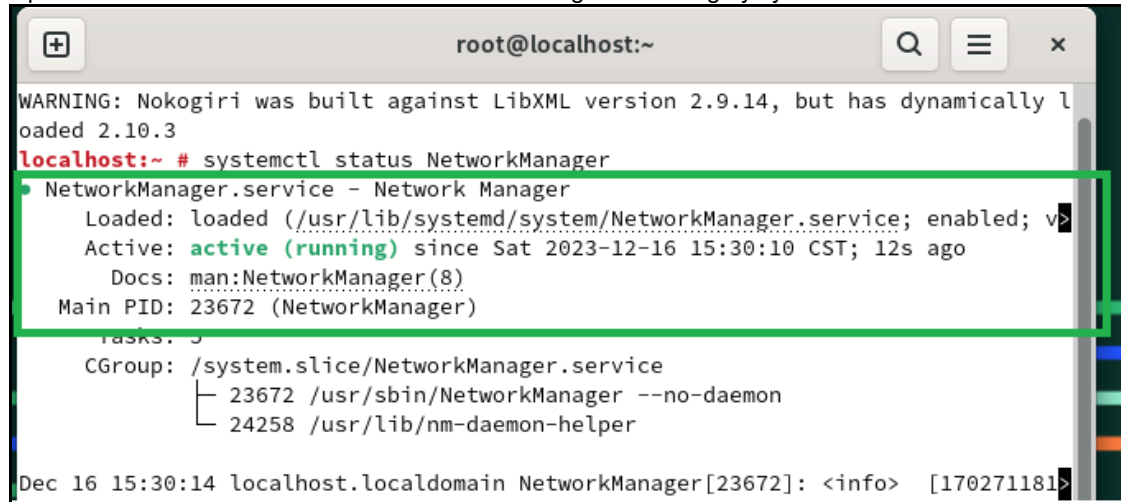


Figure 13. Warning message

- c. Open one terminal and make sure the NetworkManager is working by systemctl command.



```
root@localhost:~  
WARNING: Nokogiri was built against LibXML version 2.9.14, but has dynamically loaded 2.10.3  
localhost:~ # systemctl status NetworkManager  
● NetworkManager.service - Network Manager  
   Loaded: loaded (/usr/lib/systemd/system/NetworkManager.service; enabled; vendor preset: enabled)  
   Active: active (running) since Sat 2023-12-16 15:30:10 CST; 12s ago  
     Docs: man:NetworkManager(8)  
    Main PID: 23672 (NetworkManager)  
      Tasks: 5  
      CGroup: /system.slice/NetworkManager.service  
              └─ 23672 /usr/sbin/NetworkManager --no-daemon  
                └─ 24258 /usr/lib/nm-daemon-helper  
  
Dec 16 15:30:14 localhost.localdomain NetworkManager[23672]: <info> [170271181]
```

Figure 14. Make sure the NetworkManager is working

- d. Use the yast2 tool to select network configuration and ensure that the Wi-Fi device is listed in the Overview section. Then, follow the yast2 tool's suggestion to use NetworkManager for wireless configuration and close the yast2 tool.

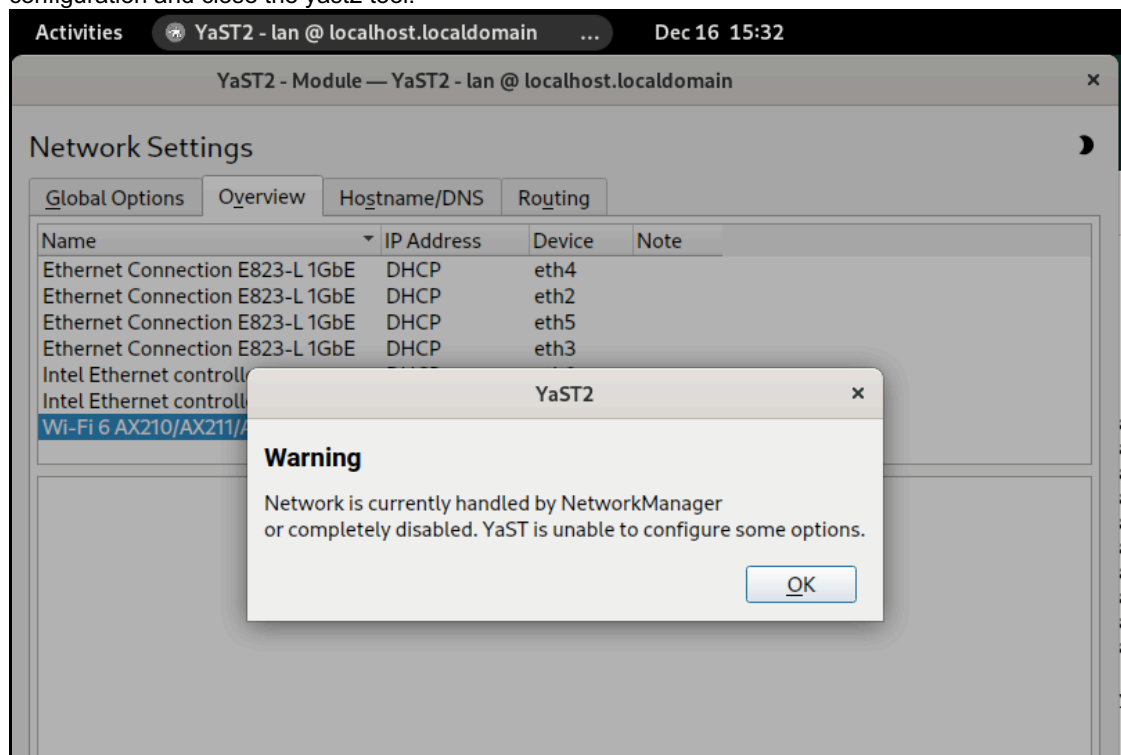


Figure 15. Confirm the Wi-Fi device is listed in Overview listed

- e. As shown in the figure below, click on the "Network Connection" button in the upper right corner, and select the "Select Network" option from the 'Wi-Fi Not Connected' menu.

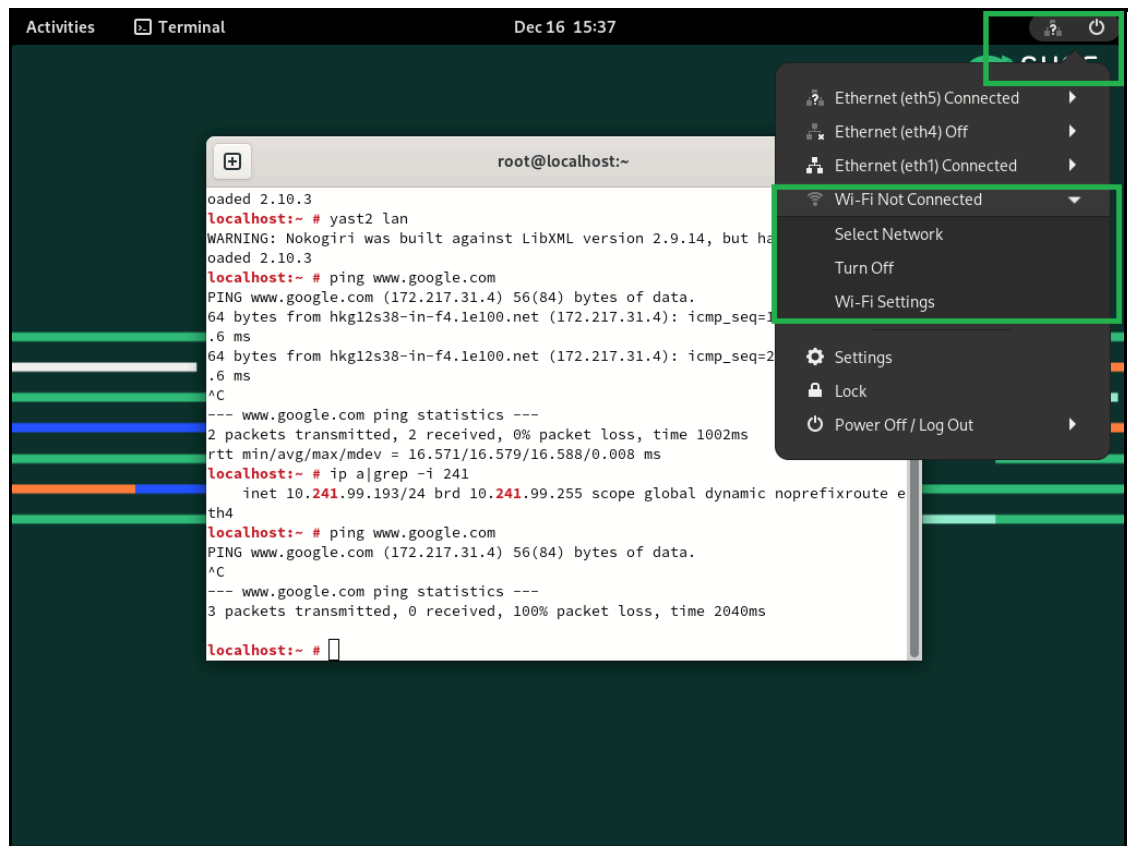


Figure 16. “Select Network” of “Wi-Fi Not Connected”

- f. Go to the “Wi-Fi Settings” and choose the appropriate AP/Security method to connect and then enter the password.

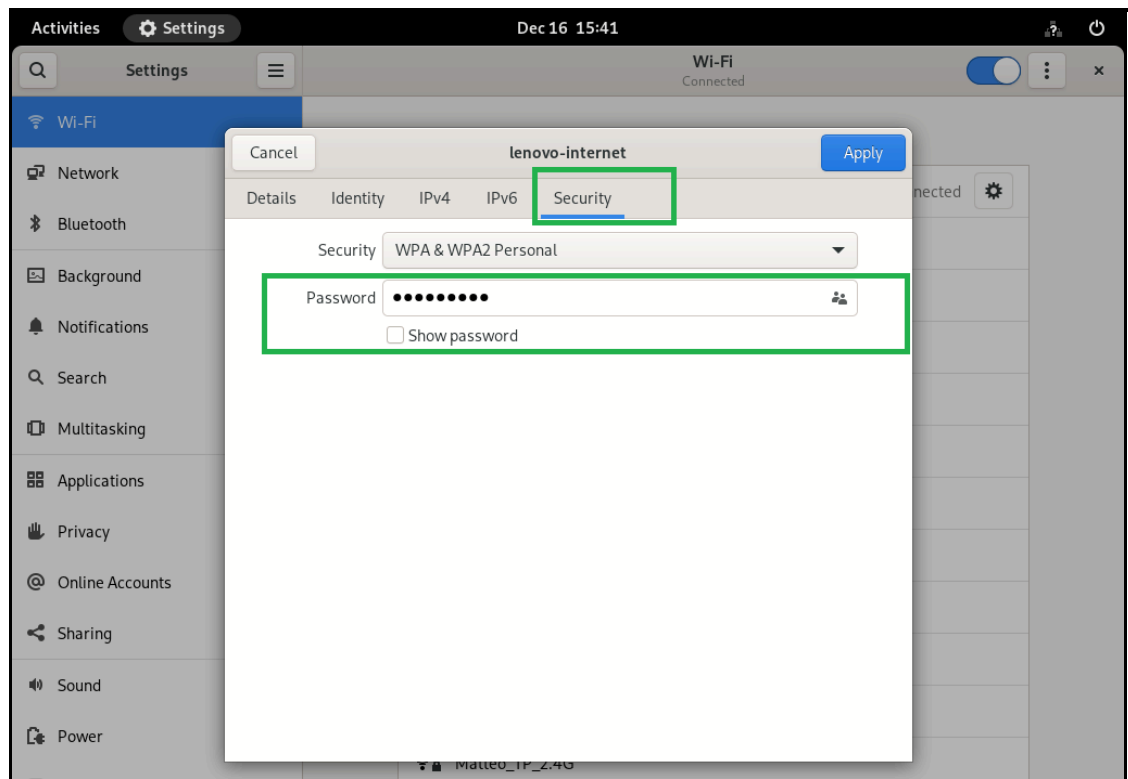


Figure 17. Choose the appropriate AP/Security method

3. After completing the wireless configuration, open one terminal to double check if the connection works by command ping.

```
#ip a |grep wlan
#ping www.google.com
```

```
localhost:~ # ip a|grep wlan0
4: wlan0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    inet 10.132.228.102/23 brd 10.132.229.255 scope global dynamic noprefixroute wlan0
localhost:~ # ip a|grep -i 192
    inet 192.168.0.6/24 brd 192.168.0.255 scope global dynamic noprefixroute eth1
    inet 192.168.0.41/24 brd 192.168.0.255 scope global dynamic noprefixroute eth5
localhost:~ # ping www.google.com
^C
localhost:~ # ping www.google.com
PING www.google.com (142.250.66.68) 56(84) bytes of data.
64 bytes from hkg12s27-in-f4.1e100.net (142.250.66.68): icmp_seq=1 ttl=56 time=18.1 ms
64 bytes from hkg12s27-in-f4.1e100.net (142.250.66.68): icmp_seq=2 ttl=56 time=90.6 ms
64 bytes from hkg12s27-in-f4.1e100.net (142.250.66.68): icmp_seq=3 ttl=56 time=102 ms
^C
```

Figure 18. Check if the connection works by command ping

Wireless configuration steps for other Linux

For other Linux distributions, we use Ubuntu 22.04 LTS as our example.

```
root@hakuba:~# uname -mrs
root@hakuba:~# cat /etc/os-release
```

```

root@se360v2:/home/conie# uname -mrs
Linux 6.2.0-39-generic x86_64
root@se360v2:/home/conie# cat /etc/os-release
PRETTY_NAME="Ubuntu 22.04.3 LTS"
NAME="Ubuntu"
VERSION_ID="22.04"
VERSION="22.04.3 LTS (Jammy Jellyfish)"
VERSION_CODENAME=jammy
ID=ubuntu
ID_LIKE=debian
HOME_URL="https://www.ubuntu.com/"
SUPPORT_URL="https://help.ubuntu.com/"
BUG_REPORT_URL="https://bugs.launchpad.net/ubuntu/"
PRIVACY_POLICY_URL="https://www.ubuntu.com/legal/terms-and-policies/privacy-policy"
UBUNTU_CODENAME=jammy

```

Figure 19. OS information checking

To configure wireless, perform these steps:

1. Check and install NetworkManager tool, such as network-manager.

```

root@se360v2:~# apt-cache search network-manager
root@se360v2:~# apt install -y network-manager

```

2. First, determine the name of the Wi-Fi interface:

```

root@se360v2:~# nmcli d

```

3. Make sure the Wi-Fi radio is on (which is its default state):

```

root@se360v2:~# nmcli r wifi on

```

```

root@se360v2:/home/conie# nmcli d

```

DEVICE	TYPE	STATE	CONNECTION
wlp5s0	wifi	disconnected	--
eno1	ethernet	unmanaged	--
eno2	ethernet	unmanaged	--
eno3np3	ethernet	unmanaged	--
eno4np2	ethernet	unmanaged	--
eno5np1	ethernet	unmanaged	--
eno6np0	ethernet	unmanaged	--
lo	loopback	unmanaged	--
enp2s0	ethernet	unmanaged	--
enp3s0	ethernet	unmanaged	--
enp4s0	ethernet	unmanaged	--
enp5s0	ethernet	unmanaged	--
enp6s0	ethernet	unmanaged	--
enp7s0	ethernet	unmanaged	--
enp8s0	ethernet	unmanaged	--
enp9s0	ethernet	unmanaged	--
enp10s0	ethernet	unmanaged	--
enp11s0	ethernet	unmanaged	--
enp12s0	ethernet	unmanaged	--
enp13s0	ethernet	unmanaged	--
enp14s0	ethernet	unmanaged	--
enp15s0	ethernet	unmanaged	--
enp16s0	ethernet	unmanaged	--
enp17s0	ethernet	unmanaged	--
enp18s0	ethernet	unmanaged	--
enp19s0	ethernet	unmanaged	--
enp20s0	ethernet	unmanaged	--
enp21s0	ethernet	unmanaged	--
enp22s0	ethernet	unmanaged	--
enp23s0	ethernet	unmanaged	--
enp24s0	ethernet	unmanaged	--
enp25s0	ethernet	unmanaged	--
enp26s0	ethernet	unmanaged	--
enp27s0	ethernet	unmanaged	--
enp28s0	ethernet	unmanaged	--
enp29s0	ethernet	unmanaged	--
enp30s0	ethernet	unmanaged	--
enp31s0	ethernet	unmanaged	--
enp32s0	ethernet	unmanaged	--
enp33s0	ethernet	unmanaged	--
enp34s0	ethernet	unmanaged	--
enp35s0	ethernet	unmanaged	--
enp36s0	ethernet	unmanaged	--
enp37s0	ethernet	unmanaged	--
enp38s0	ethernet	unmanaged	--
enp39s0	ethernet	unmanaged	--
enp40s0	ethernet	unmanaged	--
enp41s0	ethernet	unmanaged	--
enp42s0	ethernet	unmanaged	--
enp43s0	ethernet	unmanaged	--
enp44s0	ethernet	unmanaged	--
enp45s0	ethernet	unmanaged	--
enp46s0	ethernet	unmanaged	--
enp47s0	ethernet	unmanaged	--
enp48s0	ethernet	unmanaged	--
enp49s0	ethernet	unmanaged	--
enp50s0	ethernet	unmanaged	--
enp51s0	ethernet	unmanaged	--
enp52s0	ethernet	unmanaged	--
enp53s0	ethernet	unmanaged	--
enp54s0	ethernet	unmanaged	--
enp55s0	ethernet	unmanaged	--
enp56s0	ethernet	unmanaged	--
enp57s0	ethernet	unmanaged	--
enp58s0	ethernet	unmanaged	--
enp59s0	ethernet	unmanaged	--
enp60s0	ethernet	unmanaged	--
enp61s0	ethernet	unmanaged	--
enp62s0	ethernet	unmanaged	--
enp63s0	ethernet	unmanaged	--
enp64s0	ethernet	unmanaged	--
enp65s0	ethernet	unmanaged	--
enp66s0	ethernet	unmanaged	--
enp67s0	ethernet	unmanaged	--
enp68s0	ethernet	unmanaged	--
enp69s0	ethernet	unmanaged	--
enp70s0	ethernet	unmanaged	--
enp71s0	ethernet	unmanaged	--
enp72s0	ethernet	unmanaged	--
enp73s0	ethernet	unmanaged	--
enp74s0	ethernet	unmanaged	--
enp75s0	ethernet	unmanaged	--
enp76s0	ethernet	unmanaged	--
enp77s0	ethernet	unmanaged	--
enp78s0	ethernet	unmanaged	--
enp79s0	ethernet	unmanaged	--
enp80s0	ethernet	unmanaged	--
enp81s0	ethernet	unmanaged	--
enp82s0	ethernet	unmanaged	--
enp83s0	ethernet	unmanaged	--
enp84s0	ethernet	unmanaged	--
enp85s0	ethernet	unmanaged	--
enp86s0	ethernet	unmanaged	--
enp87s0	ethernet	unmanaged	--
enp88s0	ethernet	unmanaged	--
enp89s0	ethernet	unmanaged	--
enp90s0	ethernet	unmanaged	--
enp91s0	ethernet	unmanaged	--
enp92s0	ethernet	unmanaged	--
enp93s0	ethernet	unmanaged	--
enp94s0	ethernet	unmanaged	--
enp95s0	ethernet	unmanaged	--
enp96s0	ethernet	unmanaged	--
enp97s0	ethernet	unmanaged	--
enp98s0	ethernet	unmanaged	--
enp99s0	ethernet	unmanaged	--
enp100s0	ethernet	unmanaged	--
enp101s0	ethernet	unmanaged	--
enp102s0	ethernet	unmanaged	--
enp103s0	ethernet	unmanaged	--
enp104s0	ethernet	unmanaged	--
enp105s0	ethernet	unmanaged	--
enp106s0	ethernet	unmanaged	--
enp107s0	ethernet	unmanaged	--
enp108s0	ethernet	unmanaged	--
enp109s0	ethernet	unmanaged	--
enp110s0	ethernet	unmanaged	--
enp111s0	ethernet	unmanaged	--
enp112s0	ethernet	unmanaged	--
enp113s0	ethernet	unmanaged	--
enp114s0	ethernet	unmanaged	--
enp115s0	ethernet	unmanaged	--
enp116s0	ethernet	unmanaged	--
enp117s0	ethernet	unmanaged	--
enp118s0	ethernet	unmanaged	--
enp119s0	ethernet	unmanaged	--
enp120s0	ethernet	unmanaged	--
enp121s0	ethernet	unmanaged	--
enp122s0	ethernet	unmanaged	--
enp123s0	ethernet	unmanaged	--
enp124s0	ethernet	unmanaged	--
enp125s0	ethernet	unmanaged	--
enp126s0	ethernet	unmanaged	--
enp127s0	ethernet	unmanaged	--
enp128s0	ethernet	unmanaged	--
enp129s0	ethernet	unmanaged	--
enp130s0	ethernet	unmanaged	--
enp131s0	ethernet	unmanaged	--
enp132s0	ethernet	unmanaged	--
enp133s0	ethernet	unmanaged	--
enp134s0	ethernet	unmanaged	--
enp135s0	ethernet	unmanaged	--
enp136s0	ethernet	unmanaged	--
enp137s0	ethernet	unmanaged	--
enp138s0	ethernet	unmanaged	--
enp139s0	ethernet	unmanaged	--
enp140s0	ethernet	unmanaged	--
enp141s0	ethernet	unmanaged	--
enp142s0	ethernet	unmanaged	--
enp143s0	ethernet	unmanaged	--
enp144s0	ethernet	unmanaged	--
enp145s0	ethernet	unmanaged	--
enp146s0	ethernet	unmanaged	--
enp147s0	ethernet	unmanaged	--
enp148s0	ethernet	unmanaged	--
enp149s0	ethernet	unmanaged	--
enp150s0	ethernet	unmanaged	--
enp151s0	ethernet	unmanaged	--
enp152s0	ethernet	unmanaged	--
enp153s0	ethernet	unmanaged	--
enp154s0	ethernet	unmanaged	--
enp155s0	ethernet	unmanaged	--
enp156s0	ethernet	unmanaged	--
enp157s0	ethernet	unmanaged	--
enp158s0	ethernet	unmanaged	--
enp159s0	ethernet	unmanaged	--
enp160s0	ethernet	unmanaged	--
enp161s0	ethernet	unmanaged	--
enp162s0	ethernet	unmanaged	--
enp163s0	ethernet	unmanaged	--
enp164s0	ethernet	unmanaged	--
enp165s0	ethernet	unmanaged	--
enp166s0	ethernet	unmanaged	--
enp167s0	ethernet	unmanaged	--
enp168s0	ethernet	unmanaged	--
enp169s0	ethernet	unmanaged	--
enp170s0	ethernet	unmanaged	--
enp171s0	ethernet	unmanaged	--
enp172s0	ethernet	unmanaged	--
enp173s0	ethernet	unmanaged	--
enp174s0	ethernet	unmanaged	--
enp175s0	ethernet	unmanaged	--
enp176s0	ethernet	unmanaged	--
enp177s0	ethernet	unmanaged	--
enp178s0	ethernet	unmanaged	--
enp179s0	ethernet	unmanaged	--
enp180s0	ethernet	unmanaged	--
enp181s0	ethernet	unmanaged	--
enp182s0	ethernet	unmanaged	--
enp183s0	ethernet	unmanaged	--
enp184s0	ethernet	unmanaged	--
enp185s0	ethernet	unmanaged	--
enp186s0	ethernet	unmanaged	--
enp187s0	ethernet	unmanaged	--
enp188s0	ethernet	unmanaged	--
enp189s0	ethernet	unmanaged	--
enp190s0	ethernet	unmanaged	--
enp191s0	ethernet	unmanaged	--
enp192s0	ethernet	unmanaged	--
enp193s0	ethernet	unmanaged	--
enp194s0	ethernet	unmanaged	--
enp195s0	ethernet	unmanaged	--
enp196s0	ethernet	unmanaged	--
enp197s0	ethernet	unmanaged	--
enp198s0	ethernet	unmanaged	--
enp199s0	ethernet	unmanaged	--
enp200s0	ethernet	unmanaged	--
enp201s0	ethernet	unmanaged	--
enp202s0	ethernet	unmanaged	--
enp203s0	ethernet	unmanaged	--
enp204s0	ethernet	unmanaged	--
enp205s0	ethernet	unmanaged	--
enp206s0	ethernet	unmanaged	--
enp207s0	ethernet	unmanaged	--
enp208s0	ethernet	unmanaged	--
enp209s0	ethernet	unmanaged	--
enp210s0	ethernet	unmanaged	--
enp211s0	ethernet	unmanaged	--
enp212s0	ethernet	unmanaged	--
enp213s0	ethernet	unmanaged	--
enp214s0	ethernet	unmanaged	--
enp215s0	ethernet	unmanaged	--
enp216s0	ethernet	unmanaged	--
enp217s0	ethernet	unmanaged	--
enp218s0	ethernet	unmanaged	--
enp219s0	ethernet	unmanaged	--
enp220s0	ethernet	unmanaged	--
enp221s0	ethernet	unmanaged	--
enp222s0	ethernet	unmanaged	--
enp223s0	ethernet	unmanaged	--
enp224s0	ethernet	unmanaged	--
enp225s0	ethernet	unmanaged	--
enp226s0	ethernet	unmanaged	--
enp227s0	ethernet	unmanaged	--
enp228s0	ethernet	unmanaged	--
enp229s0	ethernet	unmanaged	--
enp230s0	ethernet	unmanaged	--
enp231s0	ethernet	unmanaged	--
enp232s0	ethernet	unmanaged	--
enp233s0	ethernet	unmanaged	--
enp234s0	ethernet	unmanaged	--
enp235s0	ethernet	unmanaged	--
enp236s0	ethernet	unmanaged	--
enp237s0	ethernet	unmanaged	--
enp238s0	ethernet	unmanaged	--
enp239s0	ethernet	unmanaged	--
enp240s0	ethernet	unmanaged	--
enp241s0	ethernet	unmanaged	--
enp242s0	ethernet	unmanaged	--
enp243s0	ethernet	unmanaged	--
enp244s0	ethernet	unmanaged	--
enp245s0	ethernet	unmanaged	--
enp246s0	ethernet	unmanaged	--
enp247s0	ethernet	unmanaged	--
enp248s0	ethernet	unmanaged	--
enp249s0	ethernet	unmanaged	--
enp250s0	ethernet	unmanaged	--
enp251s0	ethernet	unmanaged	--
enp252s0	ethernet	unmanaged	--
enp253s0	ethernet	unmanaged	--
enp254s0	ethernet	unmanaged	--
enp255s0	ethernet	unmanaged	--
enp256s0	ethernet	unmanaged	--
enp257s0	ethernet	unmanaged	--
enp258s0	ethernet	unmanaged	--
enp259s0	ethernet	unmanaged	--
enp260s0	ethernet	unmanaged	--
enp261s0	ethernet	unmanaged	--
enp262s0	ethernet	unmanaged	--
enp263s0	ethernet	unmanaged	--
enp264s0	ethernet	unmanaged	--
enp265s0	ethernet	unmanaged	--
enp266s0	ethernet	unmanaged	--
enp267s0	ethernet	unmanaged	--
enp268s0	ethernet	unmanaged	--
enp269s0	ethernet	unmanaged	--
enp270s0	ethernet	unmanaged	--
enp271s0	ethernet	unmanaged	--
enp272s0	ethernet	unmanaged	--
enp273s0	ethernet		

```

root@se360v2:/home/conie# nmcli d wifi connect lenovo-internet password 
Device 'wlp5s0' successfully activated with 'd03d08e2-71a6-4901-a8df-6e6943673bf6'.
root@se360v2:/home/conie# ip a | grep -i wlan

```

Figure 22. Connect to the access point

6. Close all wired network, and then use the command “ping” to double confirm the wireless client network connection.

```

root@se360v2:~# ping www.google.com

```

```

conie@se360v2:~$ ping www.google.com
PING www.google.com (172.217.163.36) 56(84) bytes of data.
64 bytes from maa05s01-in-f4.1e100.net (172.217.163.36): icmp_seq=1 ttl=56 time=1.94 ms
64 bytes from tsa01s13-in-f4.1e100.net (172.217.163.36): icmp_seq=2 ttl=56 time=1.88 ms
64 bytes from tsa01s13-in-f4.1e100.net (172.217.163.36): icmp_seq=3 ttl=56 time=2.06 ms
64 bytes from maa05s01-in-f4.1e100.net (172.217.163.36): icmp_seq=4 ttl=56 time=1.81 ms
64 bytes from tsa01s13-in-f4.1e100.net (172.217.163.36): icmp_seq=5 ttl=56 time=1.80 ms
64 bytes from tsa01s13-in-f4.1e100.net (172.217.163.36): icmp_seq=6 ttl=56 time=2.00 ms
64 bytes from tsa01s13-in-f4.1e100.net (172.217.163.36): icmp_seq=7 ttl=56 time=1.82 ms
64 bytes from maa05s01-in-f4.1e100.net (172.217.163.36): icmp_seq=8 ttl=56 time=1.90 ms
64 bytes from tsa01s13-in-f4.1e100.net (172.217.163.36): icmp_seq=9 ttl=56 time=1.91 ms
64 bytes from tsa01s13-in-f4.1e100.net (172.217.163.36): icmp_seq=10 ttl=56 time=1.81 ms
64 bytes from tsa01s13-in-f4.1e100.net (172.217.163.36): icmp_seq=11 ttl=56 time=1.88 ms
^C
--- www.google.com ping statistics ---
11 packets transmitted, 11 received, 0% packet loss, time 10015ms
rtt min/avg/max/mdev = 1.801/1.891/2.061/0.079 ms
conie@se360v2:~$ _

```

Figure 23. Confirm the wireless client network connection

Author

Conie Chang is a Linux Engineer in the Lenovo Infrastructure Solutions Group, based in Taipei, Taiwan. She has experience in Red Hat and SUSE Linux OS.

Thanks to the following people for their assistance:

- Adrian Huang, Senior Linux Kernel Engineer
- David Watts, Lenovo Press

Related product families

Product families related to this document are the following:

- [Edge Servers](#)
- [ThinkEdge SE360 V2 Server](#)

Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service. Lenovo may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

Lenovo (United States), Inc.
8001 Development Drive
Morrisville, NC 27560
U.S.A.
Attention: Lenovo Director of Licensing

LENOVO PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. Lenovo may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

The products described in this document are not intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. The information contained in this document does not affect or change Lenovo product specifications or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Lenovo or third parties. All information contained in this document was obtained in specific environments and is presented as an illustration. The result obtained in other operating environments may vary. Lenovo may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk. Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

© Copyright Lenovo 2025. All rights reserved.

This document, LP1891, was created or updated on February 15, 2024.

Send us your comments in one of the following ways:

- Use the online Contact us review form found at:
<https://lenovopress.lenovo.com/LP1891>
- Send your comments in an e-mail to:
comments@lenovopress.com

This document is available online at <https://lenovopress.lenovo.com/LP1891>.

Trademarks

Lenovo and the Lenovo logo are trademarks or registered trademarks of Lenovo in the United States, other countries, or both. A current list of Lenovo trademarks is available on the Web at <https://www.lenovo.com/us/en/legal/copytrade/>.

The following terms are trademarks of Lenovo in the United States, other countries, or both:

Lenovo®

ThinkEdge®

The following terms are trademarks of other companies:

Intel® is a trademark of Intel Corporation or its subsidiaries.

Linux® is the trademark of Linus Torvalds in the U.S. and other countries.

Other company, product, or service names may be trademarks or service marks of others.