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# **Static IP With Cloud-init**

**Thagrol Thagrolson**

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# **1 Colophon**

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## **2 Introduction**

This is a guide to configuring a static IPv4 address prior to first boot of Raspberry Pi OS Trixie or later.

It is assumed that the reader is familiar with the Linux command line and at least one text editor. Desktop users will need to open a terminal to execute many of the commands in this guide.

### **2.1 What's Not Covered**

- OS installation.
- IPv6
- OS other than Raspberry Pi OS
- Raspberry Pi OS prior to the 2025-11-24 Trixie release.

### **2.2 Requirements:**

- Raspberry Pi Imager v2.0.0 or later (2.0.6 recommended at time of writing) and a computer capable of running it.
- For §4 an understanding of IPv4 addresses, netmasks, and subnets.
- Suitable boot media such as an SD card.
- If your boot media has already been flashed it must not yet have been booted from.

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## 2.3 Conventions

Text like this indicates input to or output from the command line.

Text like this also refers to full or partial commands but is not generally intended to be entered into the command line as is.

Text <enclosed by angle brackets> must be replaced with appropriate values for your use case and the angle brackets removed.

“SD card” refers equally to full size and micro SD cards. It should also be taken to refer to any boot storage medium in use.

Where “pi” occurs as a username, replace as appropriate.

All non system paths used in this guide follow the Filesystem Hierarchy Standard<sup>1</sup> though this is not mandatory.

All IP addresses used in this guide are examples only and must be replaced with addresses specific to your network.

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<sup>1</sup> [https://en.wikipedia.org/wiki/Filesystem\\_Hierarchy\\_Standard](https://en.wikipedia.org/wiki/Filesystem_Hierarchy_Standard)

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### **3 Change Log**

2026-02-23 Initial release

2026-02-20 Draft pre-release

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## 4 The Short Version

If you're already sufficiently familiar with IPv4, know the IP address(es) you want to use, know your gateway address, know the address of your DNS server(s), and know how to get the boot partition mounted without booting from the SD card these are the required steps.

1. Open `network-config` in your preferred text editor.<sup>2</sup> You should see something similar to the following:

```
network:  
  version: 2  
  ethernets:  
    eth0:  
      dhcp4: true  
      dhcp6: true  
      optional: true  
  wifis:  
    wlan0:  
      dhcp4: true  
      regulatory-domain: "GB"  
      access-points:  
        "MY_SSID":  
          password: "my encrypted wifi password"  
      optional: true
```

2. For each interface requiring a static IP address:

Change `dhcp4: true` to `dhcp4: false`

Immediately below that line add the following:

```
  addresses: [<desired IP address>]  
  routes:  
    - to: default  
      via: <your gateway's IP address>  
  nameservers:  
    addresses: [<your DNS server's address>]
```

Remember to preserve indentation.

---

<sup>2</sup> Command line Linux users may need to use `sudo` or they may be unable to write back to it.

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You should end up with something similar to the following:

```
network:
  version: 2
  ethernets:
    eth0:
      dhcp4: false
      addresses: [10.0.0.101/24]
      routes:
        - to: default
          via: 10.0.0.1
      nameservers:
        addresses: [10.0.0.1]
    dhcp6: true
    optional: true
  wifis:
    wlan0:
      dhcp4: false
      addresses: [10.0.0.102/24]
      routes:
        - to: default
          via: 10.0.0.1
      nameservers:
        addresses: [10.0.0.1]
    regulatory-domain: "GB"
    access-points:
      "MY_SSID":
        password: "my encrypted wifi password"
    optional: true
```

3. Save and close.

Note: if you did not use Raspberry Pi Imager to flash the SD card network-config will not have the above contents. Appropriate changes can still be made.

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## 5 The Long Version

This assumes little or no knowledge of IPv4.

### 5.1 When to Use A Static Address

Use a static IP address when:

- Your network does not have a DHCP server.
- The Pi is acting as your DNS server.
- The Pi is acting as your default gateway.
- You do not intend to access the Pi from a remote machine using by using the Pi's hostname.<sup>3</sup>
- You may need to move the SD card between Pi but want the IP address to be the same.

### 5.2 Disadvantages

- Hostname lookups from other machines on your network will fail without additional configuration on each device or on your DNS server. Lookups via mDNS (`hostname.local`) will work provided both devices have it enabled.
- You need to keep a manual list of which addresses are in use.
- Using static IP address for more than a small number of devices quickly becomes unmanageable.

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<sup>3</sup> Hostname lookups will not work as neither the remote machine nor your DNS server will know the hostname to IP address mapping.

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## 5.3 Gathering Information

In order to correctly configure networking the following must be found:

- The subnet used by your network.
- The IP address of your network's gateway.
- The IP address of your network's DNS server.
- The address range used by your network's DHCP server if it has one.

Ways to collect this information include:

- Asking the person/team that manages your network. They should also be able to provide you with a suitable address.<sup>4</sup>
- Checking the settings of your DHCP server. On most domestic networks this is your router.<sup>5</sup>
- Checking settings on a machine on your network but this will not include the DHCP range.

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<sup>4</sup> This is especially important in commercial, educational, and other environments with IT departments and policies.

<sup>5</sup> Detailed instructions on this cannot be given here due to the wide variety of DHCP servers and routers in use.

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### 5.3.1 Getting Information from Raspberry Pi OS

These steps should work with most modern Linux distributions.

1. If in the desktop, open a terminal.
2. To find subnet run

```
ip a
```

In the output look for a line starting “inet” below the ID of your active interface (ignore `lo`).

The IP address and netmask in the correct format are found between “inet” and “brd”.

3. To find your gateway run

```
ip route show | grep default
```

The IP address is found between “via” and “dev”.

4. To find your nameserver(s) run

```
grep nameserver /etc/resolve.conf
```

or

```
( nmcli dev list || nmcli dev show ) 2>/dev/null | grep DNS
```

Note: a netmask is not required for the gateway or nameserver(s).

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### **5.3.2 Getting Information from Windows**

Note: this was written and tested on Windows 11 Home. Older versions and different “levels”<sup>6</sup> may vary.

1. Open Control Panel
2. Click “Network and Sharing Centre”
3. Click “Change adapter settings”
4. Right click your network adapter.
5. Click “Status”
6. Click “Details”

### **5.3.3 Getting Information from MacOS**

Note: written and tested on macOS Tahoe (Version 26.3)

1. Open System Settings
2. Click “Network”
3. Click on your active network connection
4. Click “Details”
5. Click “TCP/IP”
6. For nameservers click “DNS”

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<sup>6</sup> Pro, Enterprise, etc.

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### 5.3.4 Dotted Decimal Netmasks

Netmasks are sometimes shown using the same dotted decimal notation as the IP address to convert to the format required by cloud-init refer to the following table.

Dotted Decimal	Cloud-init <sup>7</sup>
255.0.0.0	/8
255.255.0.0	/16
255.255.255.0	/24
255.240.0.0	/12

This table is not exhaustive. It covers the most commonly used private subnets only.

### 5.3.5 Converting a Single IP Address To a Subnet

The previous steps will have provided an IP address and netmask for a single machine to convert to a standard notation refer to the table in 5.3.4 where a 0 is present in the “Dotted Decimal” column corresponding to your suffix replace the number in the same position in the IP address with a 0.

10.1.2.3/8 becomes 10.0.0.0/8

10.1.2.3/16 becomes 10.1.0.0/16

etc.

### 5.3.6 Sample Information

Subnet: 10.0.0.0/24

Gateway: 10.0.0.1

Nameserver: 10.0.0.1

DHCP range start: 10.0.0.2

DHCP range end: 10.0.0.99

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<sup>7</sup> CIDR

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## 5.4 Selecting An IP Address

The IP address **must**:

- Be in the identified subnet.
- Be unused.

The IP address **should**:

- Be outside the range used by your DHCP server if you have one.

The IP address **must not**:

- Be the first address in the subnet (e.g. 10.0.0.0). This address is used to identify the subnet.
- Be the last address in the subnet (e.g. 10.0.0.255). This address is used for broadcasts.
- Contain numbers higher than 255 or lower than 0.

Which numbers can be changed depends on the netmask:

Netmask	Changeable
/8	All number after the first “.”
/16	All number after the second “.”
/24	All number after the third “.”
/12	All number after the second “.” <sup>8</sup>

Continuing the example from 5.3.6 potential addresses include 10.0.0.132/24, 10.0.0.232/24, etc.

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<sup>8</sup> A slight simplification. The number between the first and second “.” can be varied between 0 and 31 inclusive.

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## 5.5 Putting It All Together

1. Write the OS image to your SD card. Raspberry Pi Image will likely eject the drives after verifying it so unplug and re plug the drive to get it to show up.
2. Open the boot partition.
3. Open network-config in your preferred text editor.<sup>9</sup> You should see something similar to the following:

```
network:  
  version: 2  
  ethernets:  
    eth0:  
      dhcp4: true  
      dhcp6: true  
      optional: true  
  wifis:  
    wlan0:  
      dhcp4: true  
      regulatory-domain: "GB"  
      access-points:  
        "MY_SSID":  
          password: "my encrypted wifi password"  
          optional: true
```

4. For each interface requiring a static IP address:

Change `dhcp4: true` to `dhcp4: false`

Immediately below that line add the following:

```
  addresses: [<desired IP address>]  
  routes:  
    - to: default  
      via: <your gateway's IP address>  
  nameservers:  
    addresses: [<your DNS server's address>]
```

Remember to preserve indentation.

---

<sup>9</sup> Command line Linux users may need to use `sudo` or they may be unable to write back to it.

- 
5. You should end up with something similar to the following:

```
network:
  version: 2
  ethernets:
    eth0:
      dhcp4: false
      addresses: [10.0.0.101/24]
      routes:
        - to: default
          via: 10.0.0.1
      nameservers:
        addresses: [10.0.0.1]
    dhcp6: true
    optional: true
  wifis:
    wlan0:
      dhcp4: false
      addresses: [10.0.0.102/24]
      routes:
        - to: default
          via: 10.0.0.1
      nameservers:
        addresses: [10.0.0.1]
    regulatory-domain: "GB"
    access-points:
      "MY_SSID":
        password: "my encrypted wifi password"
    optional: true
```

6. Save and close.

Note: if you did not use Raspberry Pi Imager to flash the SD card network-config will not have the above contents. Appropriate changes can still be made.

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## 6 Setting A Static IP Address After First Boot

While this is strictly outside the scope of this guide some limited information can be found below. Changes to `network-config` are not effective after the first boot. Changes made using the methods below will not be reflected in `network-config`.

### 6.1 nmtui

`nmtui` is Network Manager's menu driven configuration interface. It can be invoked by

```
sudo nmtui
```

### 6.2 nmcli

`nmcli` is Network Manager's command to interact with it directly and it can be used to modify existing connections. While a full discussion is out of scope for this guide a sample command for changing the static IP address follows:

```
sudo nmcli c modify netplan-eth0 ipv4.method manual ipv4.addresses  
10.0.0.103/24 ipv4.gateway 10.0.0.1 ipv4.dns 10.0.0.10
```

Change connection name (“`netplan-eth0`”) and all IP addresses as required.

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## 7 Hints and Tips

- If when connecting your SD card you are prompted to format a partition **do not** do so. This usually means the running OS does not understand ext4 (used for the root partition) and allowing a reformat will erase its contents.
- The allowed private subnets are 10.0.0.0/8, 172.16.0.0/12, and 192.168.0.0/16. Addresses outside these are either reserved for a specific use or globally routable and should not be used.
- If your network does not have a gateway don't include settings for one.<sup>10</sup>
- If your network does not have a nameserver/DNS server don't include settings for one.<sup>11</sup>
- If you use only a nameserver that is outside your network you Pi will not be able to connect to other machines on your network using their hostname.
- IP addresses are tied to a network interface not to a device. If your Pi has more than one active interface they must each have their own.
- Setting a static IP address for each network interface is not required. Interfaces can be left as DHCP or not configured at all if so desired.

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<sup>10</sup> e.g. a point to point link between two Pi

<sup>11</sup> e.g. a point to point link between two Pi

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## 8 Glossary

CIDR	<b>Classless Inter-Domain Routing.</b> One way of allocating and writing IP addresses. Consists of the IP address in dotted decimal format followed by / followed by the number of bits that specify the network.
DHCP	<b>Dynamic Host Configuration Protocol.</b> Used to dynamically allows IP addresses to device on a network on request.
DHCP Server	Device running the server for DHCP
DNS	<b>Domain Name System.</b> Use to convert a hostname to an IP address.
DNS Server/Nameserver	Device running the server for DNS
Dotted decimal	Human readable way of writing an IP address or netmask. Splits the 32 bit value into 8 bit chunks each separated by a “.” e.g. 10.0.0.1
IP address/IPv4 Address	32 bit numeric address assigned to a network interface. Usually written as a dotted decimal e.g. 10.0.0.1
IPv4	Version 4 of the IP protocol.
IPv6	Version 6 of the IP protocol Introduced to address shortcomings of IPv4
Netmask	Bit mask indicating which bits of the IP address represent the network and which the individual device. Usually written using dotted decimal (255.255.255.0) or as a /n suffix to the IP address (10.0.0.1/24)
Subnet	Combination of IP address and netmask that specifies a sub division of the entire IP network.