

Ubuntu Linux 22.04 LTS Installation

Lenovo ThinkStation PX, P8, P7, P5



Table of Contents

Overview	3
Section 1 – BIOS Setup	4
Section 2 – Ubuntu 22.04 Installation.....	8
Section 3 – Install Device Drivers.....	16
Section 4 – Install Nvidia Proprietary Drivers	17
Revision History	24



Overview

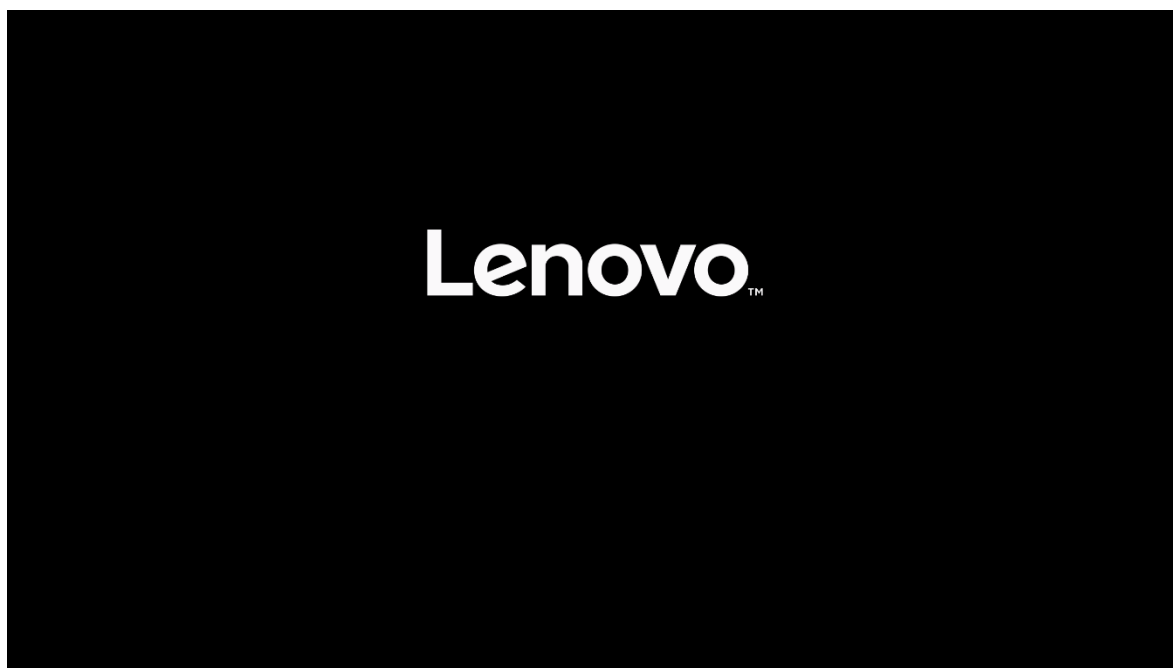
The purpose of this document is to provide high-level guidance for users to adequately install an Ubuntu Linux 22.04 LTS operating system on the ThinkStation PX, P8, P7, and P5 platforms.

Section 1 – BIOS Setup

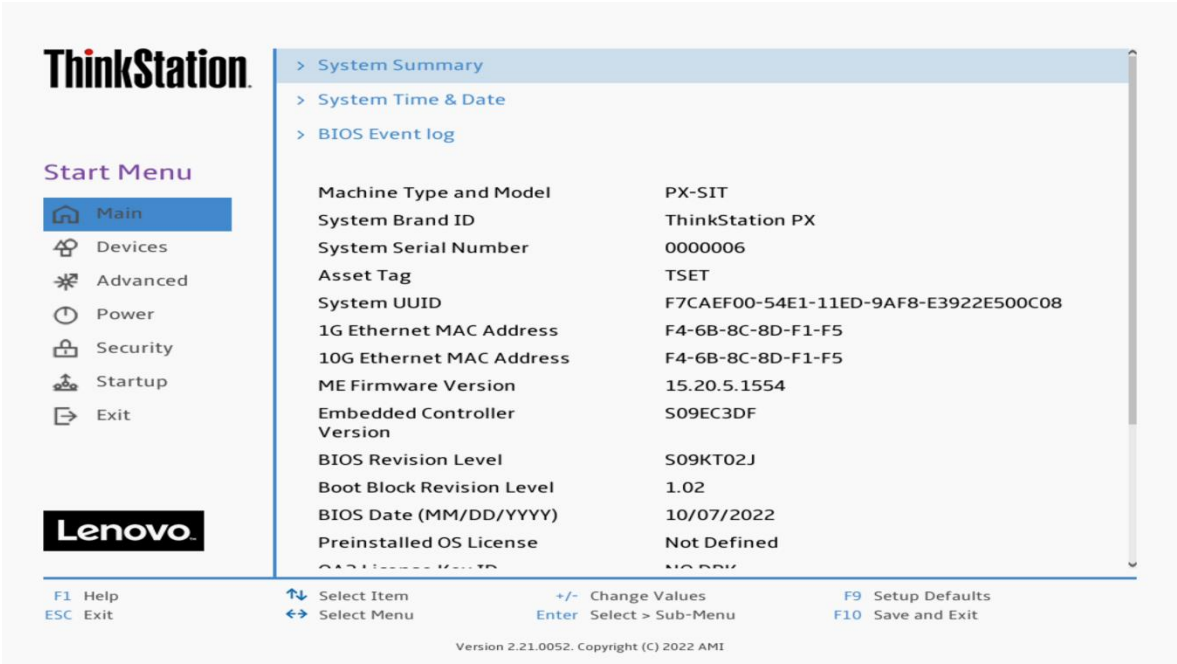
Prior to installing any operating system, it is important to make sure BIOS recognizes the storage devices appropriately.

Here are some key items to look for within BIOS setup.

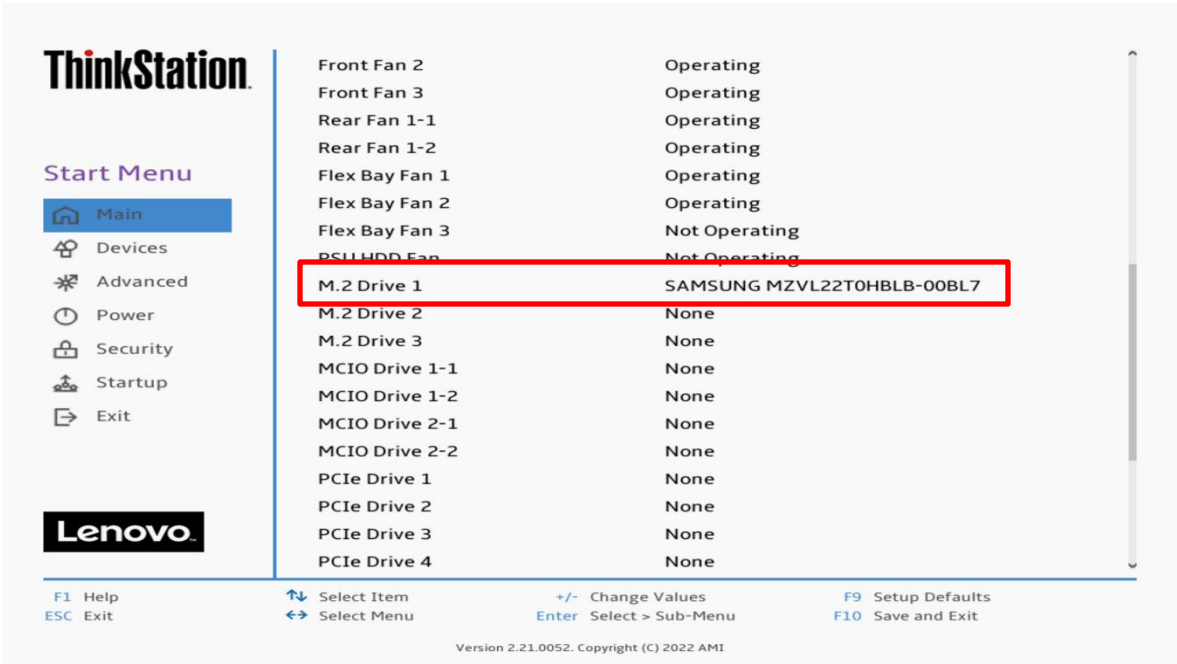
At the Lenovo splash screen, press the function key F1 to enter BIOS setup.



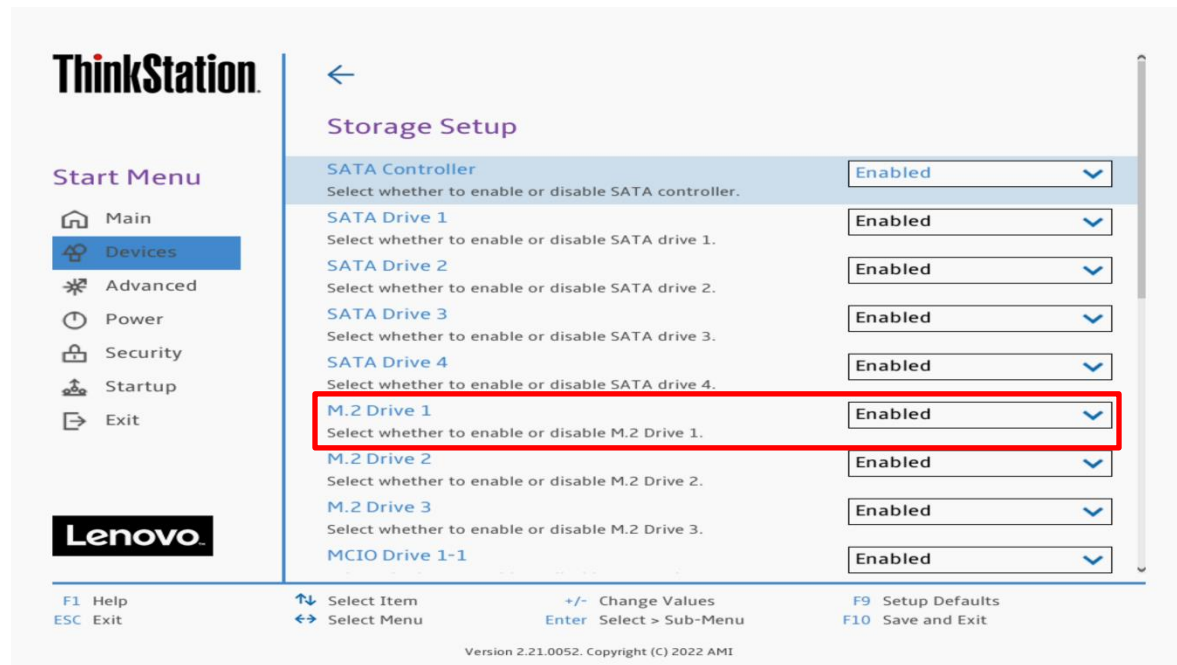
Select 'System Summary' from the main BIOS setup page.



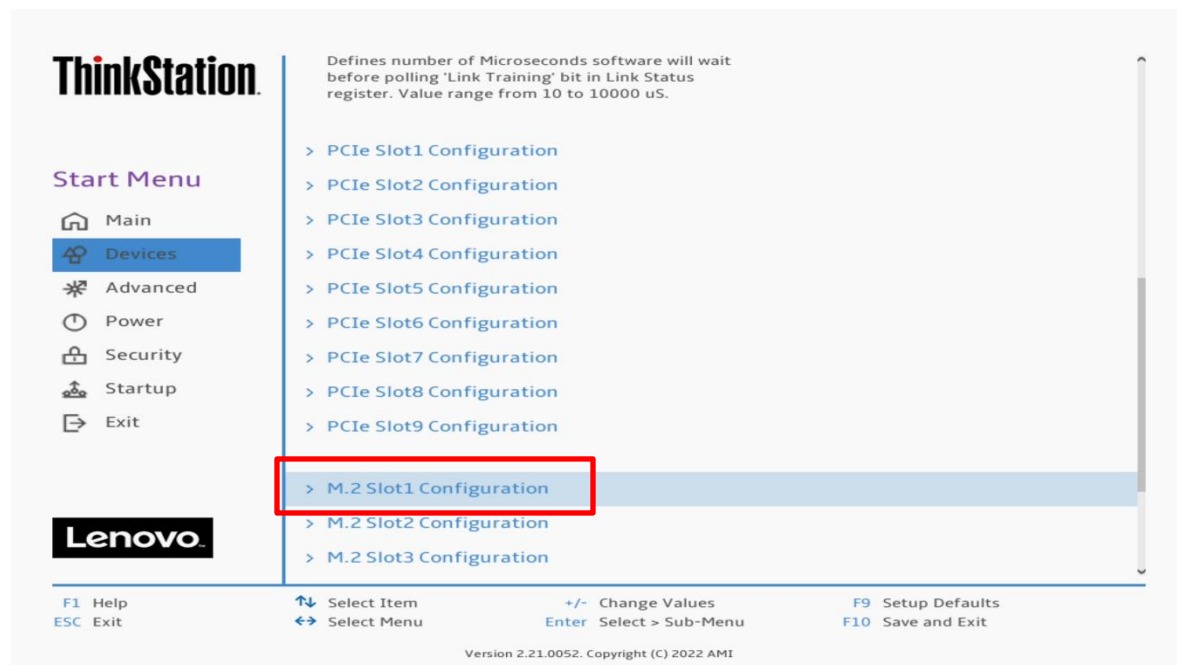
Scroll down through the list until you see the type of drive(s) you are intending to use. Note, drives may not show up here if drives are part of a RAID array.



Select 'Devices' -> 'Storage Setup' to make sure the drive is enabled.



For PCIe drives, select 'Devices' -> 'PCI Express Setup' and select the slot for where the drive is physically installed. In this example, the M.2 drive is installed in Slot 1.



Make sure the drive is linking properly.



The screenshot shows the BIOS configuration for M.2 Slot1. The 'Link Speed' dropdown is set to 'Auto'. A red box highlights the following status information:

PCIe Port Link Status	Linked as x4
PCIe Port Link Max	Max Width x4
PCIe Port Link Speed	Gen 4 (16.0 GT/s)

Navigation keys at the bottom: F1 Help, ESC Exit, Select Item, Select Menu, Change Values, Enter Select > Sub-Menu, F9 Setup Defaults, F10 Save and Exit. Version 2.21.0052. Copyright (C) 2022 AMI.

Here's an example of BIOS not recognizing a PCIe drive.

The screenshot shows the BIOS configuration for M.2 Slot2. The 'Link Speed' dropdown is set to 'Auto'. A red box highlights the following status information:

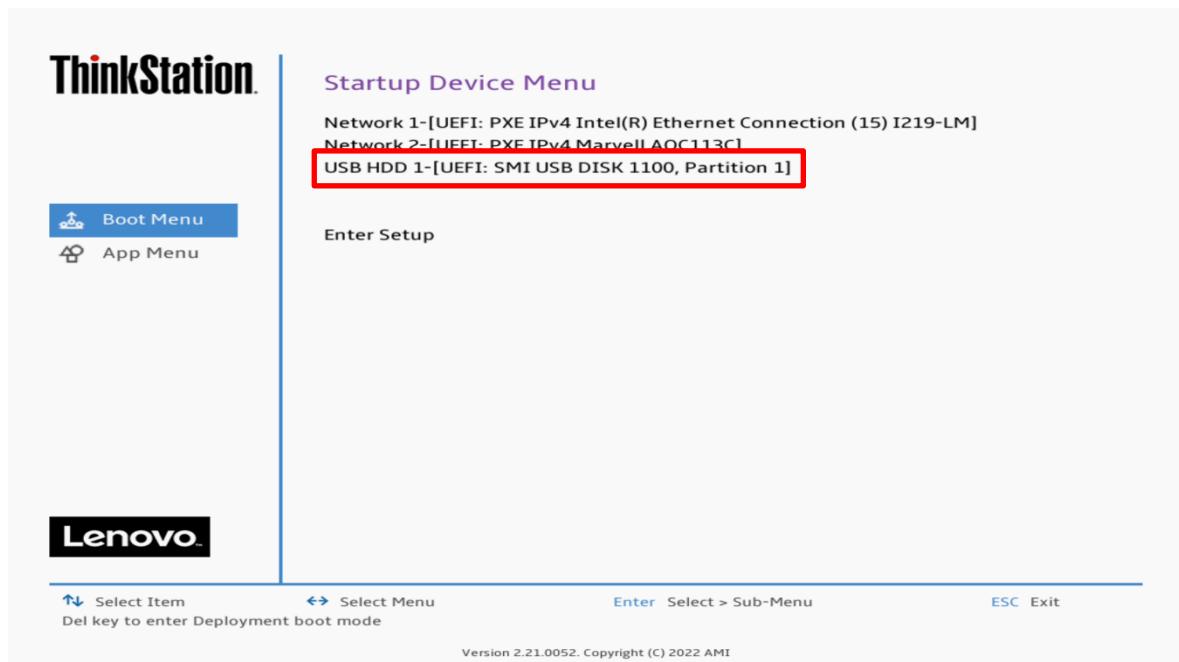
PCIe Port Link Status	Link Did Not Train
PCIe Port Link Max	Max Width x4
PCIe Port Link Speed	Link Did Not Train

Navigation keys at the bottom: F1 Help, ESC Exit, Select Item, Select Menu, Change Values, Enter Select > Sub-Menu, F9 Setup Defaults, F10 Save and Exit. Version 2.21.0052. Copyright (C) 2022 AMI.

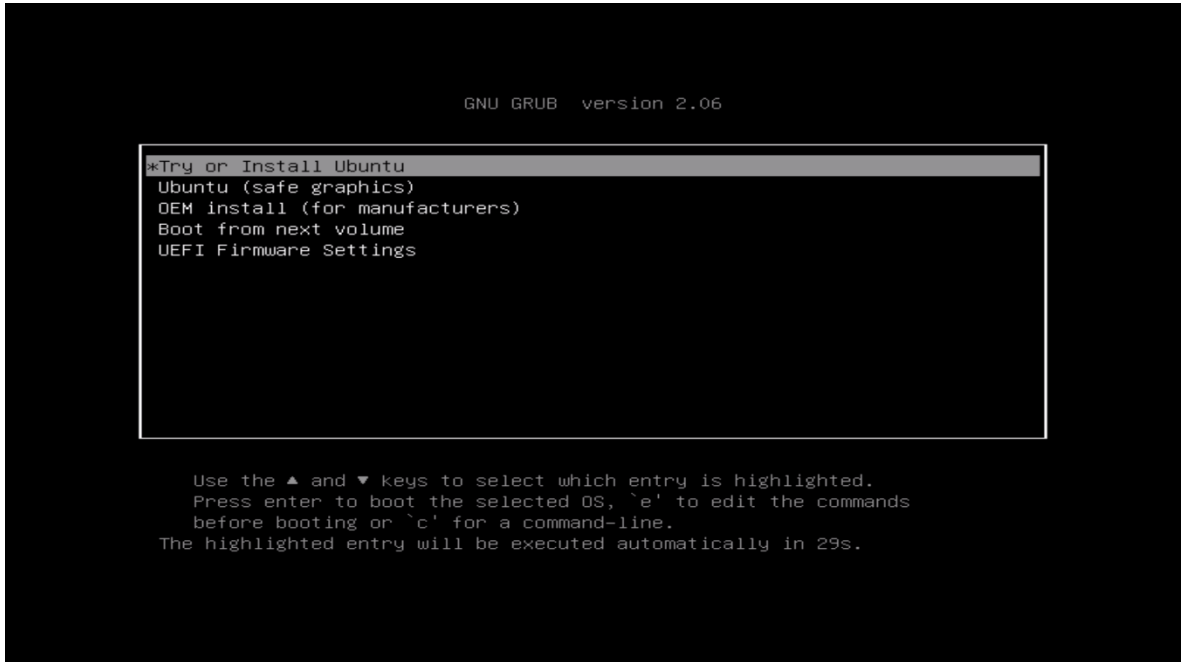
Section 2 – Ubuntu 22.04 Installation

Here are some step-by-step instructions on how to get an Ubuntu Linux 22.04 LTS operating system installed on the ThinkStation PX, P8, P7, and P5 systems.

1. Obtain a copy of the Ubuntu 22.04 installation media. It is recommended to extract the Ubuntu 22.04 iso media to a USB.
2. Insert the USB memory key into one of the USB ports on the system and power on the system.
3. At the Lenovo splash screen, press the function F12 key to enter the BIOS startup menu and select the USB installation media from the list.



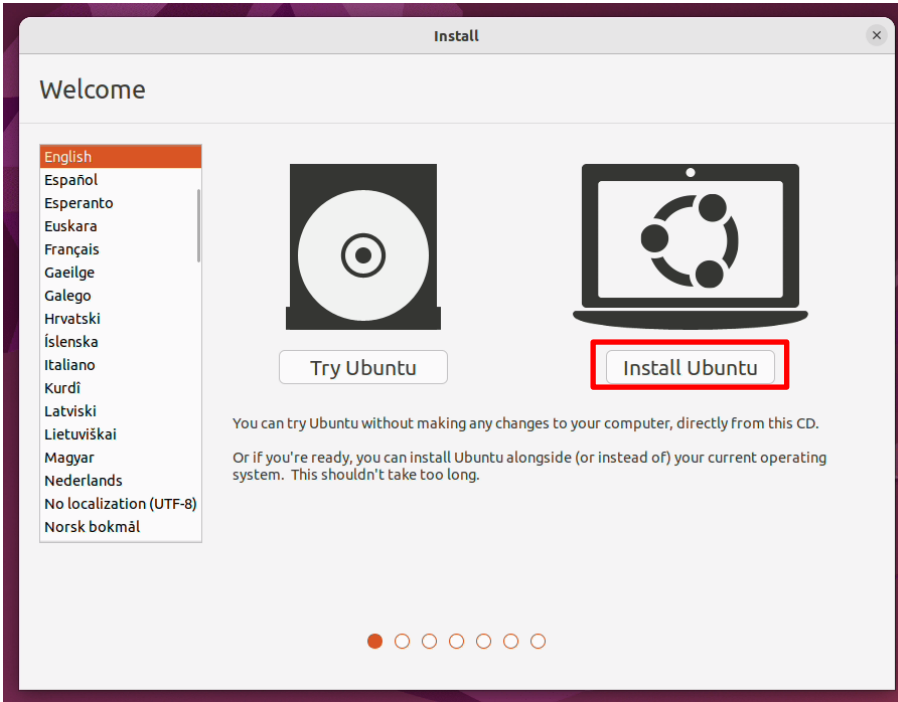
4. Select the 'Try or Install Ubuntu' option from the GRUB boot menu and press 'Enter'.



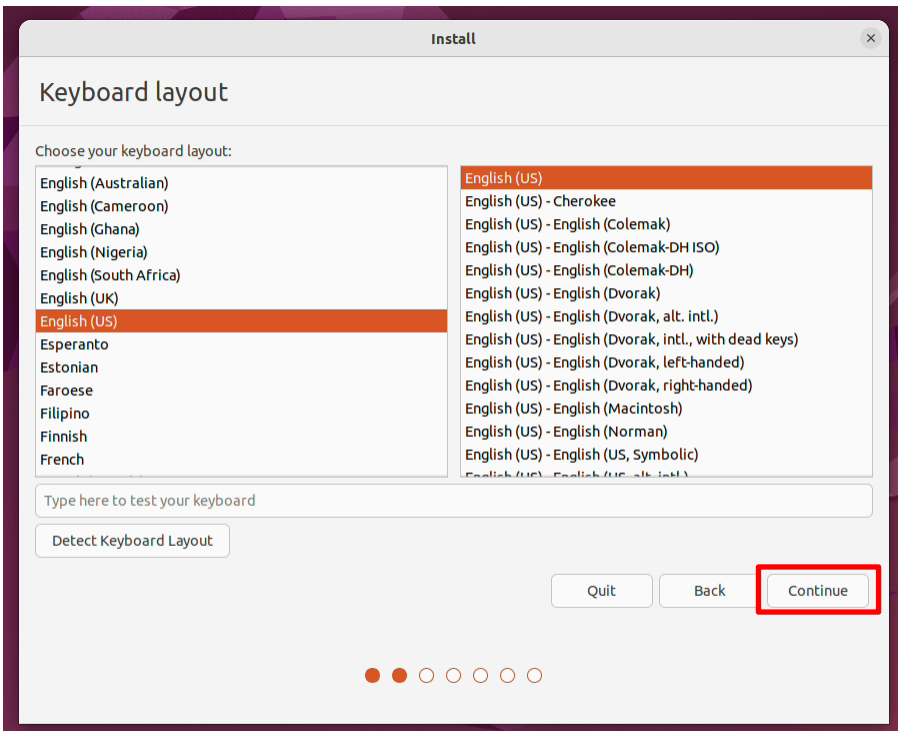
5. The Ubuntu installation media will begin to load.



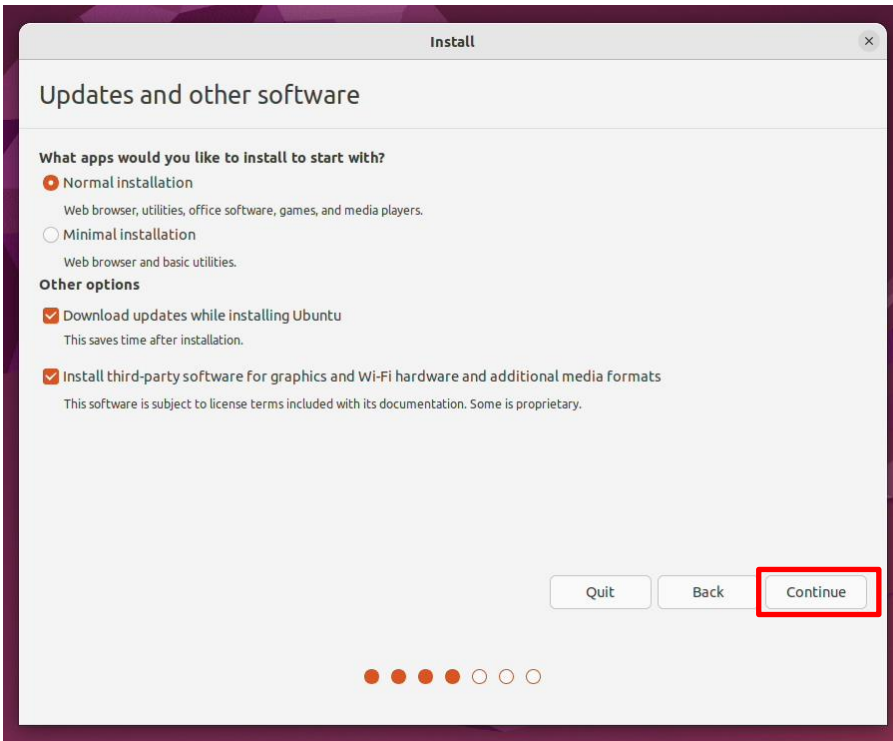
- The Ubuntu Linux Welcome screen should eventually appear. Select the appropriate language and select 'Install Ubuntu'.



- Select the appropriate keyboard layout and 'Continue'.



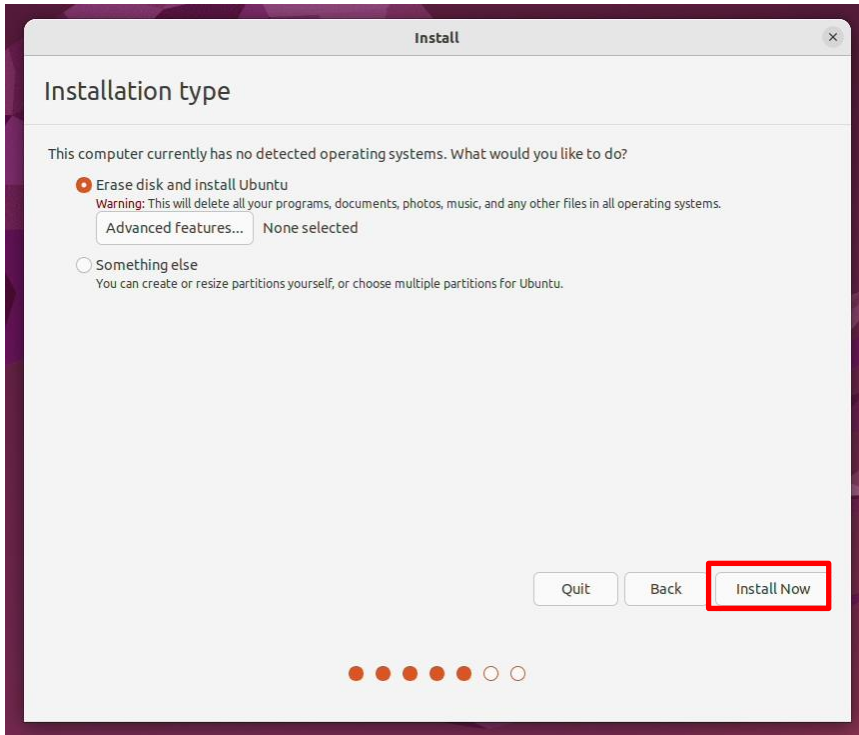
8. Select the type of installation and 'Continue'.
Note, if there is a valid internet connection on the system, the 'Other options' will be selectable.



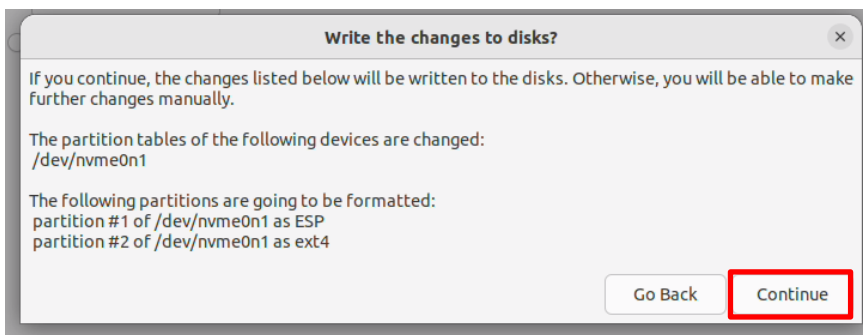
9. Select 'Erase disk and install Ubuntu' to automatically create the filesystem partitions and 'Continue'.

To manually create filesystem partitions, select 'Something else'.

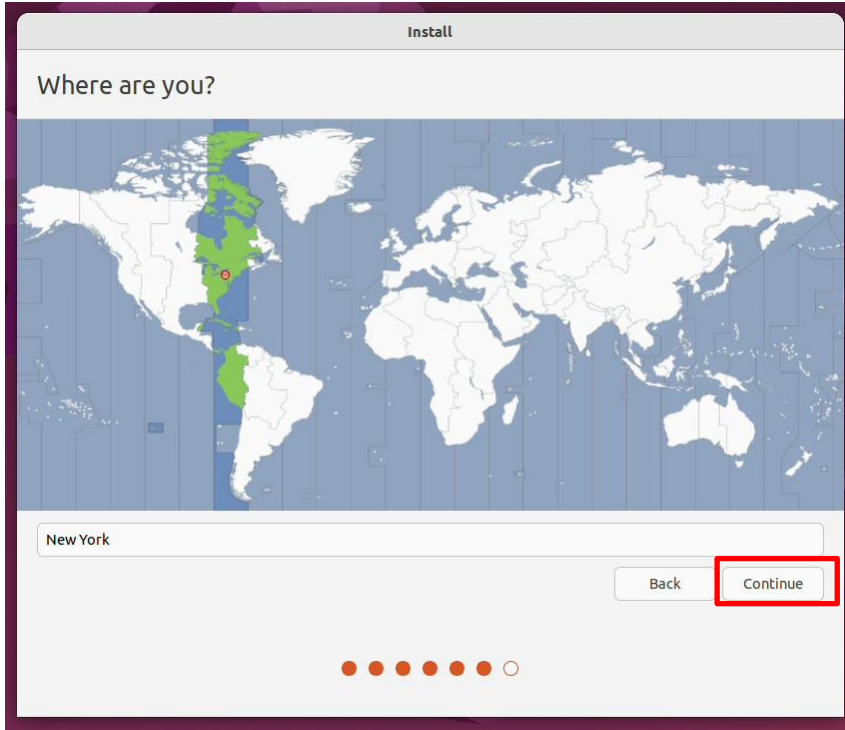
In this document, 'Erase disk and install Ubuntu' has been selected.



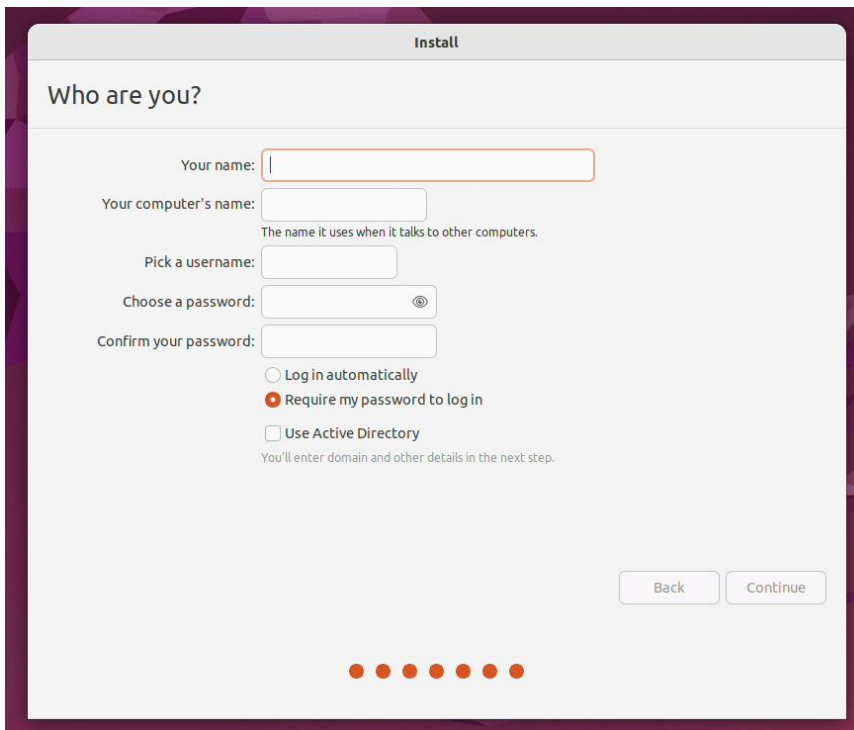
10. Select 'Continue' to confirm writing changes to the disk.



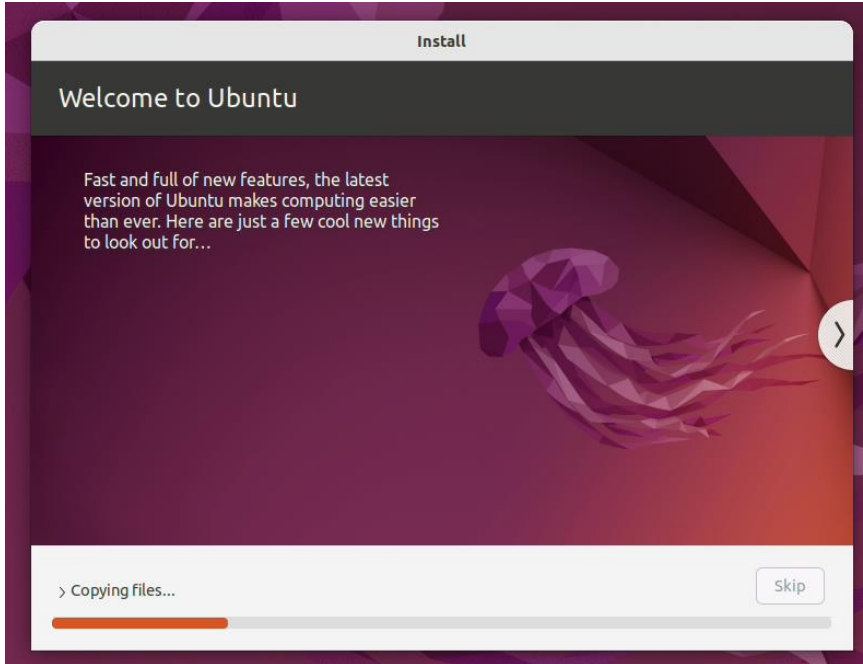
11. Select the appropriate geographical location and 'Continue'.



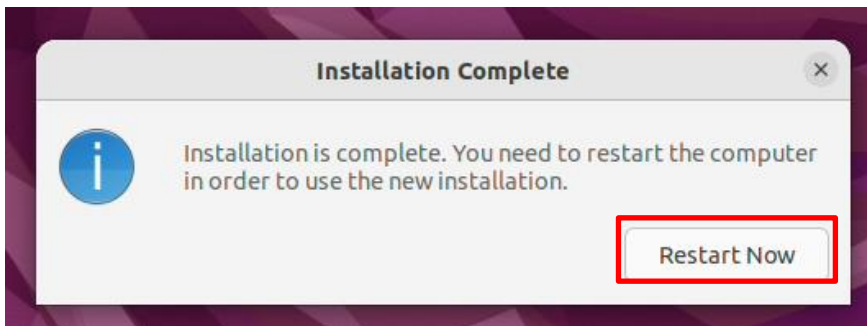
12. Fill in the appropriate boxes below and select 'Continue'.



13. Let the system finish the installation.



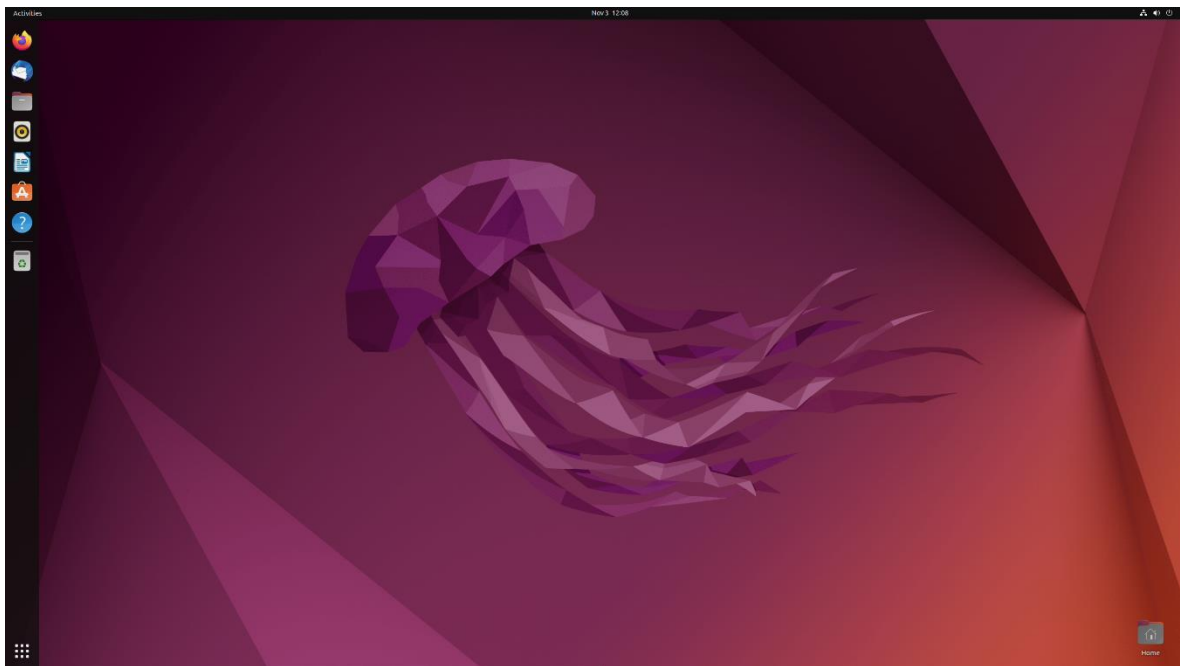
14. Once the installation completes, select 'Reboot Now'.



15. Remove the installation media (USB/DVD) and press 'Enter'.



16. Ubuntu 22.04 LTS Desktop screen.



Section 3 – Install Device Drivers

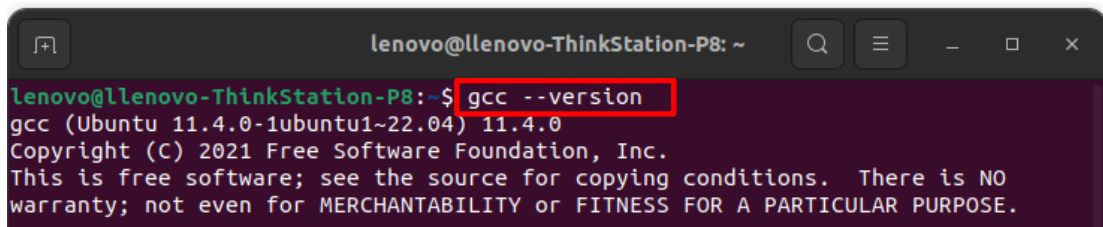
Most of the standard building blocks used in the ThinkStation PX, P8, P7, and P5 platforms are native to the Ubuntu Linux 22.04 LTS base kernel. It may be worth installing a proprietary graphics driver to get optimal performance from the graphics card. The next couple of sections provide some step-by-step instructions on how to install a proprietary Nvidia graphics driver in Ubuntu Linux.

Section 4 – Install Nvidia Proprietary Drivers

Newer versions of Nvidia driver require to have GCC version 12. Here are steps how to update the GCC version:

1. Check current GCC version.

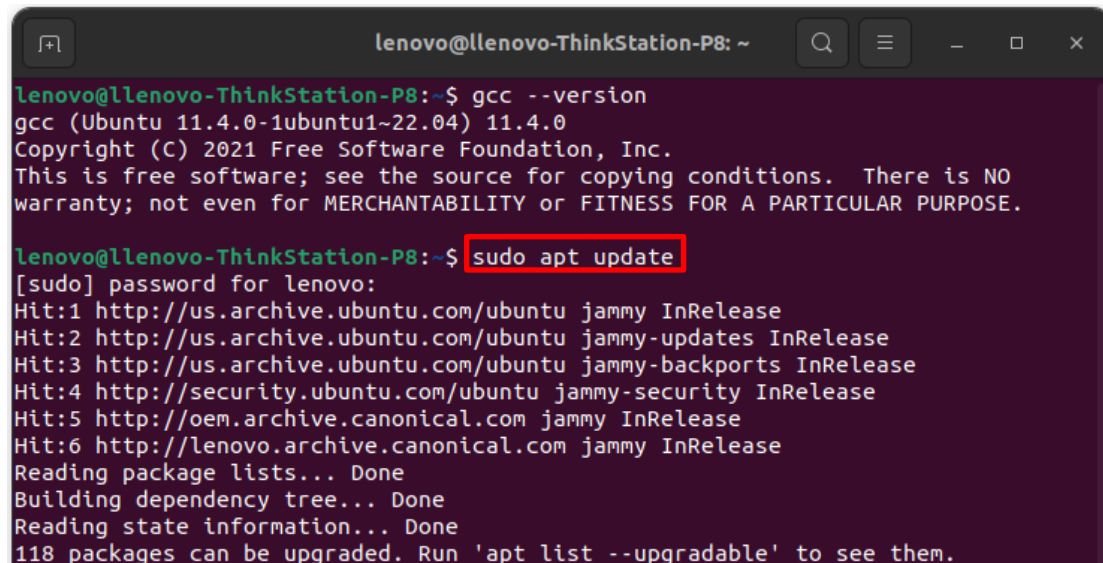
```
#gcc --version
```



```
lenovo@l1lenovo-ThinkStation-P8: ~  
lenovo@l1lenovo-ThinkStation-P8:~$ gcc --version  
gcc (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0  
Copyright (C) 2021 Free Software Foundation, Inc.  
This is free software; see the source for copying conditions. There is NO  
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
```

2. Update the repository information.

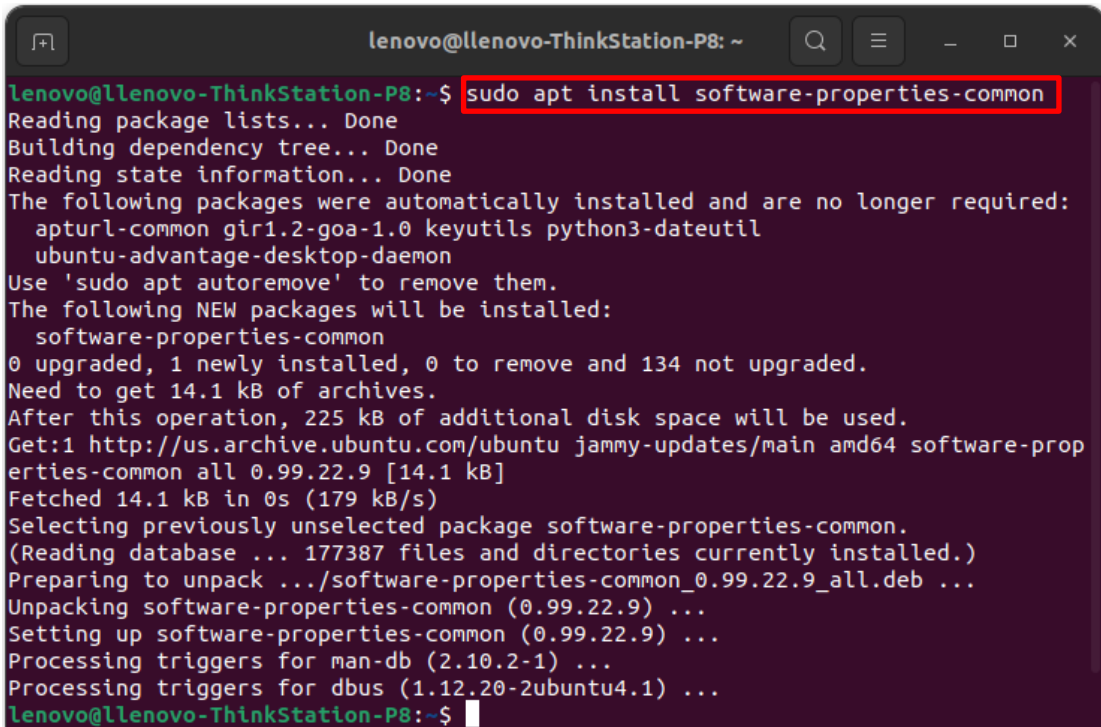
```
#sudo apt update
```



```
lenovo@l1lenovo-ThinkStation-P8: ~  
lenovo@l1lenovo-ThinkStation-P8:~$ gcc --version  
gcc (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0  
Copyright (C) 2021 Free Software Foundation, Inc.  
This is free software; see the source for copying conditions. There is NO  
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  
  
lenovo@l1lenovo-ThinkStation-P8:~$ sudo apt update  
[sudo] password for lenovo:  
Hit:1 http://us.archive.ubuntu.com/ubuntu jammy InRelease  
Hit:2 http://us.archive.ubuntu.com/ubuntu jammy-updates InRelease  
Hit:3 http://us.archive.ubuntu.com/ubuntu jammy-backports InRelease  
Hit:4 http://security.ubuntu.com/ubuntu jammy-security InRelease  
Hit:5 http://oem.archive.canonical.com jammy InRelease  
Hit:6 http://lenovo.archive.canonical.com jammy InRelease  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
118 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

3. Install the software Properties Common Package.

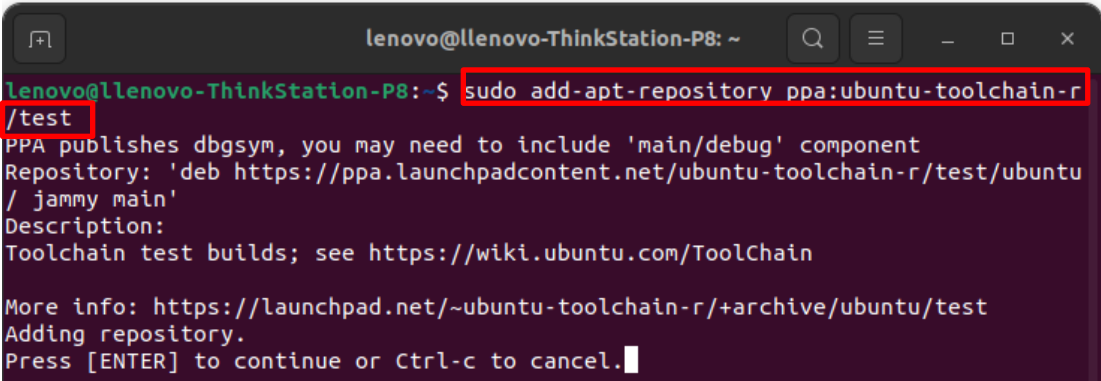
```
#sudo apt install software-properties-common
```



```
lenovo@l1lenovo-ThinkStation-P8: ~  
lenovo@l1lenovo-ThinkStation-P8:~$ sudo apt install software-properties-common  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following packages were automatically installed and are no longer required:  
  apturl-common gir1.2-goa-1.0 keyutils python3-dateutil  
  ubuntu-advantage-desktop-daemon  
Use 'sudo apt autoremove' to remove them.  
The following NEW packages will be installed:  
  software-properties-common  
0 upgraded, 1 newly installed, 0 to remove and 134 not upgraded.  
Need to get 14.1 kB of archives.  
After this operation, 225 kB of additional disk space will be used.  
Get:1 http://us.archive.ubuntu.com/ubuntu jammy-updates/main amd64 software-prop  
erties-common all 0.99.22.9 [14.1 kB]  
Fetched 14.1 kB in 0s (179 kB/s)  
Selecting previously unselected package software-properties-common.  
(Reading database ... 177387 files and directories currently installed.)  
Preparing to unpack ../software-properties-common_0.99.22.9_all.deb ...  
Unpacking software-properties-common (0.99.22.9) ...  
Setting up software-properties-common (0.99.22.9) ...  
Processing triggers for man-db (2.10.2-1) ...  
Processing triggers for dbus (1.12.20-2ubuntu4.1) ...  
lenovo@l1lenovo-ThinkStation-P8:~$
```

4. Add the GCC Repository.

```
#sudo add-apt-repository ppa:ubuntu-toolchain-r/test
```



```
lenovo@l1lenovo-ThinkStation-P8: ~  
lenovo@l1lenovo-ThinkStation-P8:~$ sudo add-apt-repository ppa:ubuntu-toolchain-r  
/test  
PPA publishes dbgsym, you may need to include 'main/debug' component  
Repository: 'deb https://ppa.launchpadcontent.net/ubuntu-toolchain-r/test/ubuntu  
/ jammy main'  
Description:  
Toolchain test builds; see https://wiki.ubuntu.com/ToolChain  
  
More info: https://launchpad.net/~ubuntu-toolchain-r/+archive/ubuntu/test  
Adding repository.  
Press [ENTER] to continue or Ctrl-c to cancel.
```

- 5. Install the desired GCC version.

```
#sudo apt install gcc-12 g++-12
```

```
lenovo@l1lenovo-ThinkStation-P8: ~  
lenovo@l1lenovo-ThinkStation-P8:~$ sudo apt install gcc-12 g++-12  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
gcc-12 is already the newest version (12.3.0-1ubuntu1~22.04).  
gcc-12 set to manually installed.  
The following package was automatically installed and is no longer required:  
  keyutils  
Use 'sudo apt autoremove' to remove it.  
Suggested packages:  
  g++-12-multilib gcc-12-doc libstdc++-12-doc  
The following NEW packages will be installed:  
  g++-12 libstdc++-12-dev  
0 upgraded, 2 newly installed, 0 to remove and 129 not upgraded.  
Need to get 14.4 MB of archives.  
After this operation, 58.2 MB of additional disk space will be used.  
Get:1 http://us.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 libstdc++-12-dev amd64 12.3.0-1ubuntu1~22.04 [2,192 kB]  
Get:2 http://us.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 g++-12 amd64 12.3.0-1ubuntu1~22.04 [12.2 MB]  
Fetched 14.4 MB in 7s (2,066 kB/s)  
Selecting previously unselected package libstdc++-12-dev:amd64.  
(Reading database ... 176622 files and directories currently installed.)  
Preparing to unpack .../libstdc++-12-dev_12.3.0-1ubuntu1~22.04_amd64.deb ...
```

- 6. Configure the default GCC version.

```
#sudo update-alternatives --install /usr/bin/gcc gcc /usr/bin/gcc-12 100 --  
slave /usr/bin/g++ g++ /usr/bin/g++-12
```

```
lenovo@l1lenovo-ThinkStation-P8:~$ sudo update-alternatives --install /usr/bin/gcc gcc /usr/bin/gcc-12 100 --slave /usr/bin/g++ g++ /usr/bin/g++-12  
update-alternatives: using /usr/bin/gcc-12 to provide /usr/bin/gcc (gcc) in auto mode
```

- 7. Verify updated version GCC.

```
#gcc --version
```

```
lenovo@l1lenovo-ThinkStation-P8:~$ gcc --version  
gcc (Ubuntu 12.3.0-1ubuntu1~22.04) 12.3.0  
Copyright (C) 2022 Free Software Foundation, Inc.  
This is free software; see the source for copying conditions. There is NO  
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  
lenovo@l1lenovo-ThinkStation-P8:~$
```

Here are some step-by-step instructions on how to install Nvidia proprietary drivers.

1. Download the appropriate Nvidia graphics driver.
2. Blacklist the Linux Nouveau driver.

```
# nano /etc/modprobe.d/blacklist.conf
```

- Add the following line, 'blacklist nouveau', and save and exit the file.

```
GNU nano 5.6.1
blacklist nouveau_
```

3. Update the initramfs file and reboot the system.

```
# update-initramfs -u
```

```
# reboot now
```

```
root@lenovo-ThinkStation-PX:/home/lenovo# update-initramfs -u
update-initramfs: Generating /boot/initrd.img-5.15.0-52-generic
root@lenovo-ThinkStation-PX:/home/lenovo# _
```

4. Once the system reboots to the Linux desktop screen, run the following command as superuser from a terminal window to exit X-windows.

```
# init 3
```

5. Login as root (superuser).

```
Ubuntu 22.04.1 LTS lenovo-ThinkStation-PX tty1
lenovo-ThinkStation-PX login: _
```

6. Browse to the directory to where the Nvidia driver installation file is located and run the following command. *In this example, it is on the Linux desktop.*

bash NVIDIA*

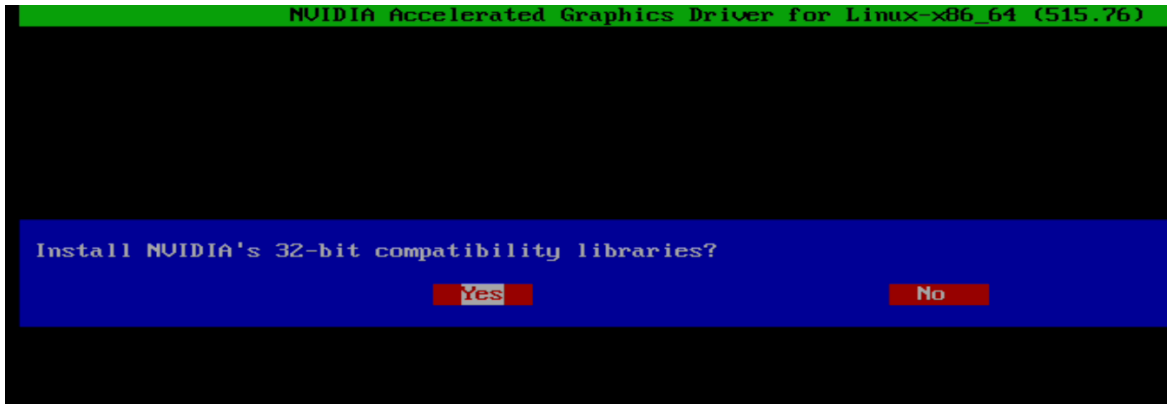
```
[root@localhost ~]# cd /home/lenovo/Desktop/
[root@localhost Desktop]# ls
NVIDIA-Linux-x86_64-515.76.run
[root@localhost Desktop]# bash NVIDIA-Linux-x86_64-515.76.run _
```

7. Note the driver should start to install.

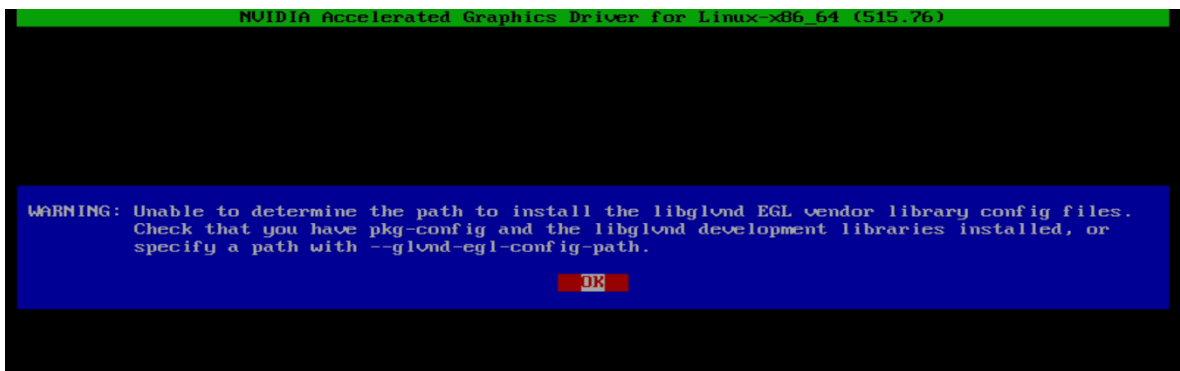
```
NVIDIA Accelerated Graphics Driver for Linux-x86_64 (515.76)

Building kernel modules
100%
```

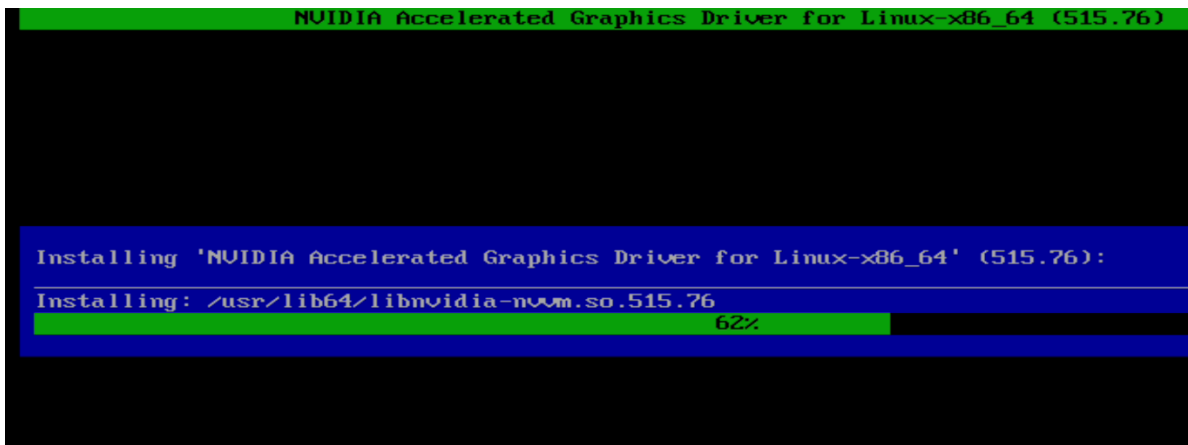
- The driver will ask whether to install NVIDIA's 32-bit compatibility libraries. *In this example, 'yes' was selected.*



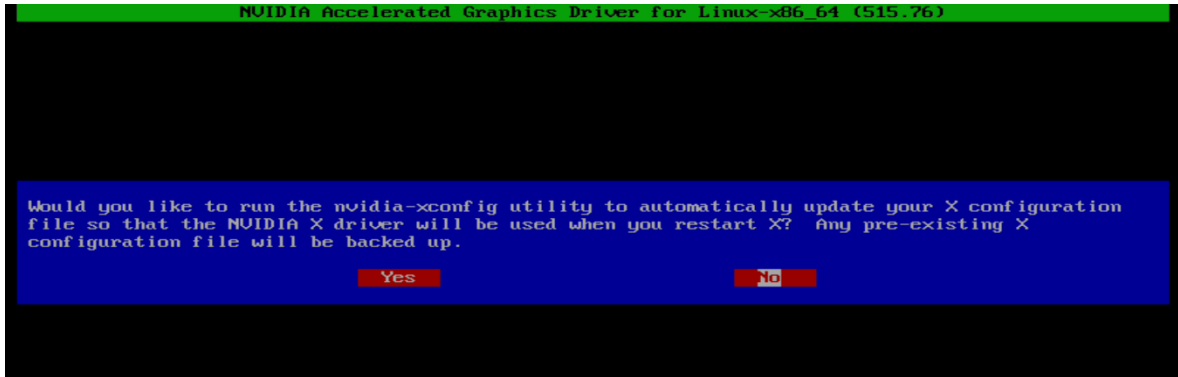
- Select 'OK' on the following warning message.



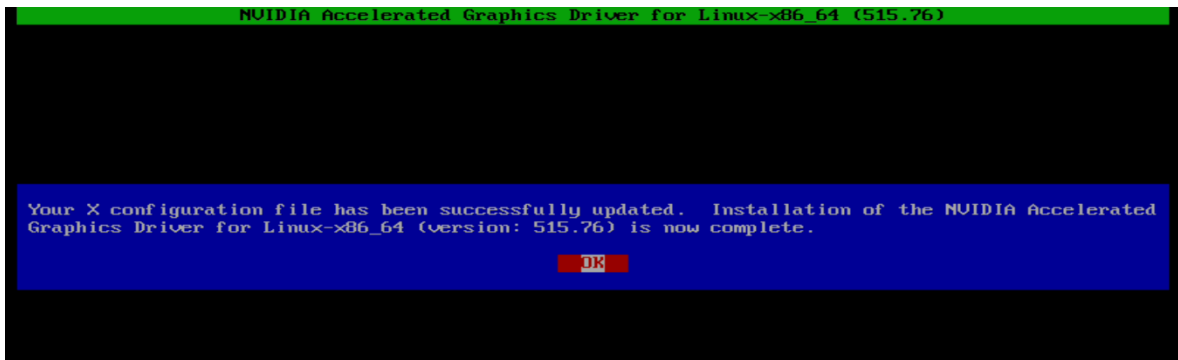
- The driver should continue to install.



11. Select 'Yes' to update the x-configuration file.

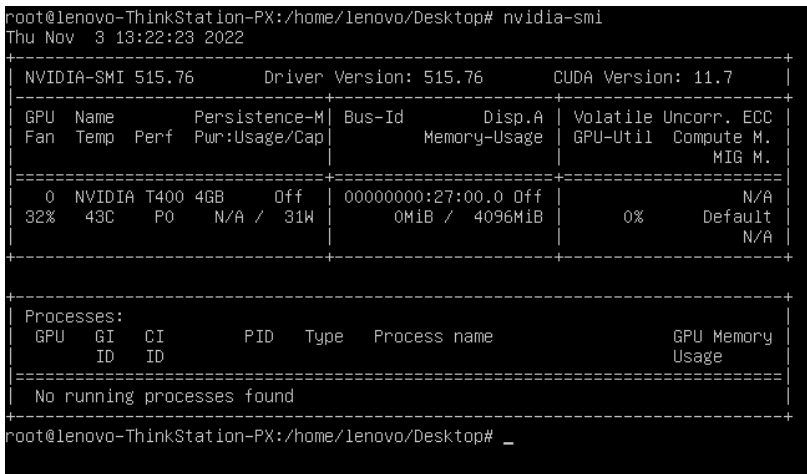


12. Select 'OK' to acknowledge that the x-configuration file has successfully been updated.



13. Run the following command to verify the Nvidia driver has been installed and loaded properly.

nvidia-smi



Revision History

Version	Date	Author	Changes/Updates
1.2	3/18/2024	A Pantelev	Updated Section 4
1.1	12/12/2023	A Pantelev	Added support for P8
1.0	4/19/2023	J Moebs	Initial launch release.