Ubuntu Linux 22.04 LTS Installation

Lenovo ThinkStation PX, P8, P7, P5



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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 <u>not</u> show up here if drives are part of a RAID array.

'hink@tatia	n Front Fon 2	Operating	
IIIIIK9IQIIO	Front Fan 3	Operating	
	Rear Fan 1-1	Operating	
	Rear Fan 1-2	Operating	
tart Menu	Flex Bay Fan 1	Operating	
○ Main	Flex Bay Fan 2	Operating	
	Flex Bay Fan 3	Not Operatin	g
Devices	PSU HDD Fan	Not Operatio	g
R Advanced	M.2 Drive 1	SAMSUNG M	ZVL22T0HBLB-00BL7
D Power	M.2 Drive 2	None	
A Security	M.2 Drive 3	None	
Startup	MCIO Drive 1-1	None	
	MCIO Drive 1-2	None	
→ Exit	MCIO Drive 2-1	None	
	MCIO Drive 2-2	None	
	PCIe Drive 1	None	
	PCIe Drive 2	None	
Lenovo	PCIe Drive 3	None	
	PCIe Drive 4	None	
1 Help	↑↓ Select Item	+/- Change Values	F9 Setup Defaults
SC Exit	←→ Select Menu	Enter Select > Sub-Menu	F10 Save and Exit

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

ThinkStation	+	
	Storage Setup	
Start Menu	SATA Controller Select whether to enable or disable SATA controller.	Enabled 🗸
Main	SATA Drive 1 Select whether to enable or disable SATA drive 1.	Enabled 🗸
* Advanced	SATA Drive 2 Select whether to enable or disable SATA drive 2.	Enabled 🗸
Power	SATA Drive 3 Select whether to enable or disable SATA drive 3.	Enabled 🗸
🕂 Security	SATA Drive 4 Select whether to enable or disable SATA drive 4.	Enabled 🗸
Exit	M.2 Drive 1 Select whether to enable or disable M.2 Drive 1.	Enabled 🗸
	M.2 Drive 2 Select whether to enable or disable M.2 Drive 2.	Enabled 🗸
Lenovo	M.2 Drive 3 Select whether to enable or disable M.2 Drive 3.	Enabled 🗸
Lenovo.	MCIO Drive 1-1	Enabled 🗸
F1 Help ESC Exit	↑↓ Select Item +/- Change Values ← Select Menu Enter Select > Sub-Menu	F9 Setup Defaults F10 Save and Exit

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.

ThinkStation	÷			
	M.2 Slot1 Con	figuration		
Start Menu	Link Speed		Auto	~
Main Pevices Advanced	PCIe Port Link Statu PCIe Port Link Max PCIe Port Link Spee	us ed	Linked as x4 Max Width x4 Gen 4 (16.0 GT/s)]
Power Security				-
Exit				
Lenovo				
F1 Help ESC Exit	 ↑↓ Select Item ←> Select Menu 	+/- Change Values Enter Select > Sub-Menu	F9 Setup Defaults F10 Save and Exit	

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



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.

Boot Menu 관 App Menu	Startup Device Network 1-[UEFI: PXE Network 2-[UEFI: PXE USB HDD 1-[UEFI: SM Enter Setup	Menu E IPv4 Intel(R) Ethernet Connection (15) I2 E IPv4 Marvell AOC 113C] II USB DISK 1100, Partition 1]	19-LM]
Lenovo			
♣ Select Item Del key to enter Deploymen	←→ Select Menu it boot mode	Enter Select > Sub-Menu	ESC Exit

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

GNU GRUB version 2.06	
∗Try or Install Ubuntu	
Ubuntu (safe graphics)	
OEM install (for manufacturers)	
UEEI Eirmuare Settings	
Use the ▲ and ▼ keys to select which entry is highlighted.	
before booting or `c' for a command-line.	
The highlighted entry will be executed automatically in 29s.	

5. The Ubuntu installation media will begin to load.

Lenovo	
c	
😅 Ubuntu	

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

	Install	×
Welcome		
English Español Esperanto Euskara Français Gaeilge Galego Hrvatski Íslenska Italiano Kurdî Latviski Lietuviškai Magyar Nederlands No localization (UTF-8) Norsk bokmål	Try Ubuntu Install Ubuntu You can try Ubuntu without making any changes to your computer, directly from this CD. Or if you're ready, you can install Ubuntu alongside (or instead of) your current operating system. This shouldn't take too long.	

7. Select the appropriate keyboard layout and 'Continue'.

Ins	stall	×
Keyboard layout		
Choose your keyboard layout:		
English (Australian) English (Cameroon) English (Ghana) English (South Africa) English (South Africa) English (UK) English (US) Esperanto Estonian Faroese Filipino Finnish French	English (US) English (US) - Cherokee English (US) - English (Colemak) English (US) - English (Colemak-DH ISO) English (US) - English (Colemak-DH) English (US) - English (Dvorak, alt. intl.) English (US) - English (Dvorak, intl., with dead keys) English (US) - English (Dvorak, intl., with dead keys) English (US) - English (Dvorak, intl., handed) English (US) - English (Dvorak, left-handed) English (US) - English (Macintosh) English (US) - English (Norman) English (US) - English (VG, Symbolic) English (US) - English (US, Symbolic)	
Type here to test your keyboard		
Detect Keyboard Layout		2

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.

Install	×
Updates and other software	
What apps would you like to install to start with? Normal installation Web browser, utilities, office software, games, and media players. Minimal installation Web browser and basic utilities. Other options	
Download updates while installing Ubuntu This saves time after installation.	
Install third-party software for graphics and Wi-Fi hardware and additional media formats. This software is subject to license terms included with its documentation. Some is proprietary.	
Quit Back Continu	•
$\bullet \bullet \bullet \bullet \circ \circ \circ$	

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.

Install	×
Installation type	
This computer currently has no detected operating systems. What would you like to do? C Erase disk and install Ubuntu Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems. Advanced features None selected	
 Something else You can create or resize partitions yourself, or choose multiple partitions for Ubuntu. 	
Quit Back Install	Now

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



- <section-header>
- 11. Select the appropriate geographical location and 'Continue'.

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

Who are you? Your name: [Your computer's name:] The Pick a username:] Choose a password:] Confirm your password:]	name it uses when it talks to	o other computers.		
Your name: Your computer's name: The Pick a username: Choose a password: Confirm your password:	e name it uses when it talks to	o other computers.		
You	Cog in automatically Require my password t Use Active Directory Utenter domain and other d	to log in letails in the next step.		
			Bac	ack 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

ΓŦ		lenovo@	þllenovo-Ti	hinkStatio	n-P8: ~	Q =	-		×
lenovo@lld gcc (Ubun Copyright This is fi warranty;	enovo-ThinkSt tu 11.4.0-1ub (C) 2021 Fre ree software; not even for	ation-P8:~\$ untu1~22.04 e Software I see the so MERCHANTAB	gccve) 11.4.0 Foundatic urce for ILITY or	ersion on, Inc. copying FITNESS	conditic FOR A PA	ons. Ther RTICULAR	e is M PURPOS	NO 5E.	

2. Update the repository information.

#sudo apt update

F	lenovo@llenovo-ThinkStation-P8: ~ $Q \equiv - \square \times$
<mark>lenov</mark> gcc (Copyr This warra	<pre>ro@llenovo-ThinkStation-P8:~\$ gccversion (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0 'ight (C) 2021 Free Software Foundation, Inc. is free software; see the source for copying conditions. There is NO anty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.</pre>
Lenov [sudd Hit:2 Hit:2 Hit:4 Hit:4 Hit:6 Readi Builc Readi	<pre>vo@llenovo-ThinkStation-P8:~\$ sudo apt update p] password for lenovo: http://us.archive.ubuntu.com/ubuntu jammy InRelease http://us.archive.ubuntu.com/ubuntu jammy-updates InRelease http://us.archive.ubuntu.com/ubuntu jammy-backports InRelease http://security.ubuntu.com/ubuntu jammy-security InRelease http://oem.archive.canonical.com jammy InRelease http://lenovo.archive.canonical.com jammy InRelease http://lenovo.archive.canonical.com jammy InRelease ng package lists Done ng state information Done</pre>
118 p	packages can be upgraded. Run 'apt listupgradable' to see them.

3. Install the software Properties Common Package.

#sudo apt install software-properties-common

ΓŦ	lenovo@llenovo-ThinkStation-P8: ~ 🔾 📃 – 🗆 ×
<mark>lenov</mark> Readi Builo Readi	p@llenovo-ThinkStation-P8:~\$ sudo apt install software-properties-common ng package lists Done ing dependency tree Done ng state information Done
The f apt ubu	ollowing packages were automatically installed and are no longer required: url-common gir1.2-goa-1.0 keyutils python3-dateutil ntu-advantage-desktop-daemon
Use	sudo apt autoremove' to remove them.
ine i	bllowing NEW packages will be installed:
	raded 1 newly installed 0 to remove and 134 not unoraded
Need	to get 14.1 kB of archives.
After	this operation, 225 kB of additional disk space will be used.
Get:1 ertie	http://us.archive.ubuntu.com/ubuntu jammy-updates/main amd64 software-prop s-common all 0.99.22.9 [14.1 kB]
Fetch	ed 14.1 kB in Os (179 kB/s)
Seled	ting previously unselected package software-properties-common.
(Read	ing database 177387 files and directories currently installed.)
Ргера	ring to unpack/software-properties-common_0.99.22.9_all.deb
Unpac	king software-properties-common (0.99.22.9)
Setti	ng up software-properties-common (0.99.22.9)
Proce	ssing triggers for man-db (2.10.2-1)
Proce	ssing triggers for dbus (1.12.20-2ubuntu4.1)
lenov	D@llenovo-ThinkStation-P8:~\$

4. Add the GCC Repository.

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

	llenovo-ThinkStation-P8: ~		_ 0	×
lenovo@llenovo-ThinkStation-P8:~\$	sudo add-apt-repository	ppa:ubuntu-	toolchai	.n-r
PPA publishes dbgsym, you may need Repository: 'deb https://ppa.launc / jammy main'	to include 'main/debug' hpadcontent.net/ubuntu-t	component coolchain-r/	/test/ubu	intu
Description: Toolchain test builds; see https:/	/wiki.ubuntu.com/ToolCha	in		
More info: https://launchpad.net/~ Adding repository. Press [ENTER] to continue or Ctrl-	ubuntu-toolchain-r/+arch c to cancel.	nive/ubuntu/	/test	

5. Install the desired GCC version.

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

lenovo@llenovo-ThinkStation-P8: ~ Q lenovo@llenovo-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 am d64 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@llenovo-ThinkStation-P8:~$ sudo update-alternatives --install /usr/bin/gc
c 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



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 nou∨eau_		

3. Update the initramfs file and reboot the system.

π upuale-initiatitis -u

reboot now

root@lenovo–ThinkStation–PX:/home/lenovo# update–initramfs –u	
update–initramfs: Generating /boot/initrd.img–5.15.0–52–generi	С
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).



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*



7. Note the driver should start to install.



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

NVIDIA	Accelerated	Graphics	Driver	for	Linux-x86_6	64 (515	.76)
Install NVIDIA's 32-bit	compatibilit	y librarie	es?				
	Yes				No		

9. Select 'OK' on the following warning message.



10. 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

root@lenovo-ThinkStation–PX:/home/lenovo/Desktop# nvidia–smi Thu Nov 3 13:22:23 2022						
NVIDIA-SMI 515.76 Driver Version: 515.76 (CUDA Version: 11.7					
GPU Name Persistence-M Bus-Id Disp.A Fan Temp Perf Pwr:Usage/Cap Memory-Usage	Volatile Uncorr. ECC GPU–Util Compute M. MIG M.					
0 NVIDIA T400 46B 0ff 0000000:27:00.0 0ff 32% 43C P0 N/A / 31W 0MiB / 4096MiB	N/A 0% Default N/A					
+ Processes:	+ 					
GPU GI CI PID Type Process name ID ID 	GPU Memory Usage					
No running processes found						
root@lenovo-ThinkStation-PX:/home/lenovo/Desktop# _						

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Revision History

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