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Linux Mini-Workshop: Day 1

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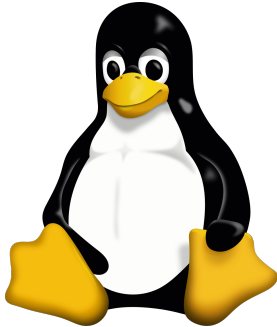
These slides, the ISO image and every installer used today will be made public:

Softwares_Ubuntu

<https://pan.sjtu.edu.cn/web/share/033e9134c7156c702958ea5223adaed2>



Meet Tux



- ▶ This is **Tux**, the official Linux mascot since 1996.
- ▶ He is a penguin because Linus Torvalds got bitten by one at a zoo and, apparently, never fully recovered.
- ▶ Tux is free and open source, and he asks for nothing in return. Pretty much the opposite of every other mascot you know.
- ▶ Every time you spot him from now on, it means someone just broke free from Bill Gates' chains.



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Why Linux

Part 1 of 6



Why Linux?



The daily annoyances disappear

- ▶ No forced restart in the middle of your paper.

And you lose almost nothing



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- ▶ Documents, slides, spreadsheets: LibreOffice, WPS Office, or the web version of Office.



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Honest disclaimer

Some things are still painful: a few Chinese banking / tax plug-ins, some proprietary lab software, and certain games. If you depend on one of those, keep **dual boot**.



Quick Poll: Show of Hands



Who has **never** touched a Linux terminal before today?

(keep your hand up, this whole talk is for you)



There is no wrong answer here. Everyone in this room started exactly where you are.



Time to Say Goodbye to a Window



- ▶ You know that little fridge-magnet penguin? Today he finally gets his revenge on the *other* kind of window.
- ▶ Installing Linux can feel exactly like that: you open the **Window(s)**, and let the penguin in.
- ▶ Don't worry, no glass actually breaks. Just years of forced updates, planned obsolescence, and the occasional blue screen, gone for good.

Disclaimer for the literal-minded

Please don't throw actual penguins or laptops at any window. Tux insists this is a metaphor.



The Advantages, Told Properly



Free as in “no crime required”



Every program today is legally, gloriously free. Built by volunteers and universities, not by a corporation renting it back to you one subscription at a time.

Torrents, guilt-free



Yes, you can torrent here. That is how half the Linux world gets its ISOs. For once, seeding is a public service, not a crime scene.

Antivirus, unemployed



Viruses targeting Linux are rare enough that your antivirus can retire and take up gardening.

Clusters and superpowers



One `ssh` command and you are on a supercomputer. Open ten terminals and you are running ten jobs at once, multiparallelization just comes naturally, no cape required.



- ▶ **Every supercomputer runs Linux.** π 2.0, Siyuan-1, national centres, the login node is a Linux shell either way. Learn it here and you already know the cluster.
- ▶ **Your software expects it.** ROOT, GEANT4, CMSSW, GLoBES, LAMMPS, VASP, Gaussian ... install in one command instead of one afternoon.
- ▶ **Reproducibility.** A package list plus a script is a reproducible environment.
- ▶ **Automation.** Batch jobs, `ssh`, `rsync`, `cron`: the work does itself while you sleep.
- ▶ **It is the same system** on your laptop, on the cluster and inside the container, so it's one set of habits for everything.

The two hours you spend today save you weeks over a PhD.



Choose Your Level of Commitment



Option	Risk	Speed	Good for
Live USB (“Try Ubuntu”)	none	slow	Looking around, testing hardware
Virtual machine (VirtualBox)	none	medium	Keeping Windows, learning safely
Dual boot	medium	full	Most people in this room
Full install (erase disk)	high	full	A spare machine, or full commitment

Today I demonstrate the full install

It is the clearest thing to film. Everything after the partitioning step is **identical** for all options.



What You Need Before We Start



- ▶ A **USB stick**, ≥ 8 GB. Everything on it is erased.
- ▶ The **Ubuntu 24.04 LTS** ISO (on the workshop page, ≈ 6 GB).
- ▶ ≥ 40 GB of free disk space (100 GB is comfortable).
- ▶ Your laptop charger. Never install on battery.
- ▶ Your Wi-Fi password.

The golden rule

Back up first.

An installer that erases a disk does not ask twice, and there is no recycle bin. Copy your files to an external drive or the cloud *now*, not later.

Why 24.04 LTS and not the newest release

LTS = Long Term Support: security updates until 2029, and every piece of scientific software is tested against it. Boring is exactly what you want in an OS.



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Preparing the Machine

Part 2 of 6



Step 1: Create the Bootable USB



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Rufus (Windows, recommended)

1. Open Rufus, plug in the USB stick.
2. *Device*: your USB stick. Check the size twice!
3. *Boot selection*: SELECT → the Ubuntu ISO.
4. *Partition scheme*: GPT *Target*: UEFI.
5. START → “Write in ISO Image mode” → OK.
6. 3–10 minutes. Wait for READY.



Step 2: Get into the Boot Menu

Press the boot-menu key repeatedly, immediately after powering on, then pick your USB stick (look for the *UEFI:* entry with your USB brand name).

Brand	Boot menu key
Lenovo (ThinkPad)	F12
Lenovo (IdeaPad)	F12 / Novo button
Dell	F12
HP	F9
ASUS	Esc
Acer	F12
Huawei / Honor	F12
MSI, others	F11

USB not showing up? Just set it as the first boot device in the BIOS and try again.



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Installing Ubuntu

Part 3 of 6



Step 3: Try, Then Install

Try Ubuntu

Runs entirely from the USB stick, nothing gets written to your disk.

Test right now: Wi-Fi, sound, screen brightness, touchpad, external monitor, webcam, and whether the fan behaves.

Install Ubuntu

Writes the system to your disk.
Reachable from the welcome screen, or from the *Install Ubuntu* icon inside the Try session.

Live demo: follow the camera

Booting the USB now. Notice the purple screen, then the welcome dialogue. If something on your hardware does not work in “Try”, it will not work after installing either. That is exactly what this test is for.



Step 4: The Installer, Screen by Screen



1. **Language:** English is fine for this workshop. You can add Chinese input later either way.
2. **Accessibility / Keyboard:** the default (English US) is right for almost every laptop here.
3. **Network:** connect to Wi-Fi now, it makes the rest smoother.
4. **Try or install** → *Install Ubuntu*.
5. **Type of installation:** *Default selection* (browser + core utilities) or *Extended selection* (adds LibreOffice, games, utilities). **Extended** is the friendlier choice.
6. **Third-party software:** tick *both* boxes, graphics/Wi-Fi drivers and media codecs. This is what makes NVIDIA cards and MP4 files work.
7. **Disk setup:** the only screen you cannot undo. Next slide.
8. **Your account:** name, computer name, username, password.
 - ▷ Username: lowercase, no spaces, no accents (joao, not João P.).
 - ▷ You will type this password many times a day. Do not improvise it.



Step 5: The Disk Screen (read carefully)

Option	What it does
Install alongside Windows	Uses the unallocated space you created; both systems survive; a menu appears at every boot. Recommended.
Erase disk and install Ubuntu	Deletes <i>everything</i> , including Windows. Fastest and simplest, if the machine is yours to sacrifice.
Manual / Something else	You create the partitions yourself. Needed for encryption, separate /home, or several disks.

Manual layout that always works (single 512 GB NVMe, 16 GB RAM):

Partition	Size	Type	Mount point
EFI system	512 MB	FAT32	/boot/efi (reuse the existing one if dual booting)
root	60–100 GB	ext4	/
swap	≈ RAM size	swap	n/a (needed for hibernation)
home	the rest	ext4	/home (survives a future reinstall)



Step 6: Copying Files, Then Reboot



- ▶ Installation takes **10–25 minutes**. The slideshow is not a progress bar, the small bar at the bottom is.
- ▶ *Restart Now* → **remove the USB stick** → .
- ▶ First boot is slower than the following ones. Do not panic at a black screen for 20 seconds.

Dual boot: the GRUB menu

A blue/black menu offers *Ubuntu* and *Windows Boot Manager*. Ubuntu starts by default after a few seconds; arrow keys choose otherwise.

No menu, straight to Windows? See the troubleshooting slide, it's usually a boot-order setting in the BIOS.

Checkpoint: you should now have

A login screen with your username on it. That is the hard part done.



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The Desktop

Part 4 of 6



Welcome to GNOME



- ▶ **Top bar:** notifications in the middle; network, sound, battery and power on the right.
- ▶ **Dock** (left): favourite and running apps.
- ▶ **Activities** (top-left, or **Super**): shows your open windows and lets you search for anything.
- ▶ **Files** (Nautilus) is your Explorer, like `C:\Users`.
- ▶ **App Center:** a graphical store, like on a phone.

The one habit to build

Press **Super**, type the first letters of what you want, press **Enter**.

settings, terminal, files, firefox... You will stop using the mouse within a week.

Live demo: follow the camera

Desktop tour: workspaces, window snapping, screenshot tool.



Shortcuts Worth Memorising Today



Keys	Action	Keys	Action
Super	Activities / search	Ctrl + Alt + T	Open a terminal
Super + A	All applications	Ctrl + Shift + C/V	Copy/paste <i>in</i> the terminal
Alt + Tab	Switch application	Super + Space	Switch keyboard layout
Super + ←/→	Snap window to half	Print	Screenshot tool
Super + PgUp/PgDn	Change workspace	Ctrl + Q	Quit application
Super + L	Lock the screen	Ctrl + C	Stop the command

The terminal exception

In a terminal, **Ctrl** + **C** means *stop*, not *copy*. Use **Ctrl** + **Shift** + **C** to copy. This trips up everyone once.



Five Settings to Change on Day One



1. **Updates.** Open *Software Updater*, install everything, reboot if asked.
2. **Chinese input.** Settings → Keyboard → Input Sources → + → Chinese → *Intelligent Pinyin*. Switch with Super + Space.
3. **Night Light.** Settings → Displays → Night Light. Your eyes at 2 a.m. will thank you.
4. **Dual boot clock.** Windows will show the wrong time after using Linux. Fix it once, from Linux:

```
timedatectl set-local-rtc 1 --adjust-system-clock
```

5. **Proprietary drivers** (NVIDIA laptops): open *Additional Drivers* and pick the recommended `nvidia-driver-XXX`, then reboot. Or:

```
sudo ubuntu-drivers autoinstall
```



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Installing Software

Part 5 of 6



- ▶ A text interface: you type a command, the computer does it. Nothing more mystical than that.
- ▶ Open with `Ctrl` + `Alt` + `T`.
- ▶ Today you need about six commands. Days 2 and 3 cover the rest.

Your first command, refreshing the catalogue of available software:

```
sudo apt update
```

Decoding it

`sudo`: “do this as administrator”. It asks for *your* password.

`apt`: Ubuntu’s package manager, it finds, downloads, installs and updates software, with all dependencies.

`update`: refreshes the list. It does *not* upgrade anything yet.

The password is invisible

No dots, no stars while you type it. Normal, not frozen. Type and press `Enter`.



Make apt Fast in Shanghai



Ubuntu's default servers are far away. SJTU runs its own mirror, so downloads go from a few hundred kB/s to tens of MB/s. Do this once, right after installing. Note that Ubuntu 24.04 uses a new file, `/etc/apt/sources.list.d/ubuntu.sources`, *not* the old `/etc/apt/sources.list`:

```
# 1. Keep a backup, in case you want to go back
sudo cp /etc/apt/sources.list.d/ubuntu.sources ~/ubuntu.sources.bak

# 2. Point every archive.ubuntu.com URL at the SJTU mirror
sudo sed -i 's|//.*archive.ubuntu.com|//mirror.sjtu.edu.cn|g' \
    /etc/apt/sources.list.d/ubuntu.sources

# 3. Reload the catalogue and upgrade
sudo apt update && sudo apt upgrade
```

Other good mirrors, same command with a different hostname: `mirrors.tuna.tsinghua.edu.cn`, `mirrors.ustc.edu.cn`, `mirrors.aliyun.com`.



Five Ways to Install Software

Method	Typical command	When
apt (repository)	<code>sudo apt install vlc</code>	Default. Thousands of packages, updated automatically.
.deb file	<code>sudo dpkg -i x.deb</code>	Software not in the repositories: WeChat, WPS, Chrome.
Snap	<code>sudo snap install code</code>	Preinstalled on Ubuntu; self-contained; slower to start.
Flatpak	<code>flatpak install ...</code>	Newest desktop apps, sandboxed.
AppImage	<code>chmod +x app.AppImage</code>	One file, no installation, just run it.

`dpkg -i` then fix dependencies

`sudo dpkg -i wechat.deb` installs the file, but if it is missing dependencies it will complain and stop. Immediately run `sudo apt --fix-broken install`: it downloads whatever was missing and finishes the job.



Live demo: follow the camera

Everything below runs on screen now. `apt` will list what it plans to do and ask *Do you want to continue? [Y/n]*, read it, then press `Y`.

```
# What is available, and what is outdated
sudo apt update
sudo apt upgrade

# Several programs in a single command
sudo apt install vlc gimp htop git curl gnome-tweaks

# If you do not know the exact name
apt search "pdf editor"
apt show htop
```

`vlc` any video | `gimp` image editor | `htop` live CPU and memory (`q` quits) | `gnome-tweaks` extra



Which command installs a .deb file you just downloaded?

A) `apt search x.deb`

B) `sudo dpkg -i x.deb`

C) `cd x.deb`



Which command installs a .deb file you just downloaded?

A) `apt search x.deb`

B) `sudo dpkg -i x.deb`

C) `cd x.deb`

B! Shout it if you got it.



Live Demo B: Installing a .deb File



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All packages below are already on the workshop page, no download needed today.

```
cd ~/Downloads      # go to the folder with the files
ls *.deb            # check what is there (press TAB to autocomplete!)

sudo dpkg -i WeChatLinux_x86_64.deb
sudo dpkg -i TencentMeeting_*.deb
```

If it complains about dependencies

```
sudo apt --fix-broken install
```

What dpkg -i does

`dpkg` unpacks and installs the package directly. It does *not* fetch dependencies by itself, that is what `apt` `--fix-broken install` is for.

Graphical alternative: double-click the .deb in Files and press *Install* in the App Center.



Your Chinese Software, on Linux



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Software	How	File
LibreOffice	preinstalled	already on the system
WeChat	<code>sudo dpkg -i</code>	WeChatLinux_x86_64.deb
Tencent Meeting	<code>sudo dpkg -i</code>	TencentMeeting_...deb
DingTalk	<code>sudo dpkg -i</code>	com.alibabainc.dingtalk_...deb
Baidu Netdisk	<code>sudo dpkg -i</code>	baidunetdisk_8.7.0_amd64.deb
WPS Office	<code>sudo dpkg -i</code>	wps-office_11.1.0.11733.XA_amd64.deb
Google Chrome	<code>sudo dpkg -i</code>	google-chrome-stable_current_amd64.deb
Zoom	<code>sudo dpkg -i</code>	zoom_amd64.deb
Xournal++ (PDF annotation)	<code>sudo dpkg -i</code>	xournalpp-1.2.7-...deb
VS Code	<code>sudo dpkg -i</code>	code_1.136.1-..._amd64.deb
Mathematica	shell installer	Mathematica_13.0.1_BNDL_LINUX.sh
VLC, GIMP, Okular	<code>apt</code>	installed by command line, not a file

Every file above will be public

ISO plus all .deb/.sh installers listed here go on one shared link after the workshop:

Softwares_Ubuntu

<https://pan.sjtu.edu.cn/web/share/033e9134c7156c702958ea5223adaed2>.

For any .deb: `sudo dpkg -i file.deb` then, if needed, `sudo apt --fix-broken install`.



Mathematica ships as a shell installer, not a .deb:

```
cd ~/Downloads
chmod +x Mathematica_13.0.1_BNDL_LINUX.sh
sudo ./Mathematica_13.0.1_BNDL_LINUX.sh
```

Follow the on-screen prompts and enter your licence when asked.

Chinese fonts and input

If characters appear as boxes:

```
sudo apt install fonts-noto-cjk
fonts-wqy-zenhei
```

For a more powerful input method:

```
sudo apt install fcitx5
fcitx5-chinese-addons
```

(then log out and back in).



One command sets up most of a physicist's laptop:

```
sudo apt install texlive-full texstudio python3-pip python3-venv \  
git openssh-client gnuplot okular
```

- ▶ **texlive-full**: LaTeX, everything included ($\approx$ 6 GB, go get a coffee).
- ▶ **python3-venv**: isolated environments per project.
- ▶ **git**: version control; also how you get most scientific codes.

Connecting to a cluster

```
ssh username@login.hpc.sjtu.edu.cn
```

No PuTTY, no extra software: it is built in.
This is where Days 2 and 3 are heading.



Bonus: Anaconda and Jupyter Notebook



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Anaconda gives you Python plus hundreds of scientific packages (NumPy, SciPy, pandas, Jupyter) in one isolated environment, with no risk of breaking the system Python.

```
cd ~/Downloads
wget https://repo.anaconda.com/archive/\
Anaconda3-2024.10-1-Linux-x86_64.sh
bash Anaconda3-2024.10-1-Linux-x86_64.sh
# accept the licence, keep the default
path,
# say "yes" to conda init, then:
source ~/.bashrc
```

Create a project environment and launch Jupyter:

```
conda create -n myenv python=3.11
jupyter
conda activate myenv
jupyter notebook
```

Why an environment

`conda create -n myenv` keeps this project's packages separate from every other project. Delete it and start over any time with no side effects.



Bonus: Gaming with Steam



- ▶ Valve does not publish an official `.deb` for Ubuntu on its own website; what circulates is an **unofficial** build repackaged by the community.
- ▶ It still works well for most games through Proton, Valve's Windows compatibility layer.
- ▶ Once installed, log in with your existing Steam account, your library and saves carry over normally.

Use with a bit of caution

Because it is unofficial, always check the source before downloading, and prefer the version distributed on Ubuntu's own *multiverse* repository:

```
sudo apt install steam
```



Undoing Things

```
sudo apt remove vlc           # remove the program, keep its settings
sudo apt purge vlc            # remove the program and its settings
sudo apt autoremove           # clean up dependencies nobody needs anymore
apt list --installed          # everything currently installed
```

Before you experiment

Install `timeshift` and take one snapshot. It restores the system to a working state the way Windows System Restore should have.

Never paste a command you do not understand

Especially anything containing `rm -rf`, or a web page telling you to `curl ... | sudo bash`.

Ask here, or on Day 2.



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Wrapping Up

Part 6 of 6



The universal method

Copy the **exact** error message and search it. Someone hit it in 2011 and someone answered in 2012. Ask Ubuntu and the Arch Wiki are both excellent.



Cheat Sheet: Photograph This Slide



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```
# --- system -----
sudo apt update           # refresh the catalogue of packages
sudo apt upgrade          # update everything installed
sudo apt install <name>   # install from the repository
sudo dpkg -i file.deb     # install a downloaded package
sudo apt --fix-broken install # finish installing missing dependencies
sudo apt remove <name>    # uninstall

# --- moving around -----
pwd                       # where am I?
ls                        # what is here?
cd ~/Downloads            # go to a folder (~ is your home)
cd ..                     # go up one level

# --- staying alive -----
<TAB>                     # autocomplete: use it constantly
Ctrl+C                    # stop the running command
man <command>             # the manual (q to quit)
```



What You Can Do Now

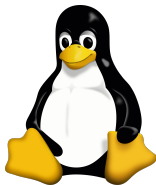


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1. Write a bootable USB stick.
2. Prepare Windows and get into the BIOS.
3. Install Ubuntu 24.04, alongside Windows or on its own.
4. Find your way around GNOME.
5. Open a terminal and use `apt`.
6. Install `.deb` packages with `dpkg -i`: WeChat, Tencent Meeting, DingTalk...
7. Fix the most common problems yourself.

Homework (optional, 20 min)

Install Ubuntu on your own machine, or in VirtualBox if you'd rather keep Windows (and its licence fees) untouched a little longer. Bring your questions, or your broken machine, to Day 2.



Thank you!

Questions?

Slides, ISO and all installers used today will be public:

Softwares_Ubuntu

<https://pan.sjtu.edu.cn/web/share/033e9134c7156c702958ea5223adaed2>

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