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Linux – introduction

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Purpose

- Get a grip on the very basics: an introduction to the (basic) Linux commands as normally used for computational research.
- Focus on using the command line
- Short hands-on examples
- Based on the slides of Mag Selwa – ICTS @ KULeuven
  - https://hpcleuven.github.io/Linux-intro/
- https://franklbvp.github.io/linuxintro/

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Outline

- Introduction - history
- Command line basics – getting help
- File system
- Working with files and directories
- More file handling
- The shell revisited
- Monitoring resources

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Why CLI?

- Fundamentally, there are two different ways to work with an operating system:
  - Graphical User Interface (GUI): use a pointing device to manipulate windows, select options, etc.
  - Command Line Interface (CLI): type commands at a prompt.

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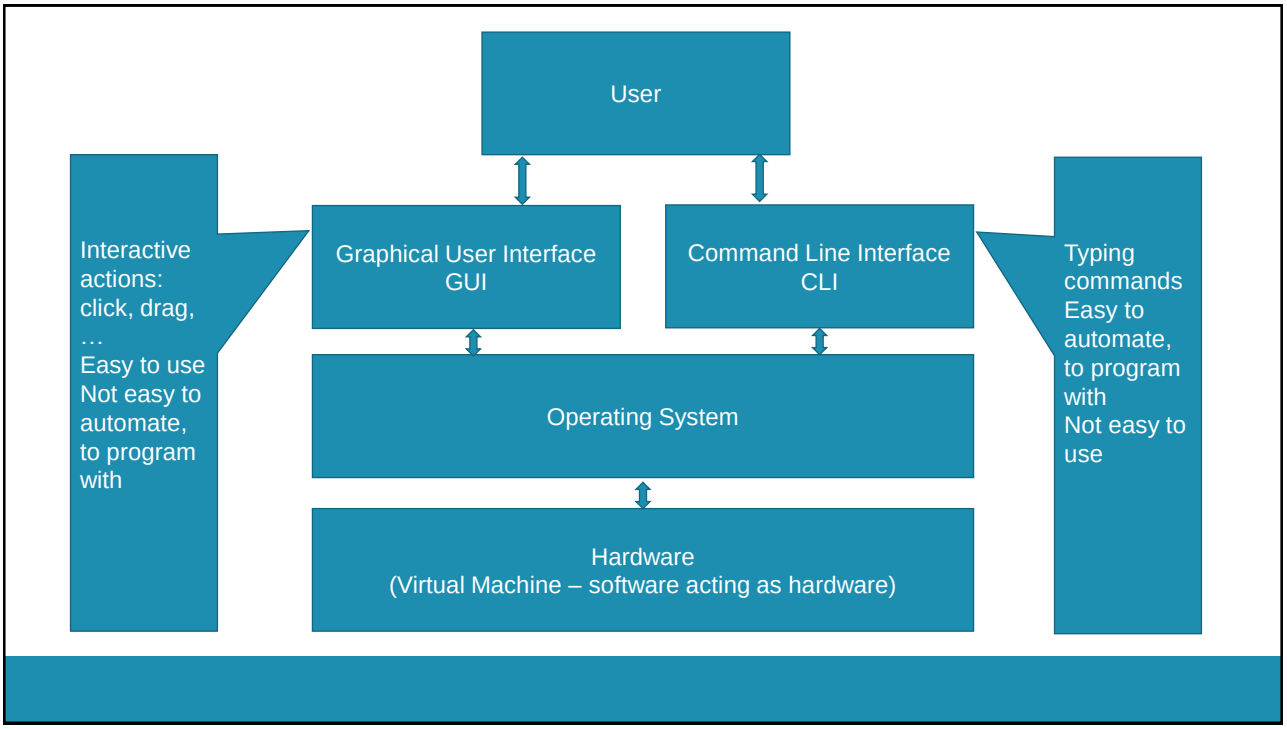

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Why CLI?

- The Linux Command Line Interface (CLI), a.k.a. terminal or shell, offers several advantages:
- **Efficiency**: CLI allows for quick operations and scripts, making it faster than GUI in many instances. You can perform complex tasks by combining simple commands into a script.
- **Control**: It provides more control over the system. You can interact directly with the system and manage every aspect of the system.
- **Automation**: With the CLI, you can automate tasks using scripts and scheduling tools like cron.
- **Less Resource Intensive**: CLI consumes fewer system resources than GUI, which can be crucial for servers or older hardware.
- **Portability**: Commands usually have the same syntax across different Linux distributions.
- **Better Understanding of the System**: Using the CLI gives you a better understanding of the Linux environment and how different parts of the system work together.

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Why CLI?

- The Linux Command Line Interface may seem complex, once you understand what is going on, it proves to be quite simple and intuitive.
- It is important to understand a command before running it, as some commands can have a significant effect.

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Running Linux on Windows

- **Dual-boot Linux and Windows**: install Linux alongside Windows, allowing to choose which operating system to use at startup. This requires partitioning the hard drive and installing Linux on a separate partition.
- **Virtual Machines (VM)**: a virtual machine (VM) is a software emulation of a physical computer system. Use virtualization software such as Oracle VirtualBox or VMware to create a virtual machine running Linux within the Windows environment.
- **Windows Subsystem for Linux (WSL)**: Windows Subsystem for Linux provides a compatibility layer enabling to run Linux binary executables natively on Windows. The setup for WSL is easy. Windows and Linux can be used side by side.
- **Cloud-based solution**: particularly useful for quick testing, learning, or accessing Linux environments. Use online code editors or web based terminals to access Linux.
- https://www.freecodecamp.org/news/5-ways-to-use-linux-on-a-windows-machine/
- https://www.geeksforgeeks.org/how-to-run-linux-software-on-windows/
- https://learn.microsoft.com/en-us/linux/install

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Virtual Machine Software

- Vmware player
  - https://www.vmware.com/products/workstation-player.html
- Virtualbox
  - https://www.virtualbox.org/
- Install a linux distribution
  - Ubuntu https://ubuntu.com/
  - CentOS https://www.centos.org/
  - Opensuse https://www.opensuse.org/

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WSL

- Try WSL2 approach first, as it is lightweight, easy installation
  - Suited to run Linux command-line tools, Bash shell scripts, and GNU/Linux command-line applications
  - Integration of Visual Studio Code allows for software development (C, C++, Python, etc.)
- Check for a detailed description:
  - https://learn.microsoft.com/en-us/windows/wsl/install
  - https://www.cs.odu.edu/~zeil/FAQs/Public/win10Bash/ (also useful for C programming)

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Graphical Linux Applications

- To run graphical Linux applications in WSL2, you'll need an X Server running. Linux GUI applications are designed to run on the X Window System.
- Windows Subsystem for Linux supports running Linux GUI applications
  - https://learn.microsoft.com/en-us/windows/wsl/tutorials/gui-apps
- Check MobaXterm
  - MobaXterm detects WSL
    - Use built-in editor
    - https://mobaxterm.mobatek.net/

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MobaXterm

- MobaXterm is a convenient way to remotely access a computer/server.
  - allows use SSH to login and execute commands on a remote computer (similar to Putty).
  - built in X11 forwarding so you can run graphical applications remotely while having the application's output displayed on your local device.
  - ability to transfer files between servers
  - https://docs.vscentrum.be/access/windows_client.html#windows-gui

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Running Linux? Online

- Webminal (https://webminal.org)
- repl.it (https://replit.com/)
- CoCalc (https://cocalc.com)

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Run Linux commands in a macOS terminal

- macOS and Linux are different operating systems, but share a common heritage in UNIX. Many of the command-line utilities from Linux are available on macOS as well.
- Use the Terminal App (Applications/Utilities/Terminal) to obtain a command line terminal.
- Many common commands work the same way on macOS as they do on Linux.
  - Check the man pages for a command
  - The same syntax rules from Linux apply to macOS.

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Thank You

Presentation is based on the information found in:

- http://dontfearthecommandline.blogspot.com/
  (not accessible anymore)
  Nicholas Marsh
  Introduction to the Command Line (Second Edition)
- http://linuxcommand.org/tlcl.php
  William Shotts
  The Linux Command Line
- https://bootlin.com/doc/legacy/command-line/unix_linux_introduction.pdf
  Michael Opdenacker & Thomas Petazzoni
  The Unix and GNU/Linux command line

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Thank You

- https://cvw.cac.cornell.edu/Linux/

- Nathan Haines, *Beginning Ubuntu for Windows and Mac Users*, Apress, 2017
- Philip Kirkbride, *Basic Linux Terminal Tips and Tricks*, Apress 2020
- Prateek Singh, *Learn Windows Subsystem for Linux*, Apress 2020

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Websites?

- https://www.howtogeek.com/t/linux/
  - Includes help, tutorials, tips and how-to guides for Linux.
- http://www.tldp.org
  - The Linux Documentation Project
- https://lwn.net
  - Linux Weekly News:Covering the Linux and free software communities since 1998.
- https://itsfoss.com/
- https://www.noobslab.com/
- https://www.tecmint.com/

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