

# **CYBR 4423**

## **Unix/Linux Administration**

### **Introduction to Unix/Linux**

# Overview

Unix/Linux

Ubuntu

Installation

X-Window and desktop environment

Command line environment

# Operating System

An operating system (OS) is software that manages computer hardware resources and provides common services to other software programs

- Program execution (processor management)

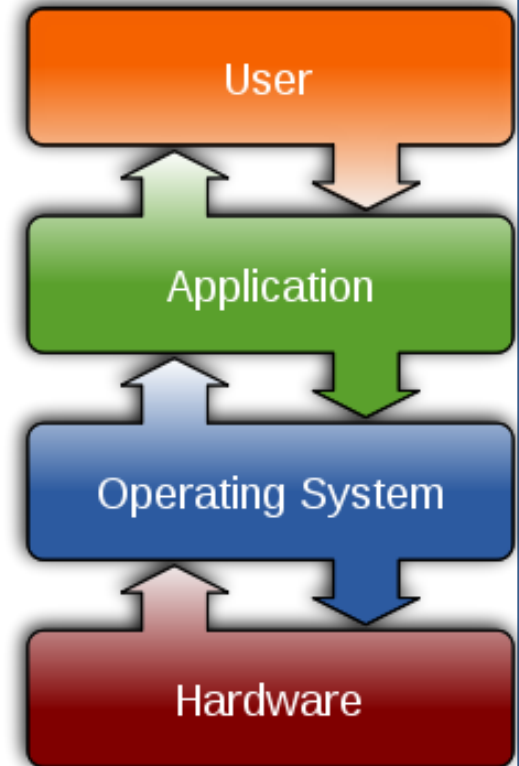
- Memory management

- Hardware device management

- File system

- API

- User interface



[Image source](#)

# Major OS in the market

## UNIX and Unix-like

UNIX

GNU/Linux

Mac OS X, iOS, Android

## Microsoft Windows

Desktop: Windows XP, Windows Vista, Windows 7

Server: Windows NT, Windows Server 2008

Mobile: Windows Phone

## Other (older)

Apple Mac OS

OS/2

# UNIX

Originally developed in 1969 by a group of AT&T employees at Bell Labs

UNIX is a trademark owned by the Open Group

## Major branches

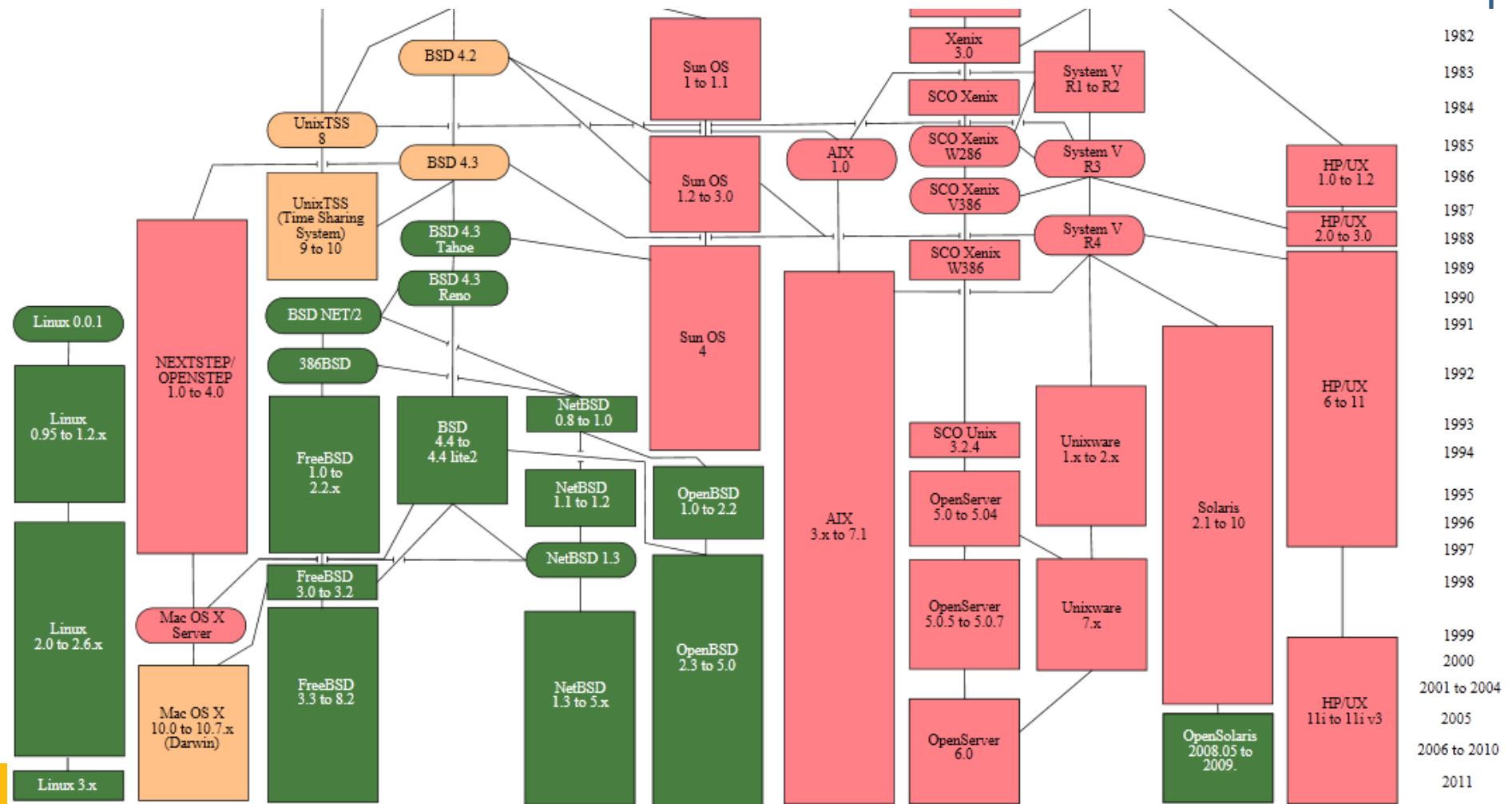
BSD: OpenBSD, FreeBSD

Solaris: OpenSolaris, Oracle Solaris

Mac OS X

IBM AIX

# Unix-like Variants



# Linux

## The family of Unix-like computer operating systems using the Linux kernel

The kernel was developed and maintained by Linus Torvalds  
Officially only the kernel is called "Linux"

## Free and open source software (FOSS)

License: GNU GPL

["GNU/Linux" or "Linux"?](#)

[Linux logo: Tux](#)

# Free Software

## GNU Free Software Definition:

Free software is a matter of the users' freedom to run, copy, distribute, study, change and improve the software. More precisely, it means that the program's users have the four essential freedoms:

Freedom 0: the freedom to run the program, for any purpose.

Freedom 1: The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1).

The freedom to redistribute copies (freedom 2).

The freedom to distribute copies of your modified versions to others (freedom 3).

[See More on Free Software](#)



# Linux Distributions

GNU/Linux is distributed in the form of distributions

Kernel + GNU tools and libraries + additional software.

Hundreds of Linux distributions are currently under development

Popular ones

Debian/Ubuntu

RedHat/Fedora

openSUSE

[Major Distributions](#)

# Ubuntu Linux

Ubuntu is an ancient African word meaning 'humanity to others'. It also means 'I am what I am because of who we all are'.

## One of the major Linux distributions

### Releases, editions and variants

Versions (two releases every year): 12.10, 12.04, etc.

LTS (long term support): 12.04.1 LTS

Edition: Ubuntu Desktop, Ubuntu Server

Flavors: Kubuntu, Xubuntu, Lubuntu, Edubuntu

[Ubuntu wiki Releases](#)

# Download and Installation

## Download Ubuntu Linux

[Most recent versions](#)

[Earlier releases](#)

## Installation choices

LiveCD, LiveUSB – no installation

Fresh install with CD/USB on a clean computer

Dual boot side by side with Windows

*Virtual machines – Recommended in this class. See the lab #1*

Install directly within Windows

## Installation guide

<https://ubuntu.com/tutorials/how-to-run-ubuntu-desktop-on-a-virtual-machine-using-virtualbox#1-overview>



# Basic Computer User Interfaces

## Command-line Interface (CLI)

Interacting with the system by typing commands

Text based

Efficient, programmable

Line by line input and output

## Graphical User Interface (GUI)

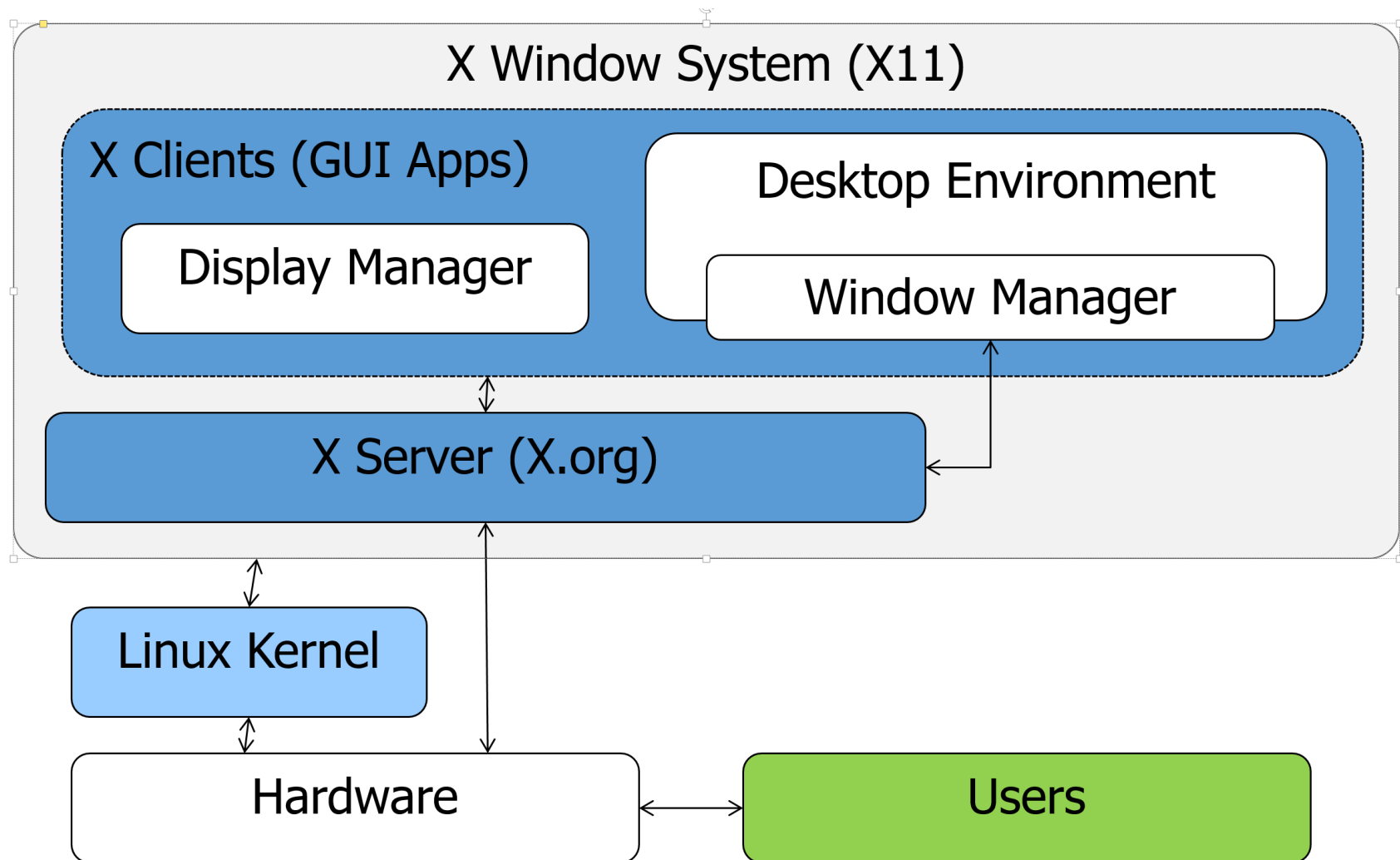
Interacting with the system through graphical elements

User friendly, multi-tasking (interaction)

WIMP (Window, Icon, Menu, Pointing)

Linux supports both CLI (shell) and GUI (desktop environment) interfaces

# Linux GUI Components



# X Window System

## X Window System

A protocol that defines how graphics are used

## Major components

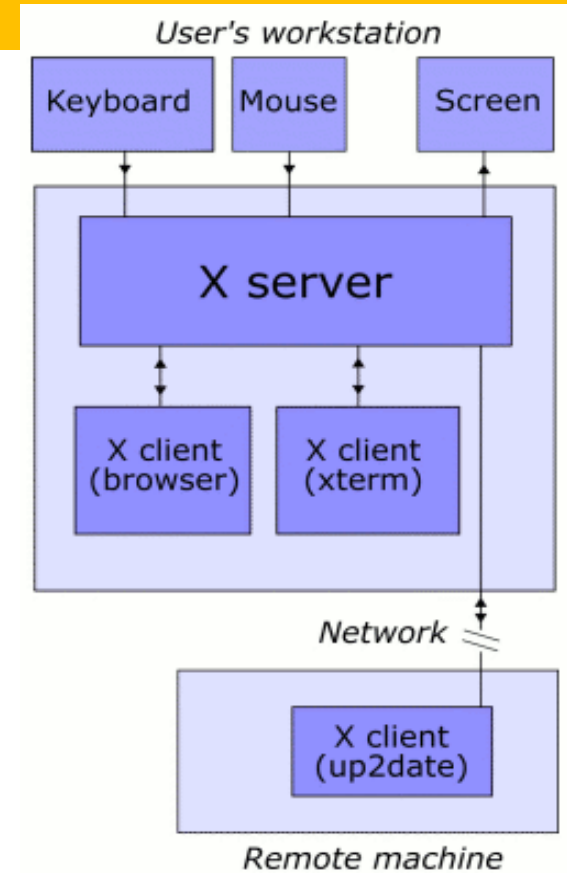
X server: Responsible for lower level hardware resource interaction and graphics drawing

X client: GUI applications

Xlib: a set of libraries for client applications

## X Server used in Linux distros

[X.org](http://X.org)



[Source of the Figure](#)

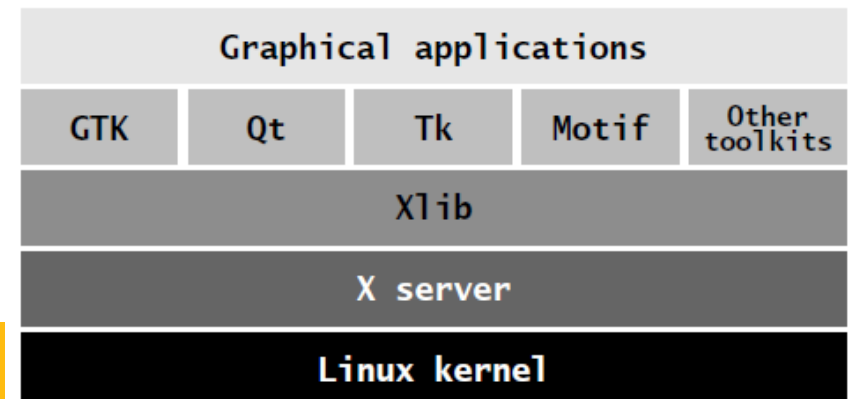


Figure 8-1 The X stack

Textbook



# Display Manager, Window Manager and Desktop Environment

## Display manager

Allows the starting of a session on an X server.

Presents the user with a login screen. A session starts when the user successfully enters a valid combination of username and password.

## Window manager

Manages placement and appearance of windows

## Desktop environment

A desktop environment is a more comprehensive package to bring together X clients and create a common graphical user environment and development platform.

Popular ones

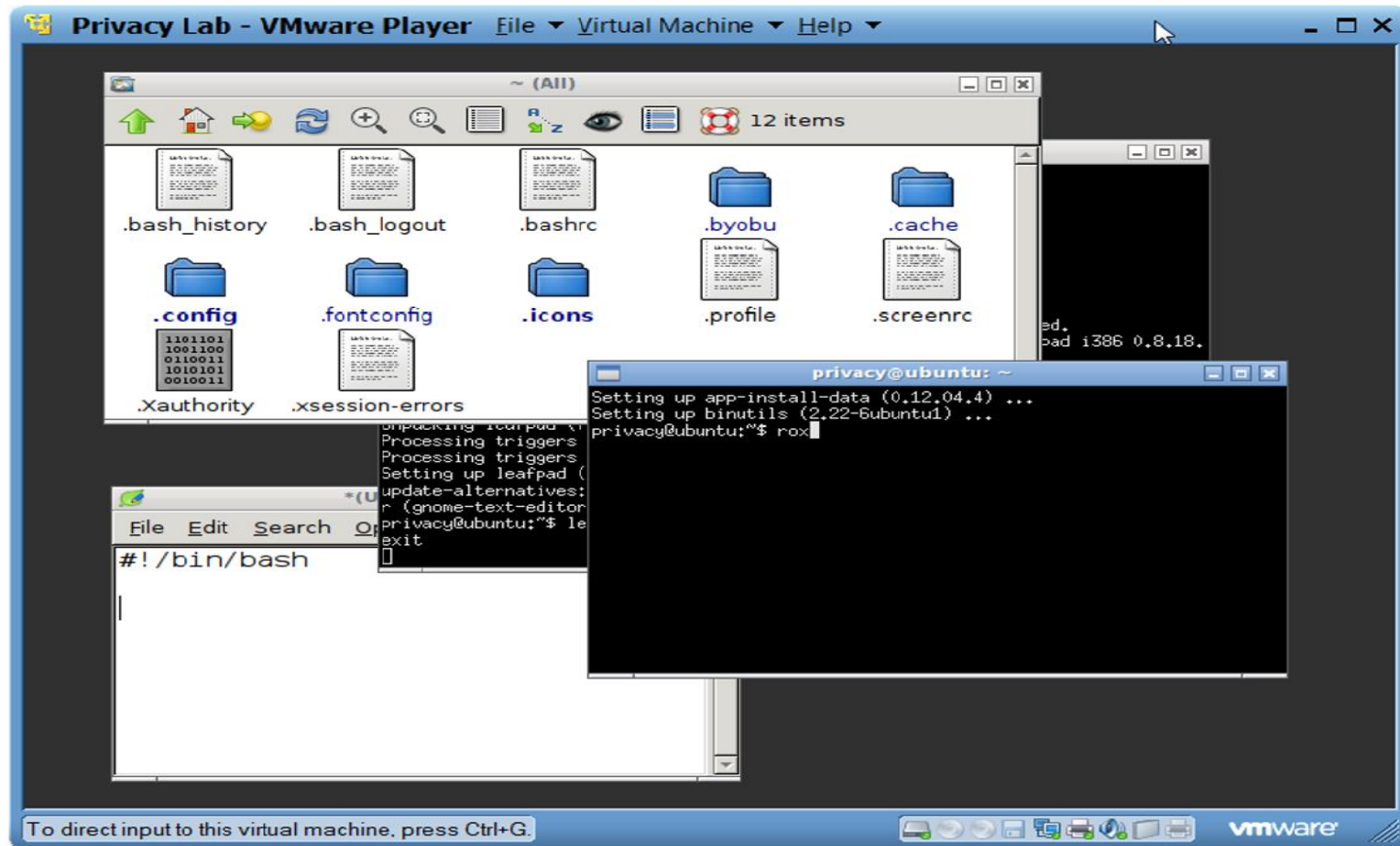
[KDE Plasma](#)

[GNOME](#)

Lightweight: Xfce, LXDE, Openbox

# A Window Manager but without a Desktop Environment

(This Linux is installed with Openbox GUI. You can see windows but no desktop.)





# GNOME

Emphasis on simplicity, usability, and making things just work – “KISS”

At least used to be.

Composed entirely of free and open source software

## Versions

v2.32, released in Sept 2010, is used in Ubuntu Linux 11.04

v3.0, released in Apr 2011, version 3.36 is used in Ubuntu 20.04

A completely new modern desktop

Introduction of GNOME Shell.

A redesigned settings framework with fewer, more focused options. The final version was 3.38 released on Sept 2020

Version 40/41 released in 2021 , is “the next generation of GNOME”.

<https://forty.gnome.org/>

<https://www.omgubuntu.co.uk/2021/03/gnome-40-new-features>

# Other Desktops

## KDE Plasma Workspace

Originally designed to ease transition for users from other operating systems (such as Microsoft Windows) by allowing a similar desktop layout

Includes a large package of KDE programs

Versions

Kubuntu 11.04 includes KDE Plasma and Applications v4.6

## Xfce

## LXDE

CDE: common desktop environment, traditionally for Unix systems

Unity: a graphical shell for Ubuntu



# Desktop Environments for Ubuntu Linux

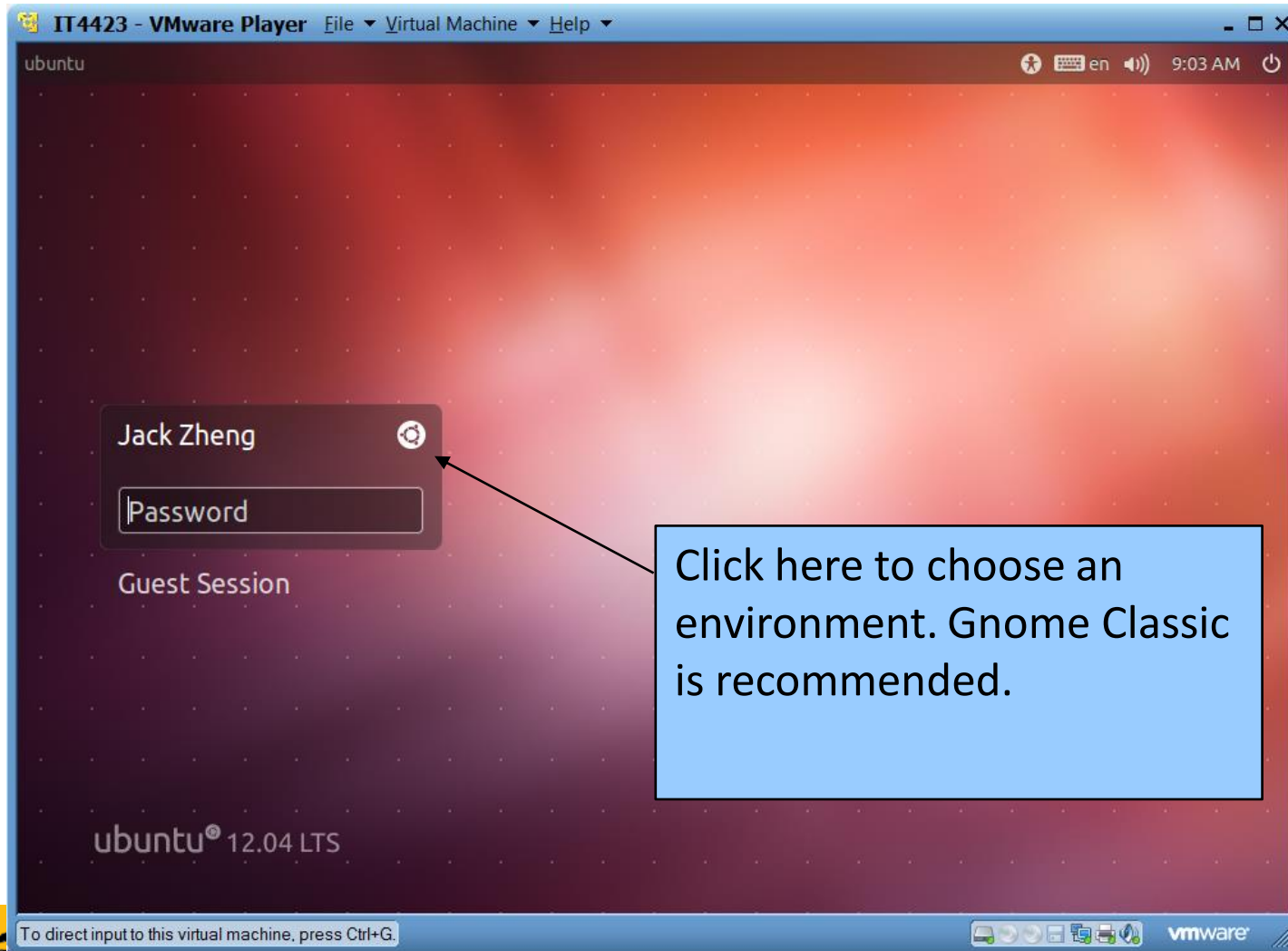
Before 11.04, Gnome is the default desktop environment

[GNOME Desktop Guide](#)

Ubuntu v11.04 adopts “Unity” as the default, but ships Gnome as part of the package (called "Ubuntu Classic")

Install and use Gnome Classic:

# Choosing a Login Session Type



# Command Line Interface

CLI is a mechanism for interacting with a computing environment by typing commands to perform specific tasks.

- Text only

- Line-by-line linear input and output

- used by systems with insufficient resources to support a graphical user interface

- easier to develop programs

- enable direct call to programs and options

# Entering CLI

## Use a GUI-based terminal emulator

A terminal window allows the user access to a text terminal and all its applications

## Boot into the CLI directly

Use Ubuntu Linux Server edition, or  
Configure the boot file to start X Window System manually

## Remotely log in to a system via SSH

# Terminal Emulator

A GUI-based terminal emulator adds additional functionalities for ease of use

- Multi-window/tab (multiple terminals at the same time)
- Easy copy and paste
- Cursor position
- Color schemes
- Scrolling for all output history
- Mouse events
- URL detection

## Applications

- gnome-terminal
- konsole
- xterm

# CLI: Basic Elements

## Command prompt

Each command start from a command prompt

Command prompt indicates that it is ready to accept a new command

A command (ls) with options (-l) and arguments (/root)

```
root@ubuntu:~# ls -l /root
total 32
drwxr-xr-x 3 root root 4096 2011-09-05 05:23 Desktop
drwxr-xr-x 2 root root 4096 2011-09-03 02:32 Documents
drwxr-xr-x 2 root root 4096 2011-09-03 02:32 Downloads
drwxr-xr-x 2 root root 4096 2011-09-03 02:32 Music
drwxr-xr-x 2 root root 4096 2011-09-03 02:32 Pictures
drwxr-xr-x 2 root root 4096 2011-09-03 02:32 Public
drwxr-xr-x 2 root root 4096 2011-09-03 02:32 Templates
drwxr-xr-x 2 root root 4096 2011-09-03 02:32 Videos
root@ubuntu:~#
```

Command prompt. The default format is:  
User name + computer name + current  
directory

quired or

optional)

Hit enter key to execute a command



# Browsing Directories and Files

## Directory and file quick view

Directories are organized in a hierarchy (tree structure) starting from "/" (the root directory)

## Commands

pwd (print working directory): show the working (current) directory

ls (list): list files in the specified directory

cd (change directory): go to another directory

# pwd, cd, ls

~ means the home directory for a user

pwd to display current directory path starting from the root /

The ls command displays all files and sub-directories

Starting from the home directory: change to the "Documents" sub-directory. Note directory names are case sensitive. Notice the change of the command prompt on the next line.

See the command prompt to confirm directory changes

"/" means the root directory, the parent of all directories.

cd without any target will change to the home directory ~

".." means the parent directory, the immediate upper level directory.

-l option will show files in a long format.

```
it4423@ubuntu: /home
File Edit View Search Terminal Help
it4423@ubuntu:~$ pwd
/home/it4423
it4423@ubuntu:~$ ls
Desktop Downloads Music Public
Documents examples.desktop Pictures Templates
it4423@ubuntu:~$ cd Documents/
it4423@ubuntu:~/Documents$ ls
it4423@ubuntu:~/Documents$ cd ..
it4423@ubuntu:~$ cd /
it4423@ubuntu:/$ ls
bin dev initrd.img media proc sbin sys var
boot etc lib mnt root selinux tmp vmlinuz
cdrom home lost+found opt run srv
it4423@ubuntu:/$ cd
it4423@ubuntu:~$ cd ..
it4423@ubuntu:~/home$ pwd
/home
it4423@ubuntu:~/home$ ls
it4423
it4423@ubuntu:~/home$ ls -l
total 4
drwxr-xr-x 22 it4423 it4423 4096 Jan 7 10:55 it4423
it4423@ubuntu:~/home$
```

# Commands to View Text Files

## cat

No paging

## more

With paging options but can only go forward (pressing space bar).  
Press "q" to exit.

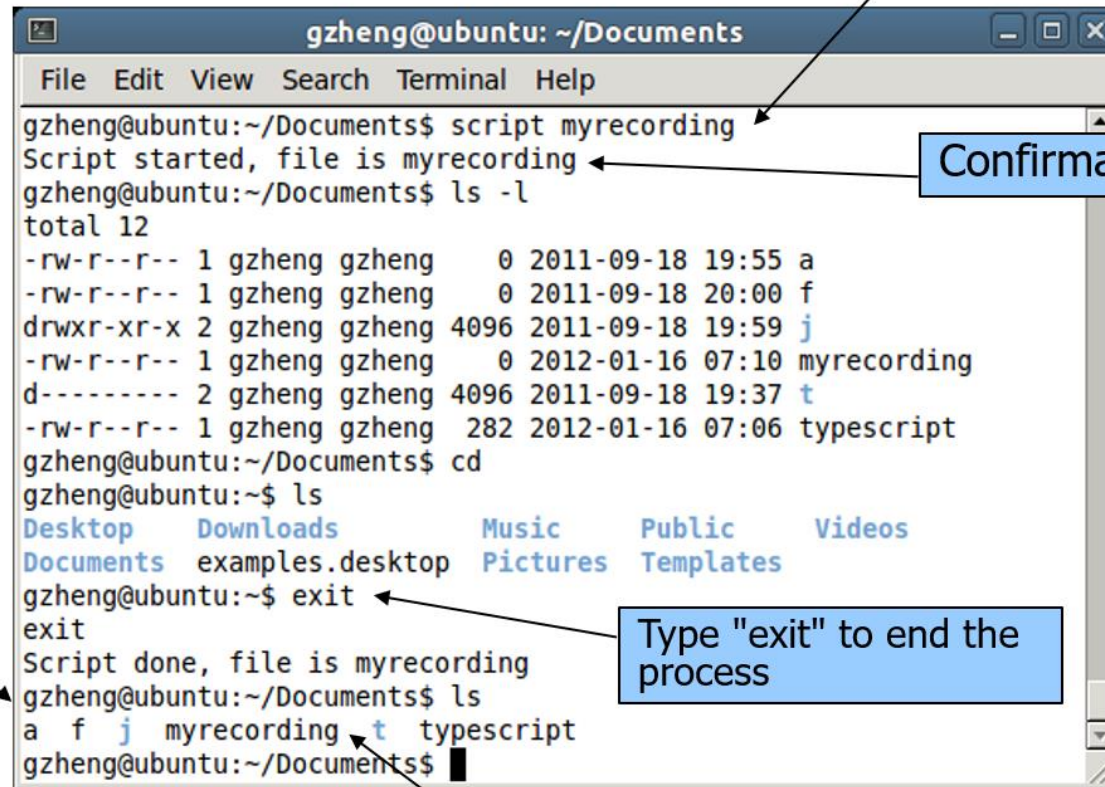
## less

With paging options and go forward and backward (using page-up and page-down keys).  
Press "q" to exit.

[The Ultimate Power of Less](#)

# Recording Screen Input and Output

- "script" command



```
gzheng@ubuntu: ~/Documents
File Edit View Search Terminal Help
gzheng@ubuntu:~/Documents$ script myrecording
Script started, file is myrecording
gzheng@ubuntu:~/Documents$ ls -l
total 12
-rw-r--r-- 1 gzheng gzheng    0 2011-09-18 19:55 a
-rw-r--r-- 1 gzheng gzheng    0 2011-09-18 20:00 f
drwxr-xr-x 2 gzheng gzheng 4096 2011-09-18 19:59 j
-rw-r--r-- 1 gzheng gzheng    0 2012-01-16 07:10 myrecording
d----- 2 gzheng gzheng 4096 2011-09-18 19:37 t
-rw-r--r-- 1 gzheng gzheng 282 2012-01-16 07:06 typescript
gzheng@ubuntu:~/Documents$ cd
gzheng@ubuntu:~$ ls
Desktop  Downloads  Music  Public  Videos
Documents  examples.desktop  Pictures  Templates
gzheng@ubuntu:~$ exit
exit
Script done, file is myrecording
gzheng@ubuntu:~/Documents$ ls
a f j myrecording t typescript
gzheng@ubuntu:~/Documents$
```

Start the process and save to a file "myrecording".

Confirmation

Notice the directory is changed back.

Type "exit" to end the process

Here's a script file saved.

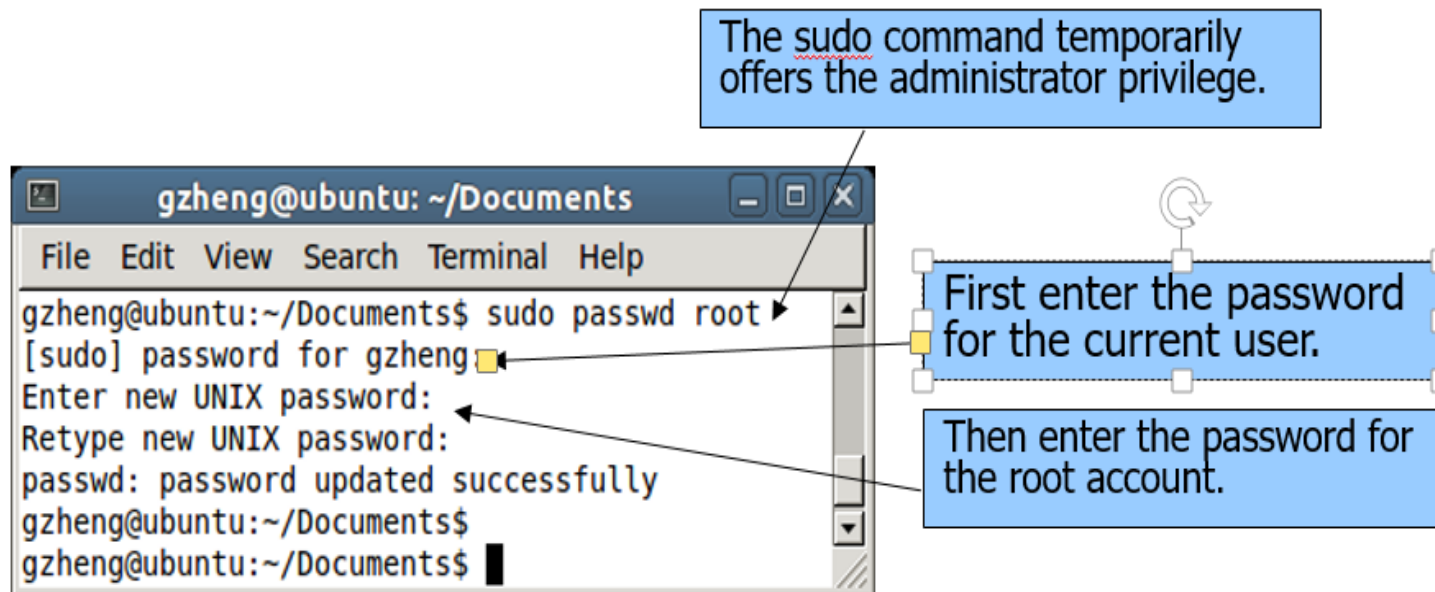
# Need More Privileges?

## Enable the "root" account

"root" account is the top level administrator in the Linux OS.

By default it is not enabled for security reasons.

Enable it by assigning a password to it.



# Text Editing

PICO (Pine Composer) is a simple to use text editor

Editing and command modes are unified

Nano is a GNU clone of PICO because PICO does not have a free software license

Others

VI, VIM, EMACS

# Other Common System Commands

## clear

Clear the terminal screen

## date

Display/set current date and time

[Linux date command](#)

## cal

Show monthly calendar

[Linux cal and ncal command](#)

# Summary

## Key concepts

Open source, GNU

OS, Unix, Linux, Linux distribution

VMWare, virtual machine

X Window System, and its components, X server, X client

Desktop environment, window manager, display manager

Gnome, KDE

CLI, terminal, command prompt, directory, file

## Key skills, commands and operations

Install Ubuntu Linux in VMware Player.

Basic use of GUI and CLI

CLI commands

cd, pwd, ls

cat, more, less

script, clear, date, cal

pico, nano, vim



# Good Readings and Resources

[Operating systems](#)

[Unix history](#)

[GNU philosophy](#)

[Linux distributions](#)

[X Window System](#)

[Linux desktop environments](#)

[Desktop resources](#)

[Introduction to Linux command line](#)

