



# Linux Environment and UI

IT 4423

Unix/Linux Administration

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Spring 2012



# Overview

- ◆ X-Window and desktop environment
- ◆ Command line environment

# Basic Computer User Interfaces

## ◆ Command-line Interface (CLI)

- Interacting with the system by typing commands
- Text based
- Line by line input and output

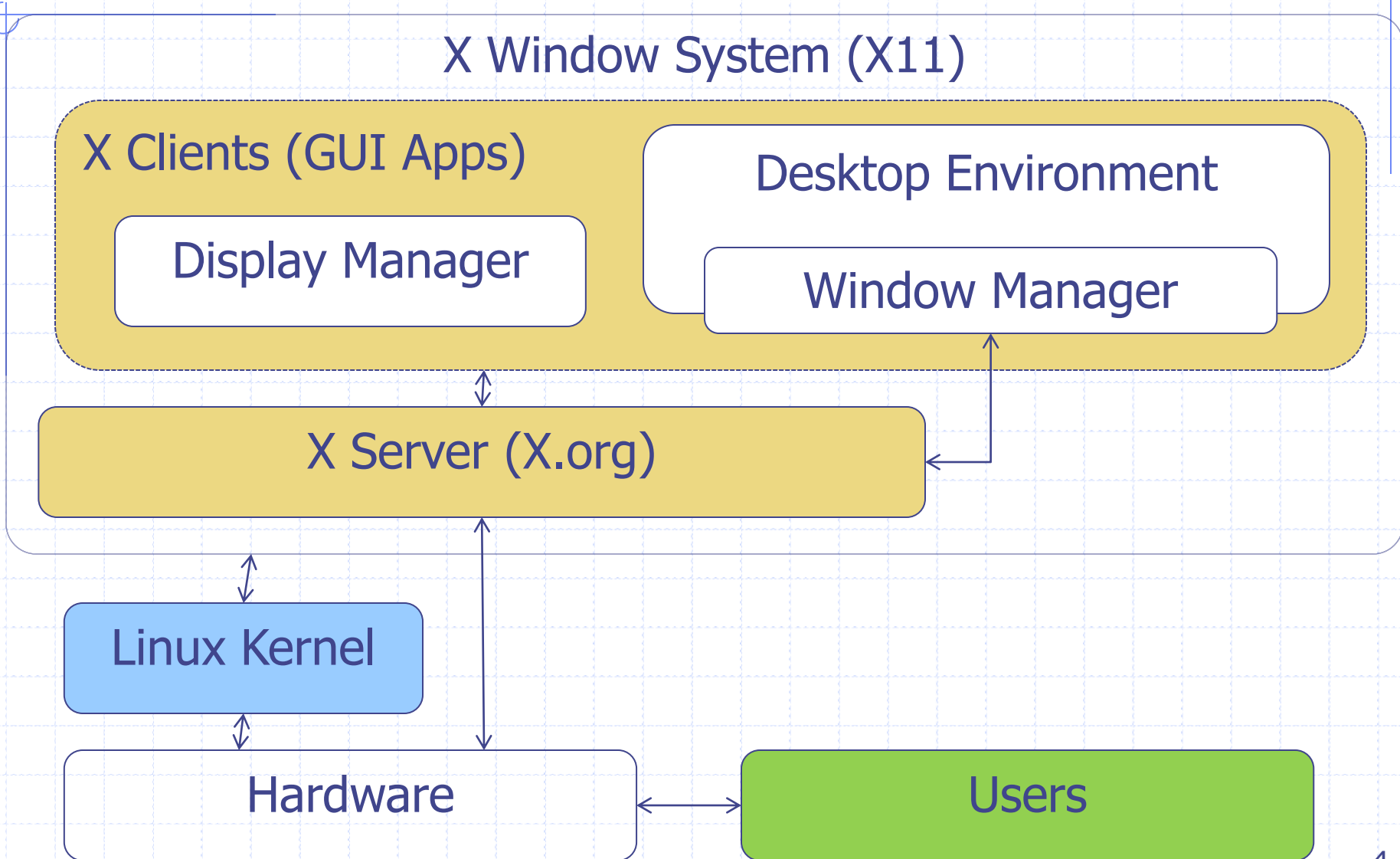
## ◆ Graphical User Interface (GUI)

- 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 (X11)



# X Window System

## ◆ X Window System

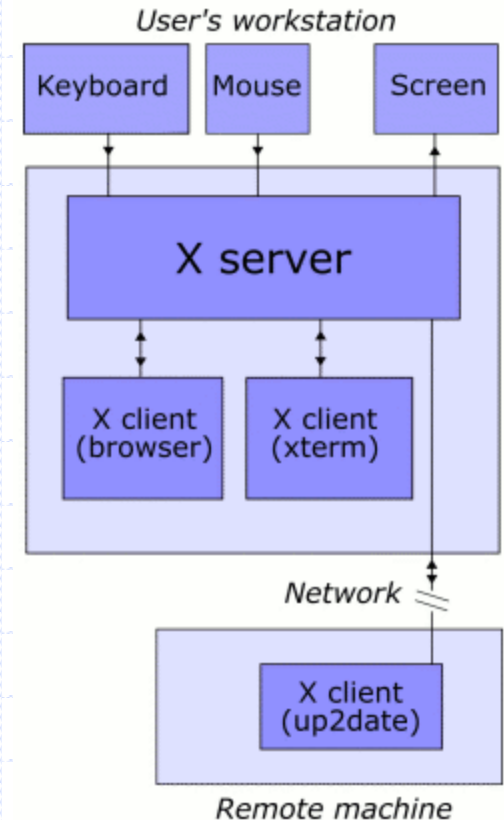
- A protocol that defines how graphics are used

## ◆ 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>



[http://en.wikipedia.org/wiki/File:X\\_client\\_sever\\_example.svg](http://en.wikipedia.org/wiki/File:X_client_sever_example.svg)

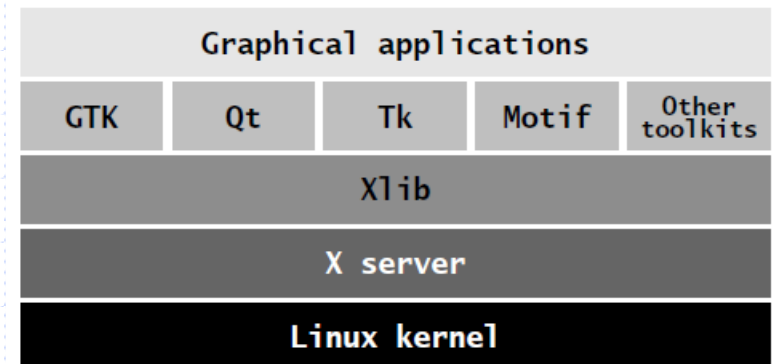


Figure 8-1 The X stack

# Window Manager and Desktop Environment

## ◆ Window manager

- Manages placement and appearance of windows

## ◆ Desktop environment

- A desktop environment is a more comprehensive package to bring together assorted X clients and create a common graphical user environment and development platform.
- Popular ones
  - ◆ KDE Plasma: <http://kde.org/workspaces>
  - ◆ GNOME: <http://www.gnome.org>
  - ◆ Lightweight: Xfce, LXDE

# GNOME

- ◆ Emphasis on simplicity, usability, and making things just work – “KISS”
- ◆ 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, is “the next generation of GNOME”.
    - ◆ A completely new modern desktop
    - ◆ <http://gnome3.org>

# 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

# Other Desktops

## ◆ Xfce

- <http://www.xfce.org>

## ◆ LXDE

- <http://lxde.org>

## ◆ CDE: common desktop environment, traditionally for Unix systems

- [http://en.wikipedia.org/wiki/Common\\_Desktop\\_Environment](http://en.wikipedia.org/wiki/Common_Desktop_Environment)
- <http://xwinman.org/cde.php>

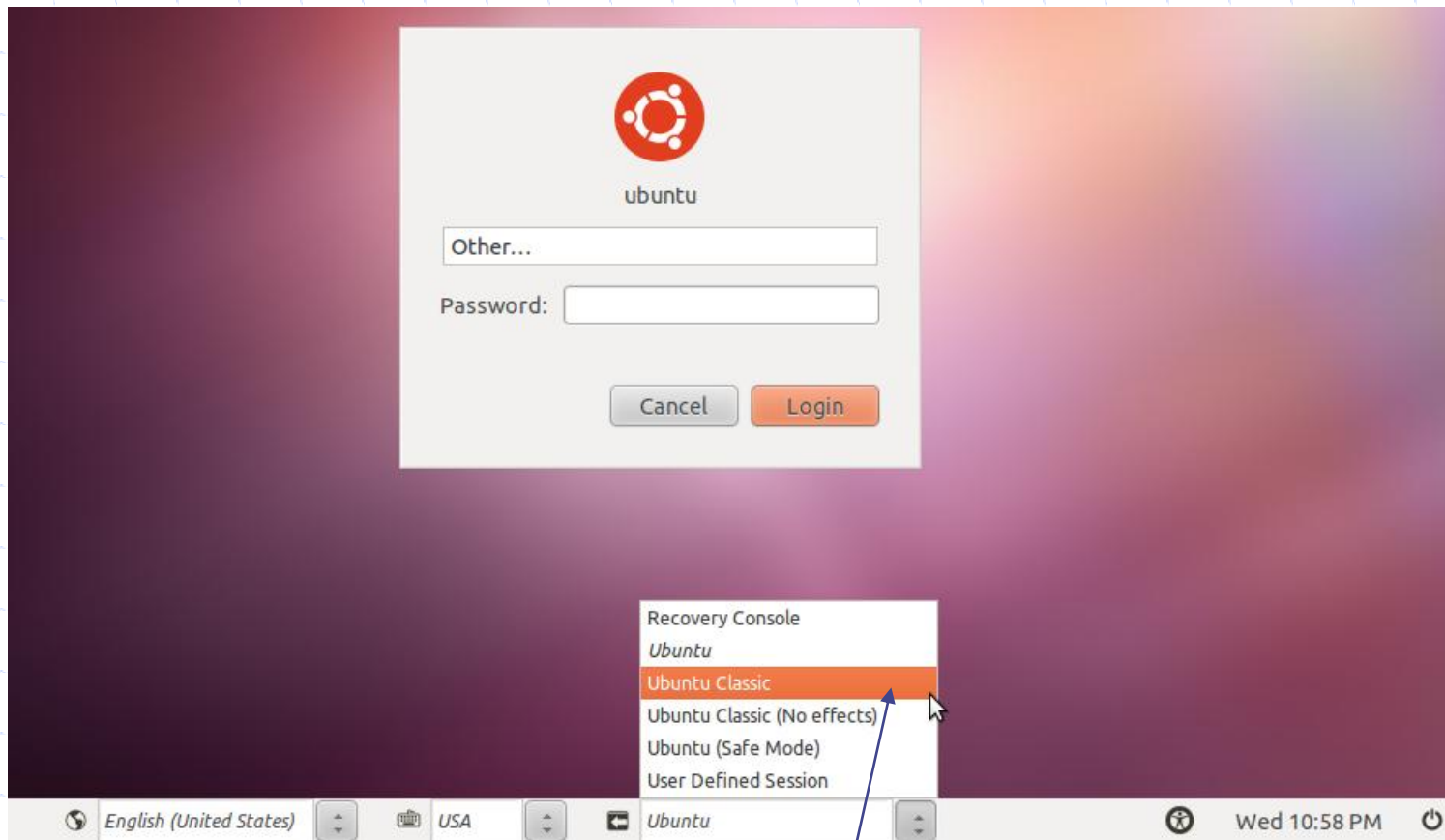
## ◆ Unity: a graphical shell for Ubuntu

- <http://unity.ubuntu.com>

# Desktop Environments for Ubuntu Linux

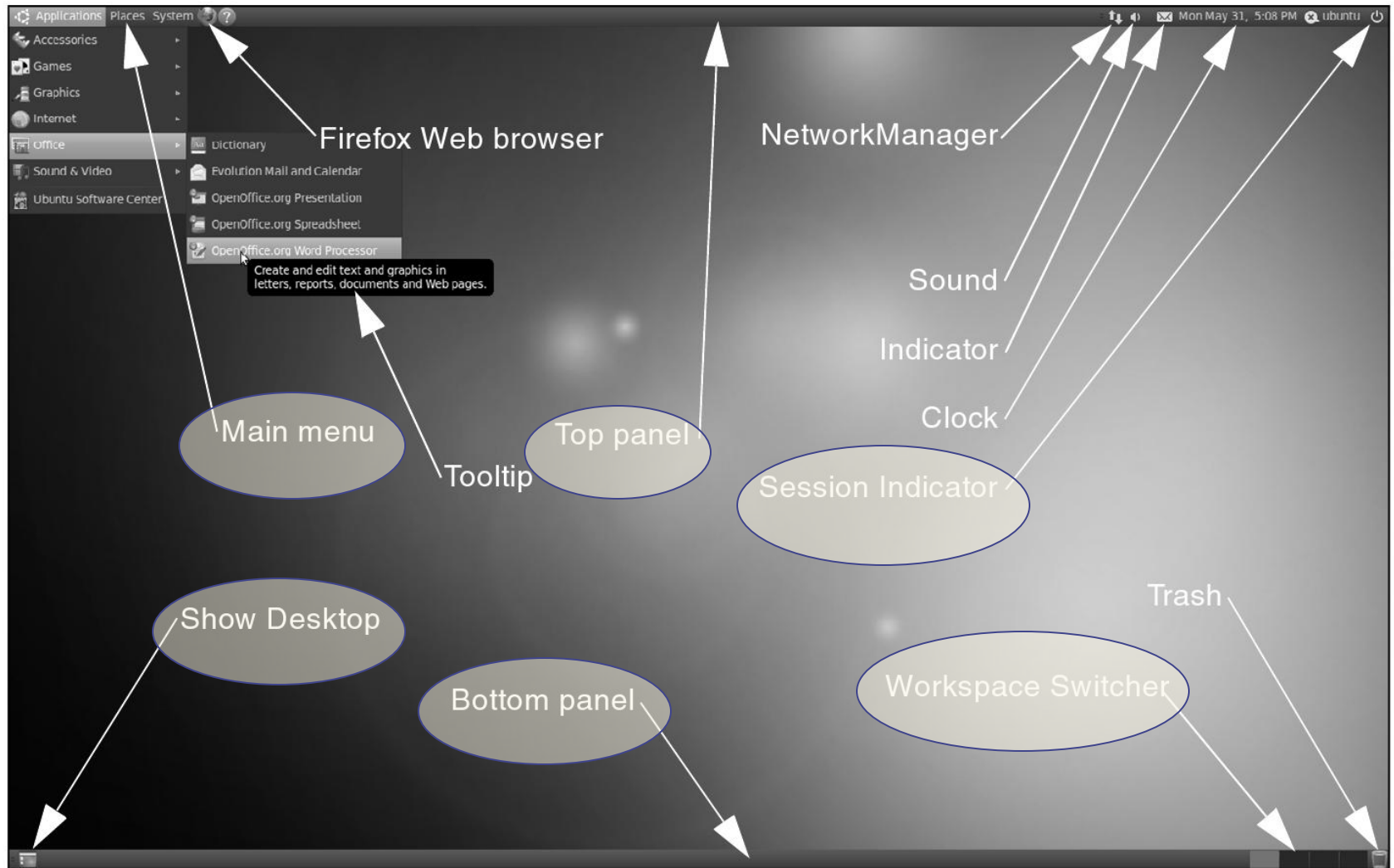
- ◆ Before 11.04, Gnome is the default desktop environment
- ◆ v11.04 adopts “Unity” as the default, but ships Gnome as part of the package (Ubuntu Classic)
  - Note the virtual machine will not run Unity so Gnome is the default.
- ◆ KDE is a separate package that can be downloaded and installed

# Choosing a Login Session Type



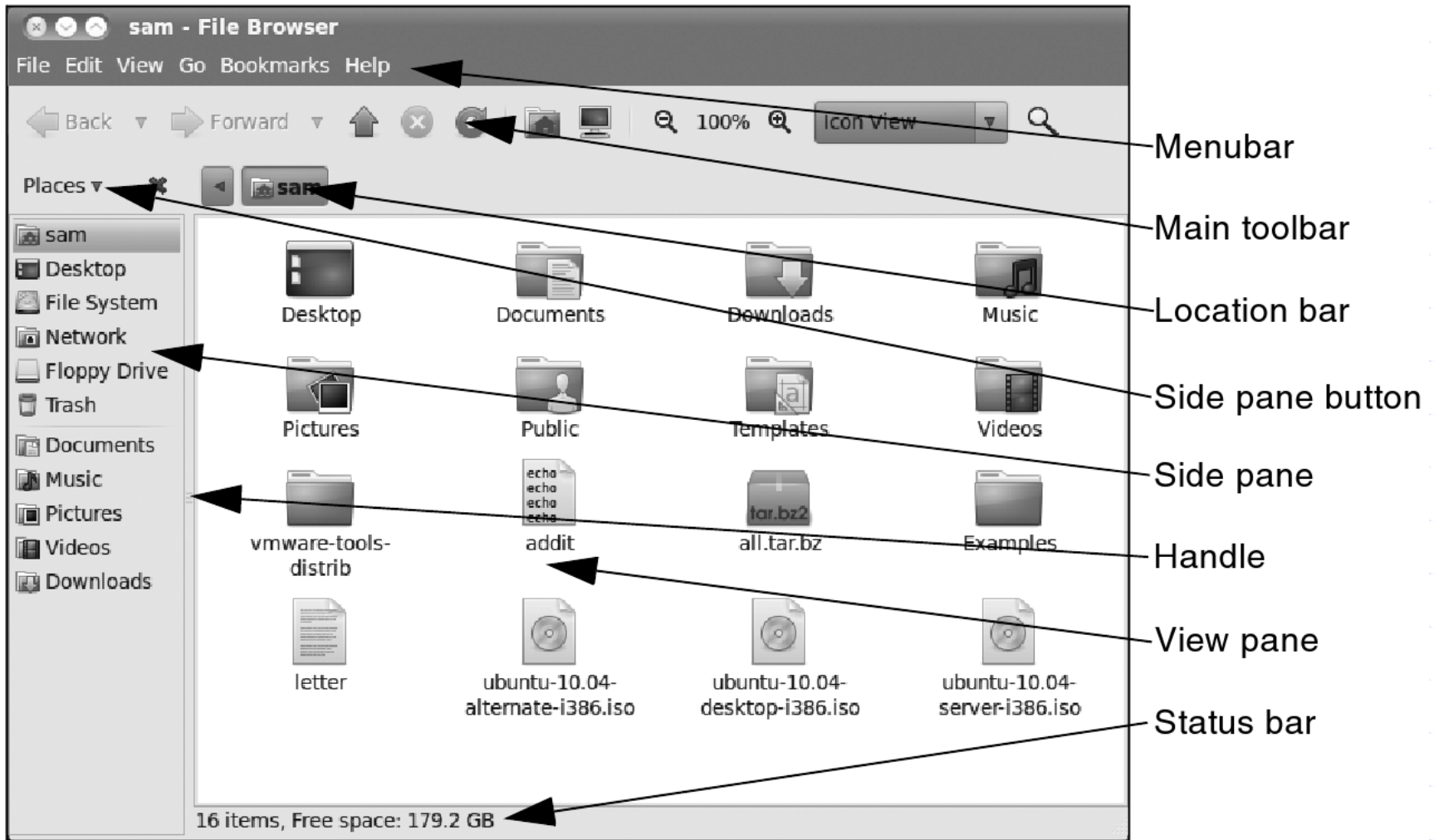
This is Gnome.

# GNOME v2.32 Desktop Overview



**Figure 4-2** The initial workspace

# Nautilus File Manager



**Figure 8-2** A Nautilus File Browser window displaying icons

# Gnome Desktop Guide

◆ Refer to the following site

- <http://library.gnome.org/users/user-guide/>

# Use KDE on Ubuntu

## ◆ Kubuntu

- Ubuntu Linux with KDE by default
- <http://www.kubuntu.org/>
- Note: during the installation you may experience black screen for a while, just wait patiently.

## ◆ Install KDE in Ubuntu

- <http://www.psychocats.net/ubuntu/kde>
- Note: the installation may take quite some time.

# 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

## ◆ Commands

- Each command has a command name (required), options and arguments (required or optional)
- Hit enter key to execute a command

# Basic Command Operations

- ◆ Auto completion: tab key
  - No need to type all characters!
  - This applies to commands and directory/file names
- ◆ Command history
  - Use up/down arrow key to navigate through commands entered before.
  - Use history command
    - ◆ <http://www.computerhope.com/unix/uhistory.htm>
- ◆ Command editing
  - Use left/right arrow keys, del, backspace to edit a command

# Browsing Directories and Files

## ◆ Directory and file preview

- 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

# ls

The ls command displays all files and sub-directories

-F option will show file type symbol: "/" means this is a sub directory.

-a option will show all files: hidden files which start with a dot .

Two options combined to show all files with file type symbol

-l option will show files in a long format.

```
root@ubuntu: ~
File Edit View Search Terminal Help
root@ubuntu:~# ls
Desktop Downloads Pictures Templates
Documents Music Public Videos
root@ubuntu:~# ls -F
Desktop/ Downloads/ Pictures/ Templates/
Documents/ Music/ Public/ Videos/
root@ubuntu:~# ls -a
. Downloads .local Templates
.. .gconf .mozilla .themes
.bashrc .gconfd Music .thumbnails
.cache .gnome2 .nautilus Videos
.config .gnome2_private Pictures .xsession-errors
.dbus .gtk-bookmarks .profile .xsession-errors.old
Desktop .gvfs Public
.dmrc .ICEauthority .pulse
Documents .icons .pulse-cookie
root@ubuntu:~# ls -aF
./ Downloads/ .local/ Templates/
../ .gconf/ .mozilla/ .themes/
.bashrc .gconfd/ Music/ .thumbnails/
.cache/ .gnome2/ .nautilus/ Videos/
.config/ .gnome2_private/ Pictures/ .xsession-errors
.dbus/ .gtk-bookmarks .profile .xsession-errors.old
Desktop/ .gvfs/ Public/
.dmrc .ICEauthority .pulse/
Documents/ .icons/ .pulse-cookie
root@ubuntu:~# ls -l
total 32
drwxr-xr-x 2 root root 4096 2012-01-06 11:24 Desktop
drwxr-xr-x 2 root root 4096 2012-01-06 11:24 Documents
drwxr-xr-x 2 root root 4096 2012-01-06 11:24 Downloads
drwxr-xr-x 2 root root 4096 2012-01-06 11:24 Music
drwxr-xr-x 2 root root 4096 2012-01-06 11:24 Pictures
drwxr-xr-x 2 root root 4096 2012-01-06 11:24 Public
drwxr-xr-x 2 root root 4096 2012-01-06 11:24 Templates
drwxr-xr-x 2 root root 4096 2012-01-06 11:24 Videos
root@ubuntu:~#
```

# cd



~ means the home directory for a user

See the command prompt to confirm directory changes

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.

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

```
gzheng@ubuntu: /etc/firefox
File Edit View Search Terminal Help
gzheng@ubuntu:~$ cd Documents/
gzheng@ubuntu:~/Documents$ cd /
gzheng@ubuntu:/$ cd
gzheng@ubuntu:~$ cd ..
gzheng@ubuntu:/home$ cd ..
gzheng@ubuntu:/$ cd home/gzheng/Documents
gzheng@ubuntu:~/Documents$ cd /root/Desktop
-bash: cd: /root/Desktop: Permission denied
gzheng@ubuntu:~/Documents$ cd /etc/firefox
gzheng@ubuntu:/etc/firefox$
```

cd without any target will change to the home directory ~

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

Use relative path (starting from the current directory) to go to any level of sub-directory.

The root directly is reserved for the "root" user.

Use absolute path (always starting with "/") to go to any directory directory

# 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.



"less" is more.

# Get Command Reference

## ◆ man

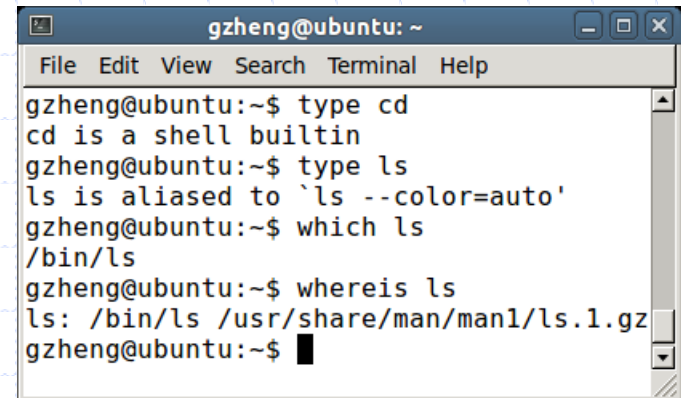
- View command manuals (press "q" to exit)

## ◆ type

- Show the type of a command

## ◆ which

- Show the file location of a command.



```
gzheng@ubuntu: ~  
File Edit View Search Terminal Help  
gzheng@ubuntu:~$ type cd  
cd is a shell builtin  
gzheng@ubuntu:~$ type ls  
ls is aliased to `ls --color=auto'  
gzheng@ubuntu:~$ which ls  
/bin/ls  
gzheng@ubuntu:~$ whereis ls  
ls: /bin/ls /usr/share/man/man1/ls.1.gz  
gzheng@ubuntu:~$
```

## ◆ whereis

- Locate binary, source, manual, configuration, and other files related to a command.

# Recording Screen Input and Output

## ◆ "script" command

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

```
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$
```

Confirmation

Notice the directory is changed back.

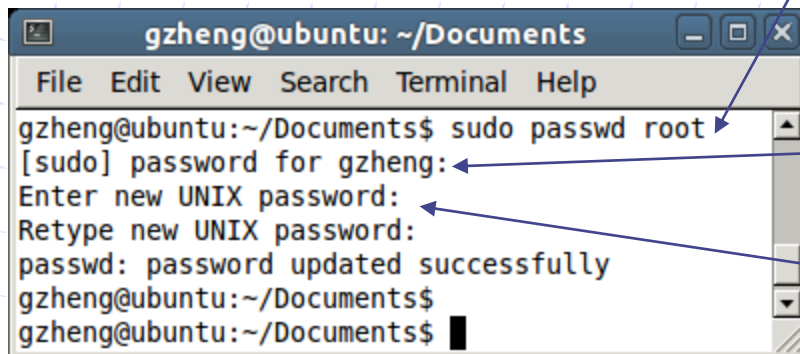
Type "exit" to end the process

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.



```
gzheng@ubuntu: ~/Documents
File Edit View Search Terminal Help
gzheng@ubuntu:~/Documents$ sudo passwd root
[sudo] password for gzheng:
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
gzheng@ubuntu:~/Documents$
gzheng@ubuntu:~/Documents$
```

The sudo command temporarily offers the administrator privilege.

First enter the password for the current user.

Then enter the password for the root account.

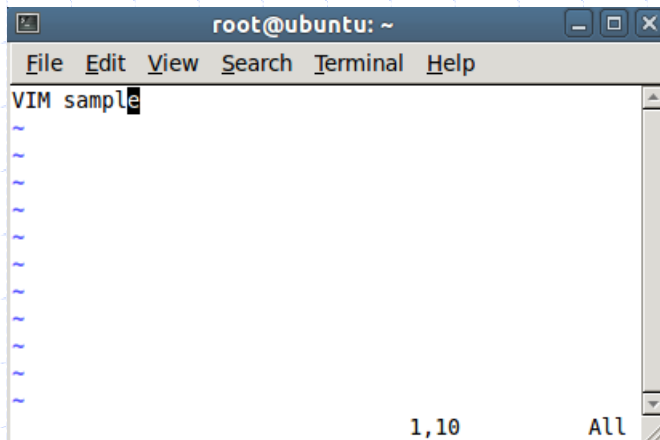
# VIM

## ◆ Using vim for text editing

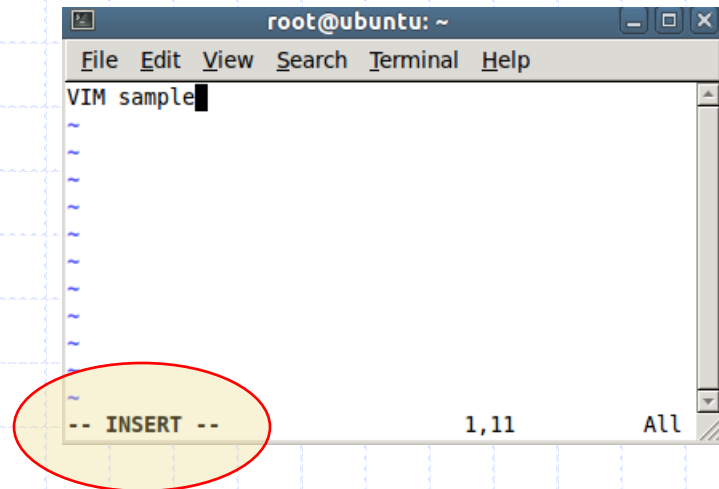
- vim [file name]
- vim is in command mode first; hit "i" to enter editing mode

## ◆ Two modes (indicated at the bottom)

- Insert (editing) mode: hit "i" key to enter
- Command mode: hit "Esc" key to enter



A terminal window titled "root@ubuntu: ~" showing the vim editor. The menu bar includes "File", "Edit", "View", "Search", "Terminal", and "Help". The text "VIM sample" is on the first line. The status bar at the bottom shows "1,10" and "All".



A terminal window titled "root@ubuntu: ~" showing the vim editor. The menu bar includes "File", "Edit", "View", "Search", "Terminal", and "Help". The text "VIM sample" is on the first line. The status bar at the bottom shows "1,11" and "All". The text "-- INSERT --" is highlighted with a red oval.

# VIM Operations

## ◆ Basic commands

- Quit
- Quit without saving
- Save
- Save as
- Save and exit
- Search

:q

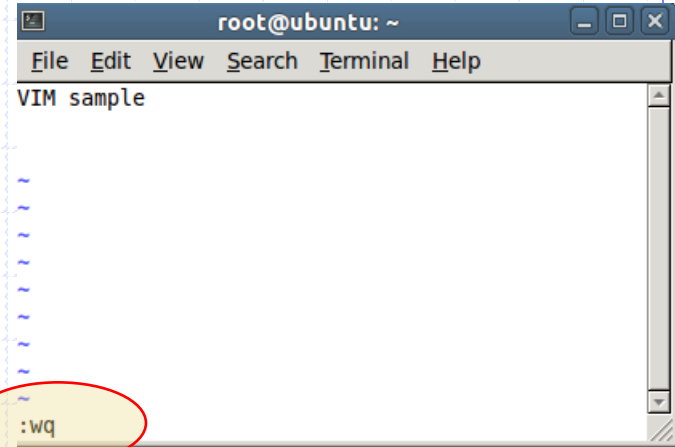
:q!

:w

:w [file name]

:wq

:/[pattern]

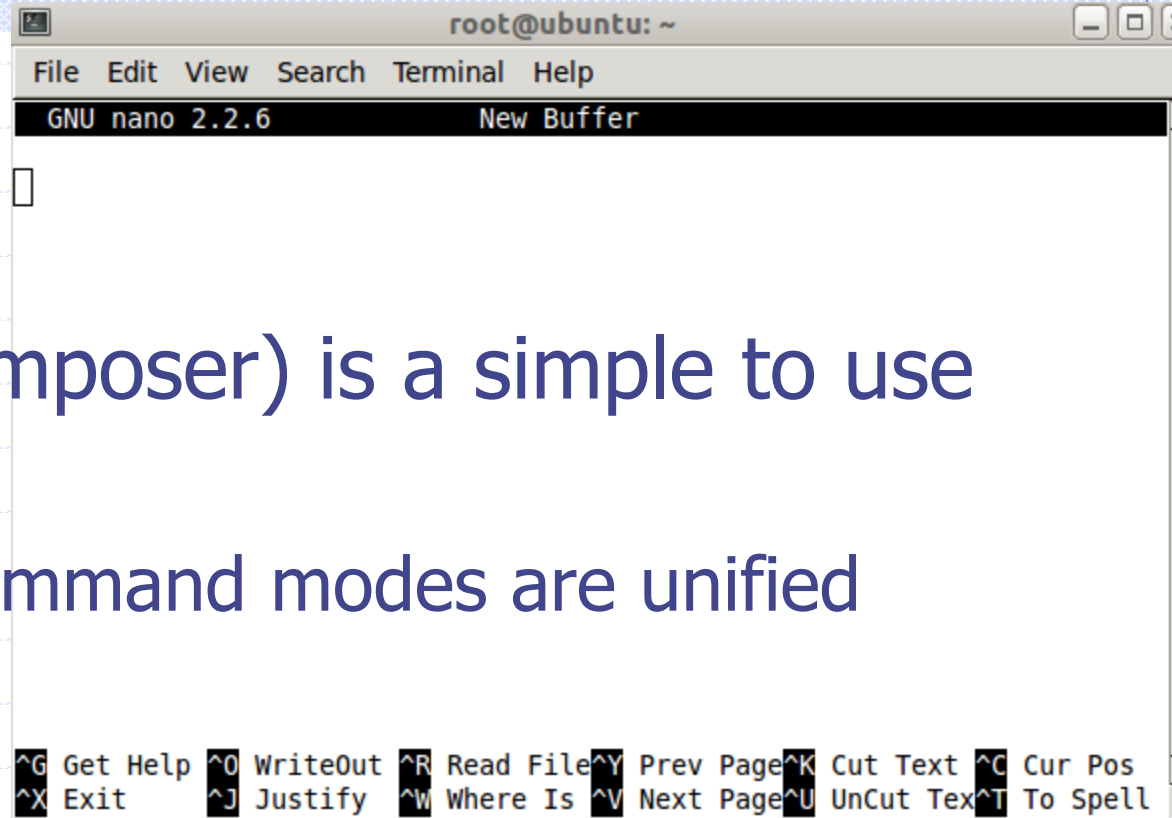


## ◆ vim command reference

- <http://www.tuxfiles.org/linuxhelp/vimcheat.html>

# PICO/Nano

- ◆ PICO (Pine Composer) is a simple to use text editor
  - Editing and command modes are unified



```
root@ubuntu: ~
File Edit View Search Terminal Help
GNU nano 2.2.6 New Buffer
^G Get Help ^O WriteOut ^R Read File ^Y Prev Page ^K Cut Text ^C Cur Pos
^X Exit ^J Justify ^W Where Is ^V Next Page ^U UnCut Tex ^T To Spell
```

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

# Other Common System Commands

## ◆ clear

- Clear the terminal screen

## ◆ date

- Display/set current date and time
- <http://www.computerhope.com/unix/udate.htm>

## ◆ cal

- Show monthly calendar
- <http://www.computerhope.com/unix/ucal.htm>

# Summary

## ◆ Key concepts

- 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 commands and operations

- Command execution, edit, history, auto-completion
- cd, pwd, ls
- cat, more, less
- man, type, which, whereis
- script, clear, date, cal
- vim, pico, nano

# Good Readings and Resources

## ◆ X Window System

- [http://en.wikipedia.org/wiki/X\\_Window\\_System](http://en.wikipedia.org/wiki/X_Window_System)
- <http://linuxdevcenter.com/pub/a/linux/2005/08/25/whatisXwindow.html>
- <http://tldp.org/HOWTO/XWindow-Overview-HOWTO/index.html>

## ◆ Linux desktop environments

- <http://www.renewablepcs.com/about-linux/kde-gnome-or-xfce>

## ◆ Desktop resources

- <http://opendesktop.org/>

## ◆ Introduction to Linux command line

- [http://www.freesoftwaremagazine.com/articles/command\\_line\\_intro](http://www.freesoftwaremagazine.com/articles/command_line_intro)