

UNIX講習

UNIXシステムとコマンドの紹介

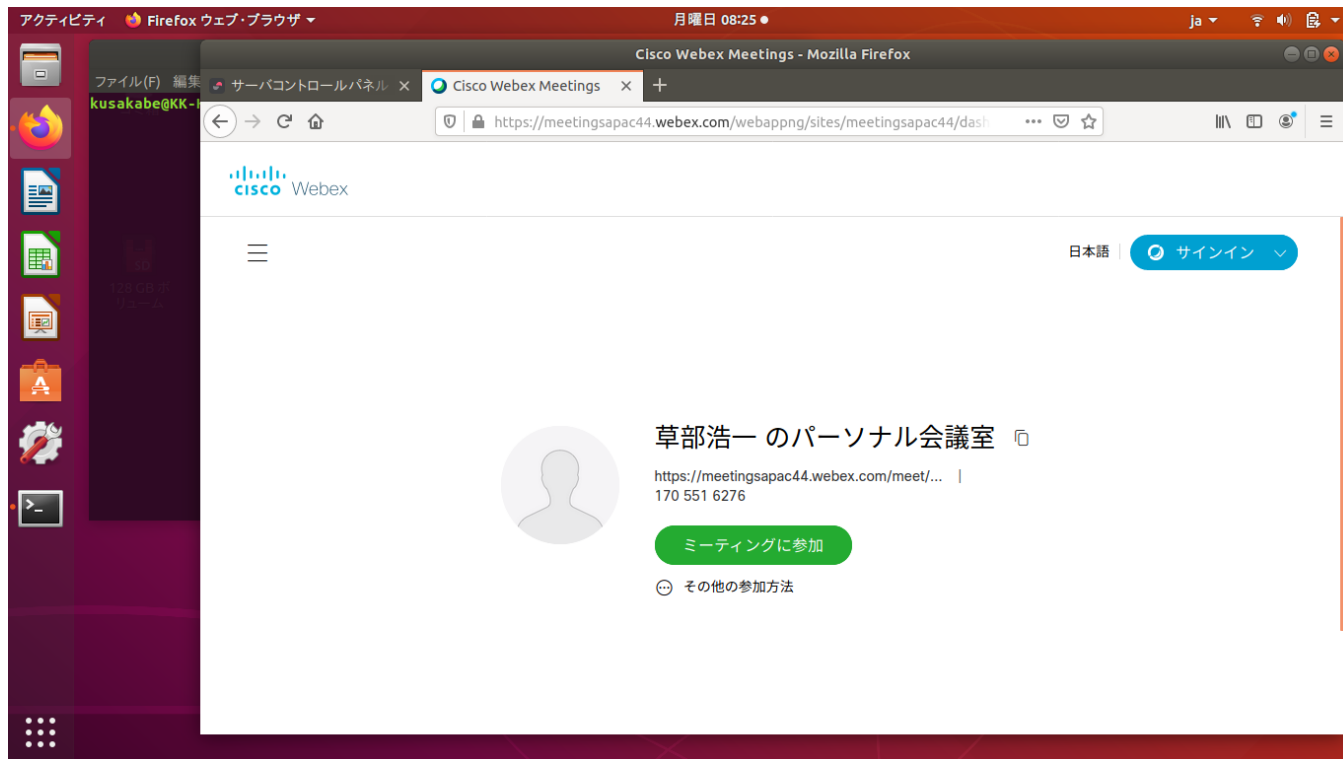
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物質創成専攻 未来物質領域

草部 浩一

Webex connection via Linux

- When you have a network connection via Linux successfully, ...
- You can use Webex via “Web applications”, e.g. “firefox”. Some tips will be shown later.



An instruction on X window (ubuntu machine)

- We use machines operated by a Linux system .
- Each user is identified by “user id” & “password”.
- Your terminal might start by pushing the monitor button (📺) .

User id is 'cmd'.



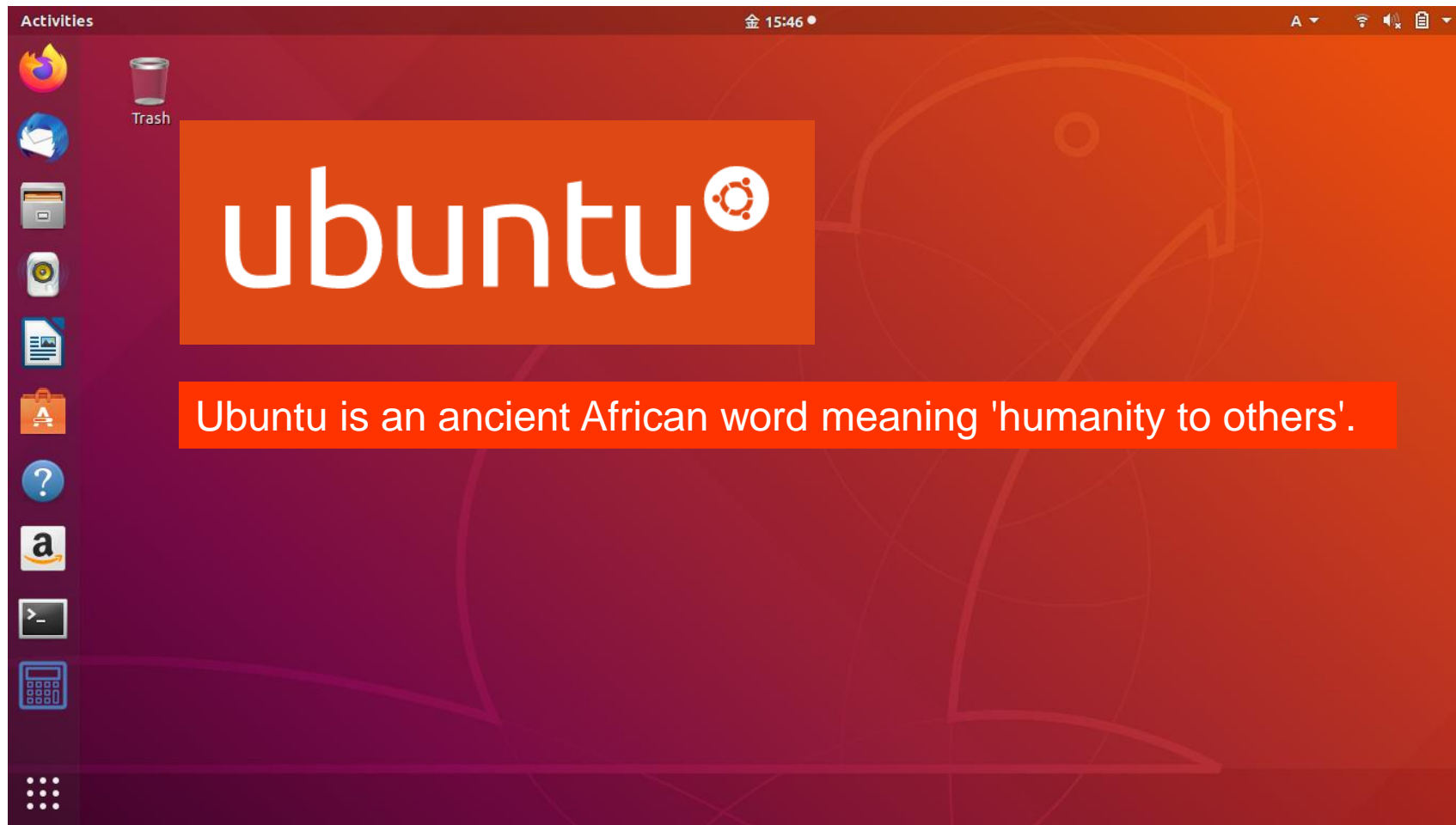
Please neglect this page when you have your own PC & Linux system for CMD-WS27!

You need password 'c.m.dworkshop' to login a terminal machine.

Another password 'cmdworkshop' might work to launch your machine.

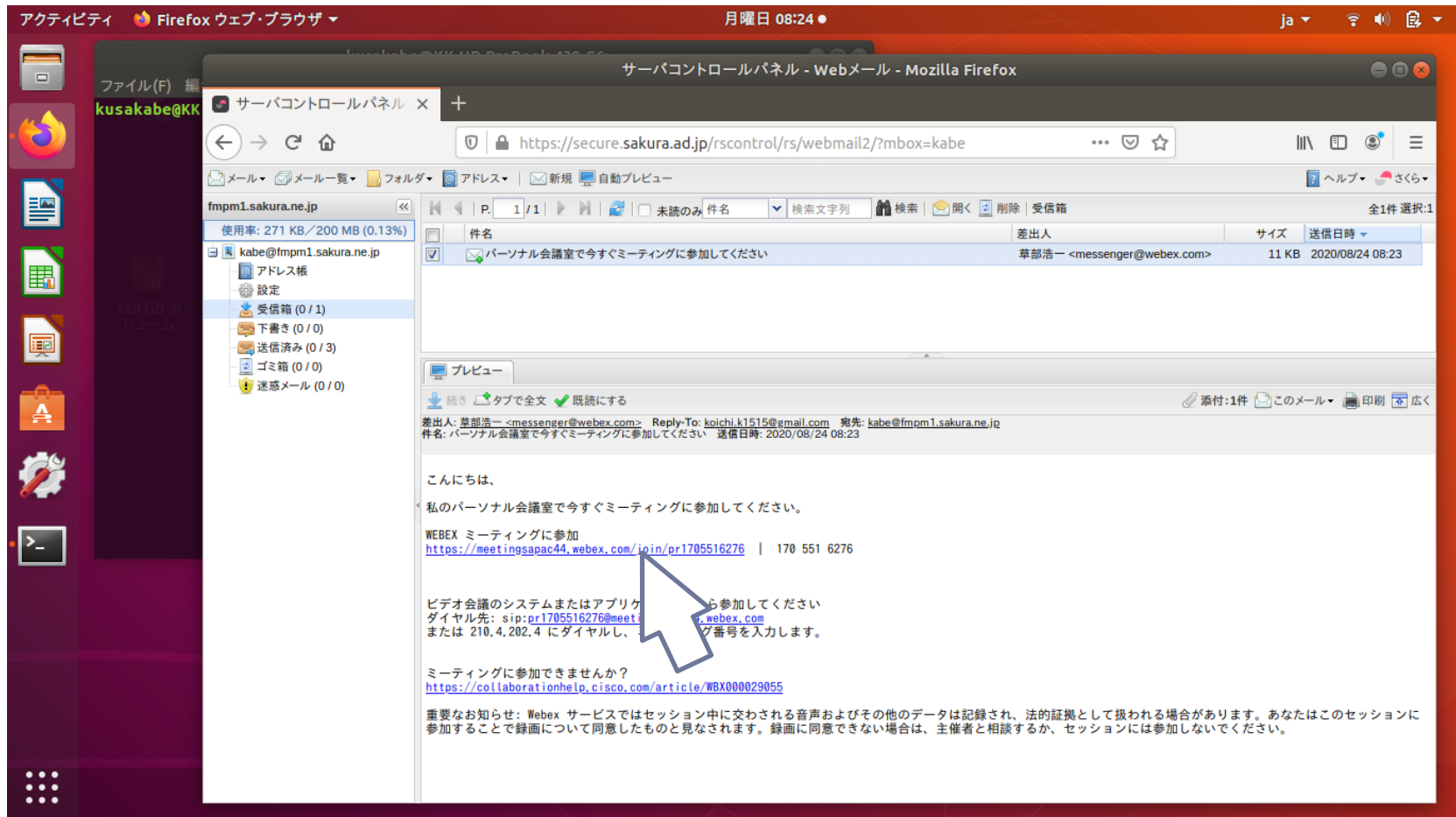
You have a good '日本語' environment, if you start by choosing it.

ubuntu : the spirit of Ubuntu to the world of computers



Two hints for Webex connection

- Obtain an invitation e-mail on Linux!
- Click “web-address” to get connection



You see the “terminal” icon. Click it.

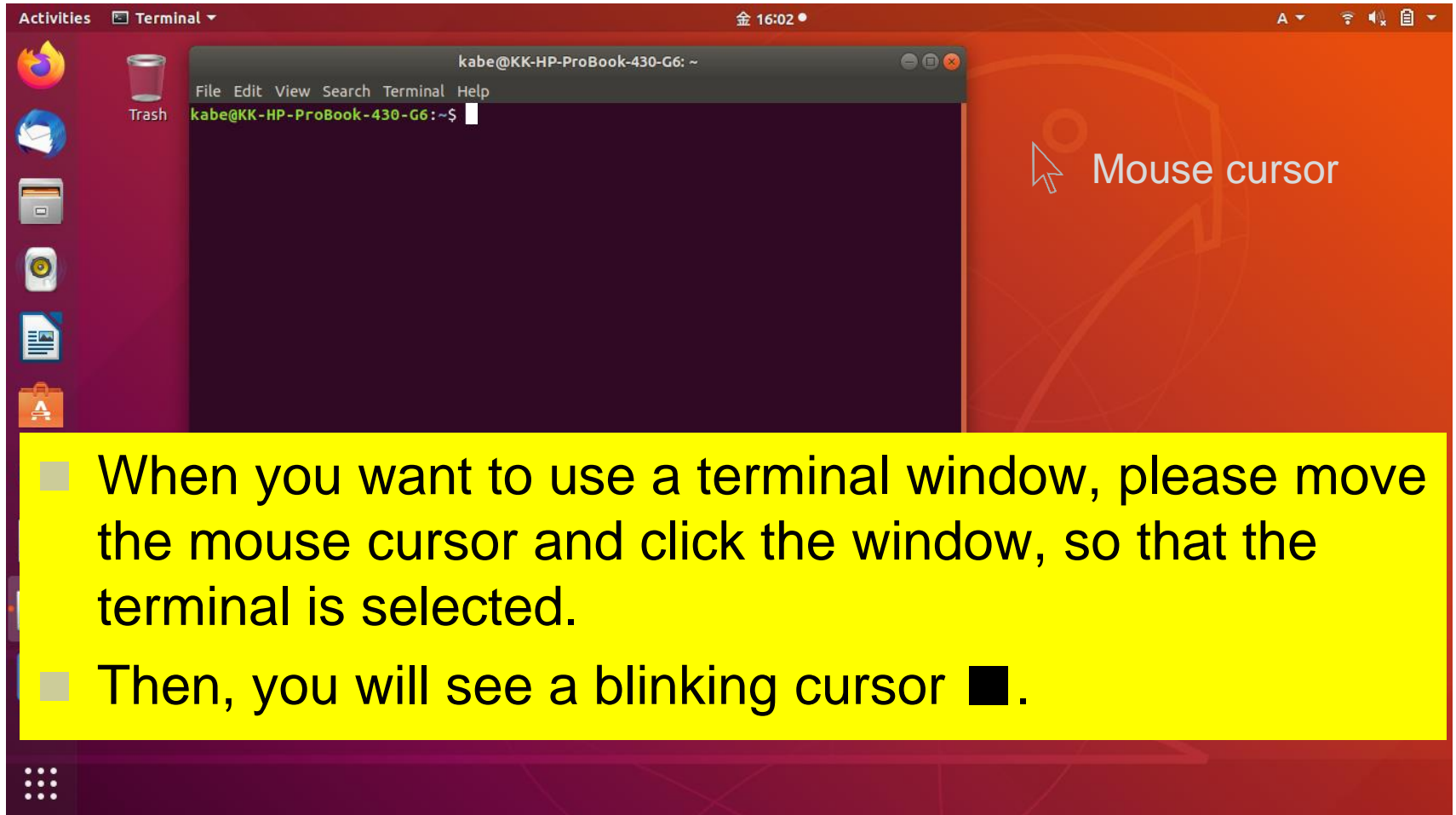
The image shows a screenshot of an Ubuntu desktop environment. The desktop background is a dark red color with a faint, stylized human head outline. The top panel displays the 'Activities' button on the left, the system clock showing '金 15:48' in the center, and system status icons on the right. The left sidebar contains a vertical stack of application icons: Firefox, Trash, Mail, Files, Music, Documents, Home, Dash, Amazon, and Calculator. The 'Terminal' icon, which is a black square with a white prompt character '> _', is highlighted with a red rectangular box. A blue arrow points from the bottom-left towards the terminal icon. A context menu is open over the terminal icon, listing the following options: 'All Windows', 'New Terminal', 'Remove from Favorites', 'Show Details', and 'Quit 2 Windows'. A blue text box at the bottom center contains the text: 'When you had 2 terminals, then =>'. The text 'Click the icon!' is written in large white font on the right side of the desktop.

Click the icon!

When you had 2 terminals, then =>

- All Windows
- New Terminal
- Remove from Favorites
- Show Details
- Quit 2 Windows

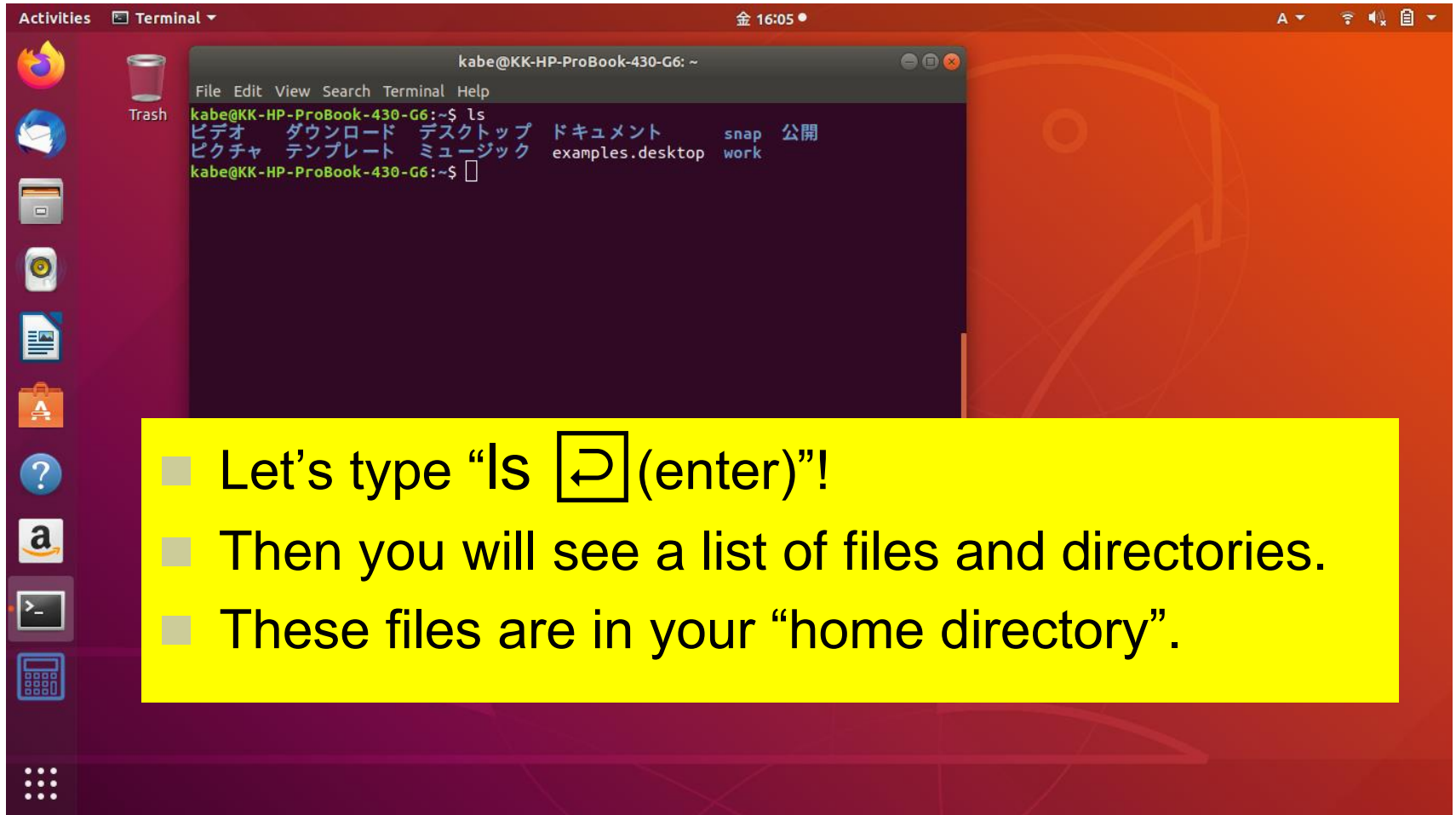
Selection of the terminal



When you want to use a terminal window, please move the mouse cursor and click the window, so that the terminal is selected.

- Then, you will see a blinking cursor ■.

Type “ls” to see your home directory.



The screenshot shows a Linux desktop environment with a terminal window open. The terminal title is "kabe@KK-HP-ProBook-430-G6: ~". The terminal output shows the result of the "ls" command:

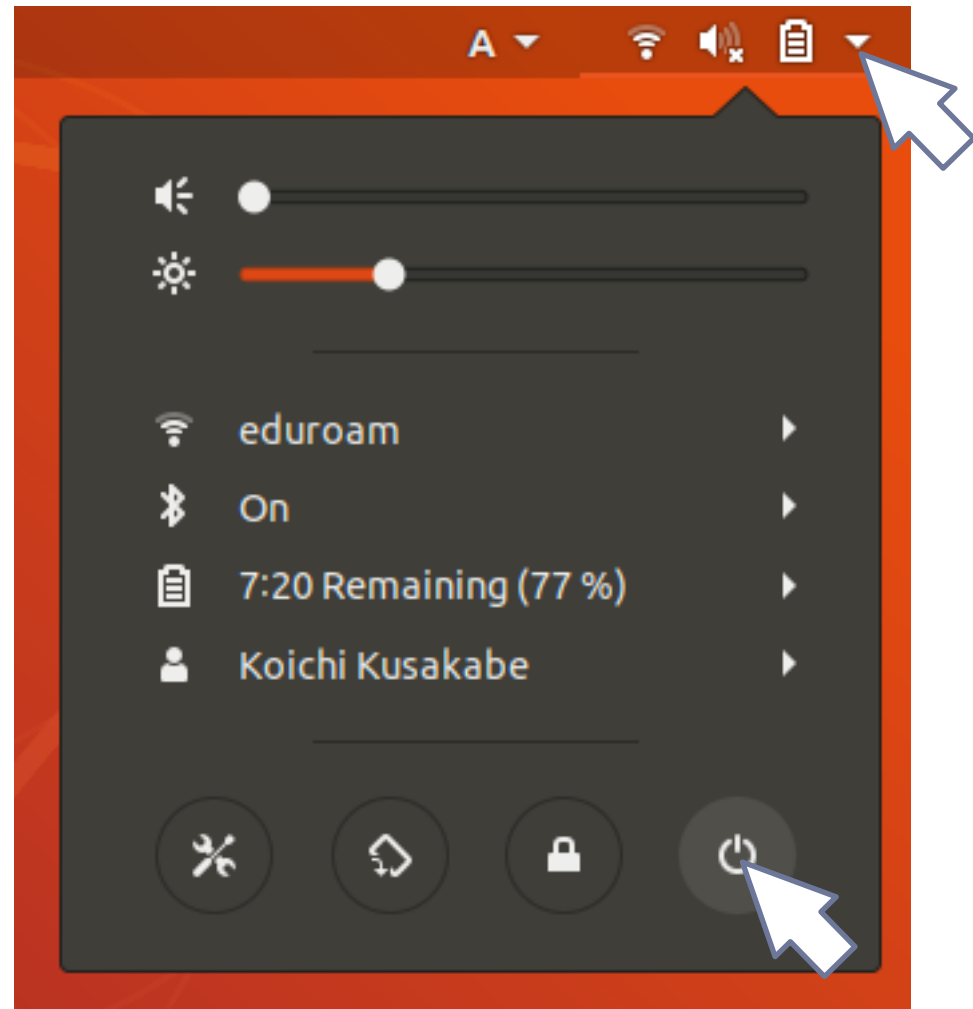
```
kabe@KK-HP-ProBook-430-G6:~$ ls  
ビデオ ダウンロード デスクトップ ドキュメント snap 公開  
ピクチャ テンプレート ミュージック examples.desktop work  
kabe@KK-HP-ProBook-430-G6:~$
```

The desktop background is red with a faint geometric pattern. The terminal window has a dark background with light text. The desktop environment includes a sidebar with various application icons and a top panel with system indicators.

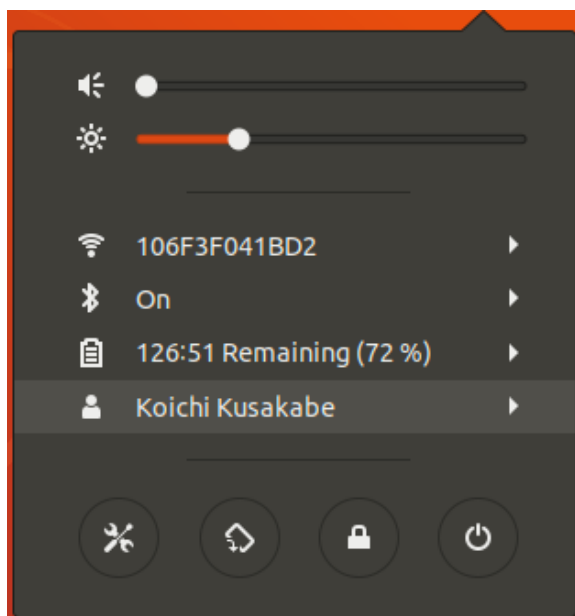
- Let's type “ls ↵ (enter)”!
- Then you will see a list of files and directories.
- These files are in your “home directory”.

To start “Log out” or “Shutdown”

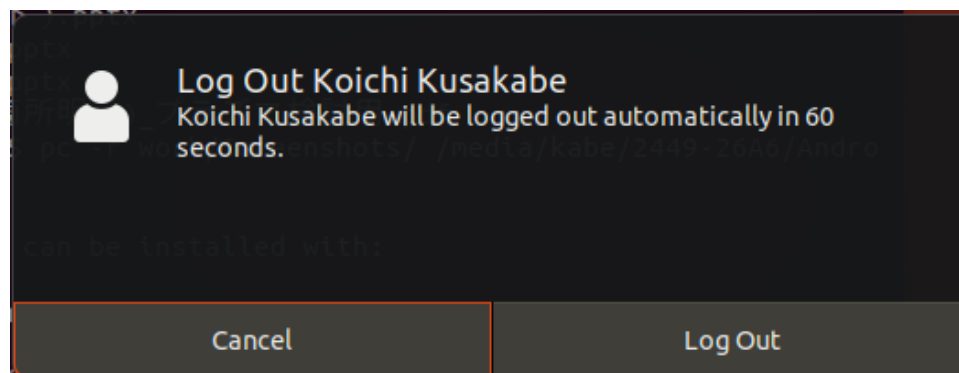
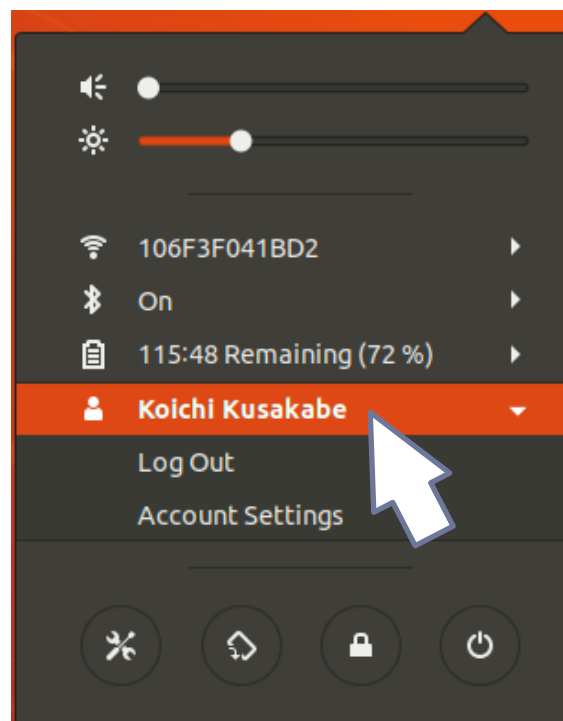
- Type an icon of the system setting in the title bar. You will see a pull down menu.
- You could have a little different style.
- But, it is not so difficult to find a solution solving your demands, once you get “your style”.



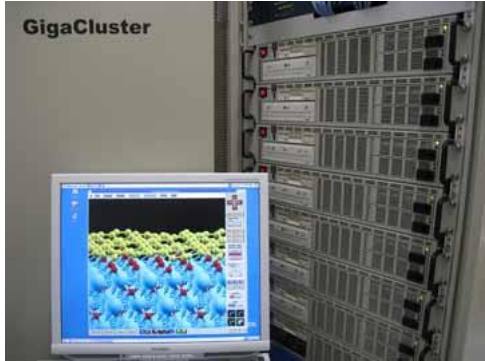
Logout procedure on ubuntu



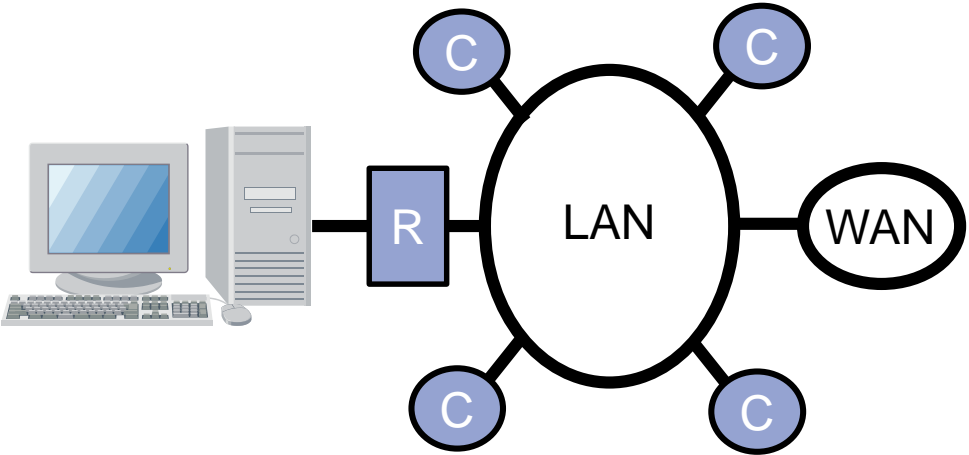
“Log Out” is hidden in a submenu.



Login : you start connection to the system!

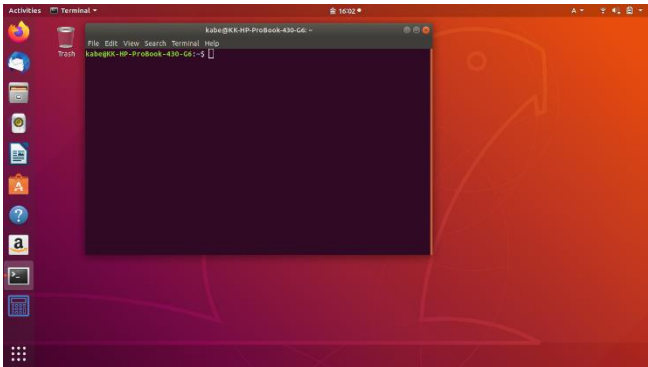


Bob → Unix on a PC A user in a Unix system → Another Unix system



A user → Internet

Always you would see,

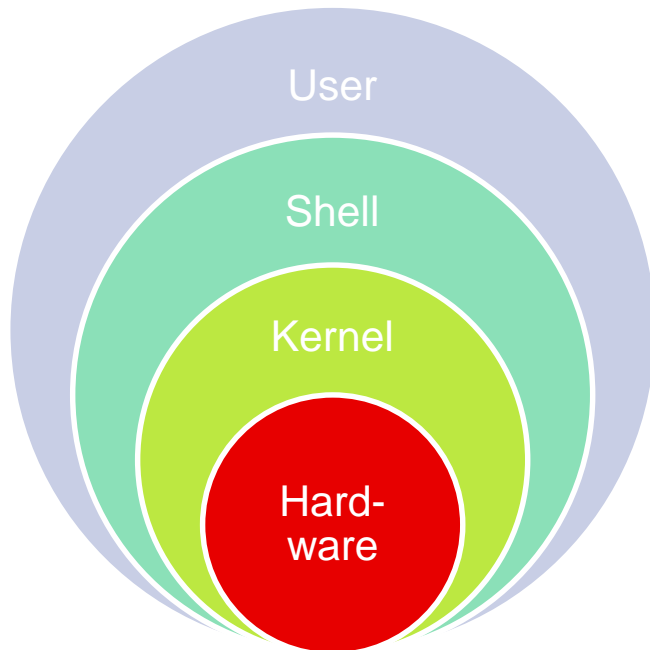


SSH : Secure Shell

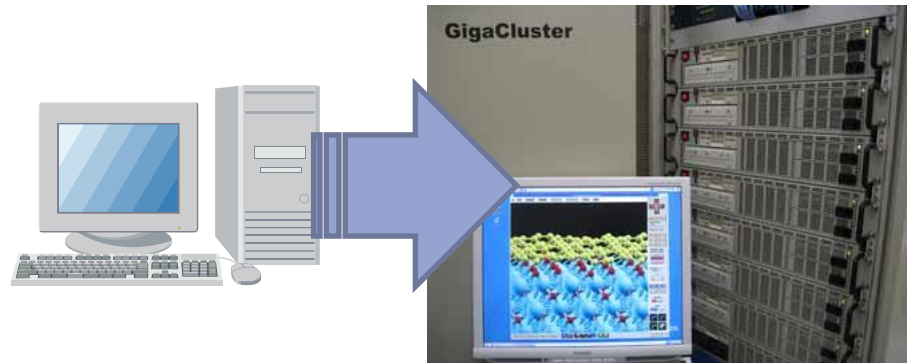
A cryptographical network protocol

This is “a protocol for secure data communication” between two networked computers. It allows us

- To connect your terminal PC to another computer,
- To “**login**” in a secure manner,
- To execute “remote commands”.

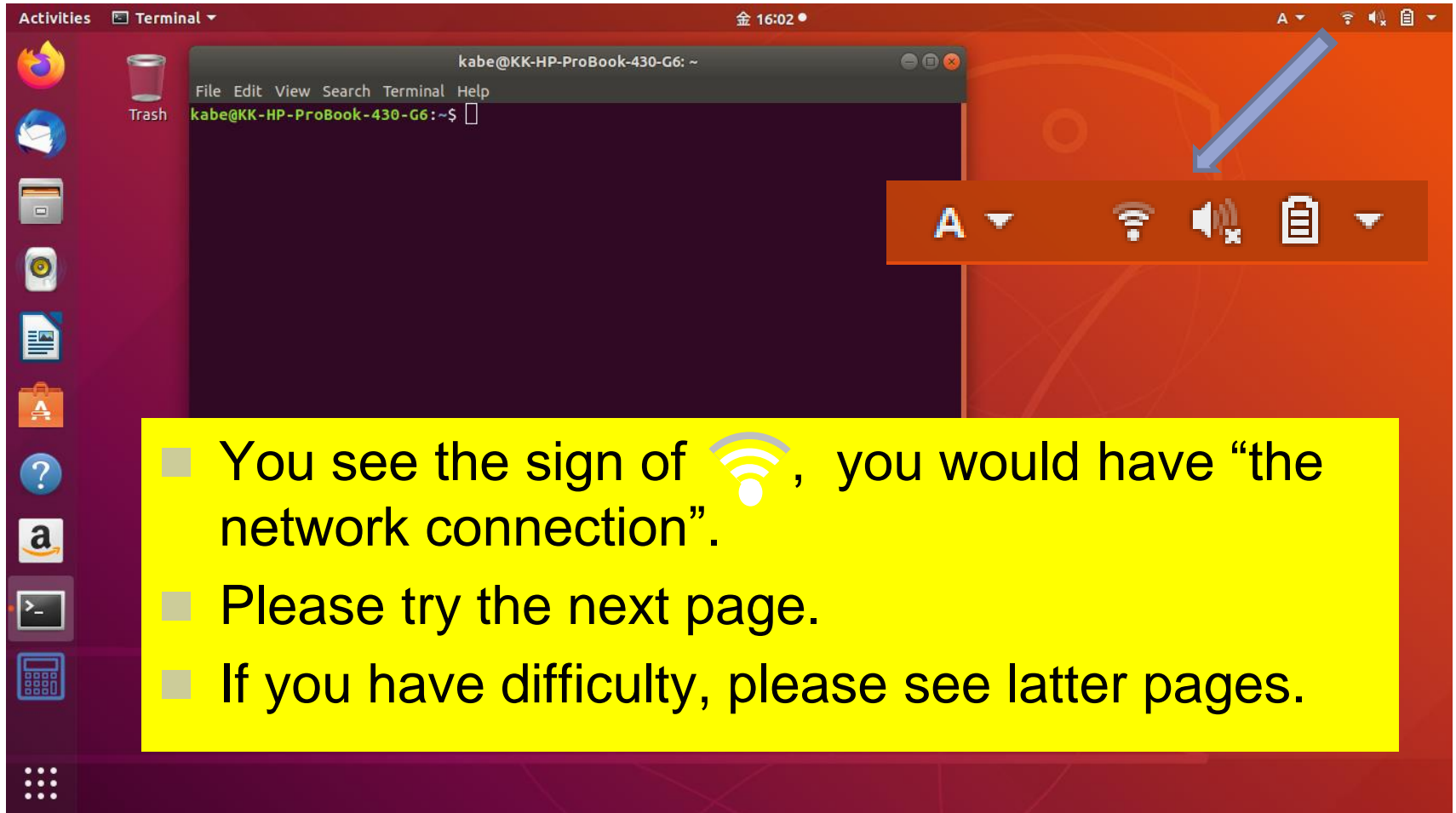


ssh




Using “ssh” in the next page, you can control a remote host as if you are using it in front of you. This action is done in a secured manner!

When your machine is connected to the net,



The screenshot shows a Linux desktop environment with a terminal window open. The terminal displays the prompt `kabe@KK-HP-ProBook-430-G6: ~$`. The system tray in the top right corner contains icons for network connectivity, volume, and power. A blue arrow points to the network icon, which is a Wi-Fi symbol. A yellow box contains the following text:

- You see the sign of , you would have “the network connection”.
- Please try the next page.
- If you have difficulty, please see latter pages.

Let's login "cmd" !

- Find your "user id": stud** (ex. stud07)
- On a terminal, use "ssh" to log in **cmd2** in OU.

Expr. 1 `ssh -Y -l stud** cmd2.phys.sci.osaka-u.ac.jp` ↩

Ex. 1 `ssh -Y -l stud07 cmd2.phys.sci.osaka-u.ac.jp`

Expr. 2 `ssh -Y stud**@cmd2.phys.sci.osaka-u.ac.jp` ↩

Ex. 2 `ssh -Y stud07@cmd2.phys.sci.osaka-u.ac.jp`

- Your passphrase is "**cmdstud****".

("**" is same as the two digits in your id of "stud**".)

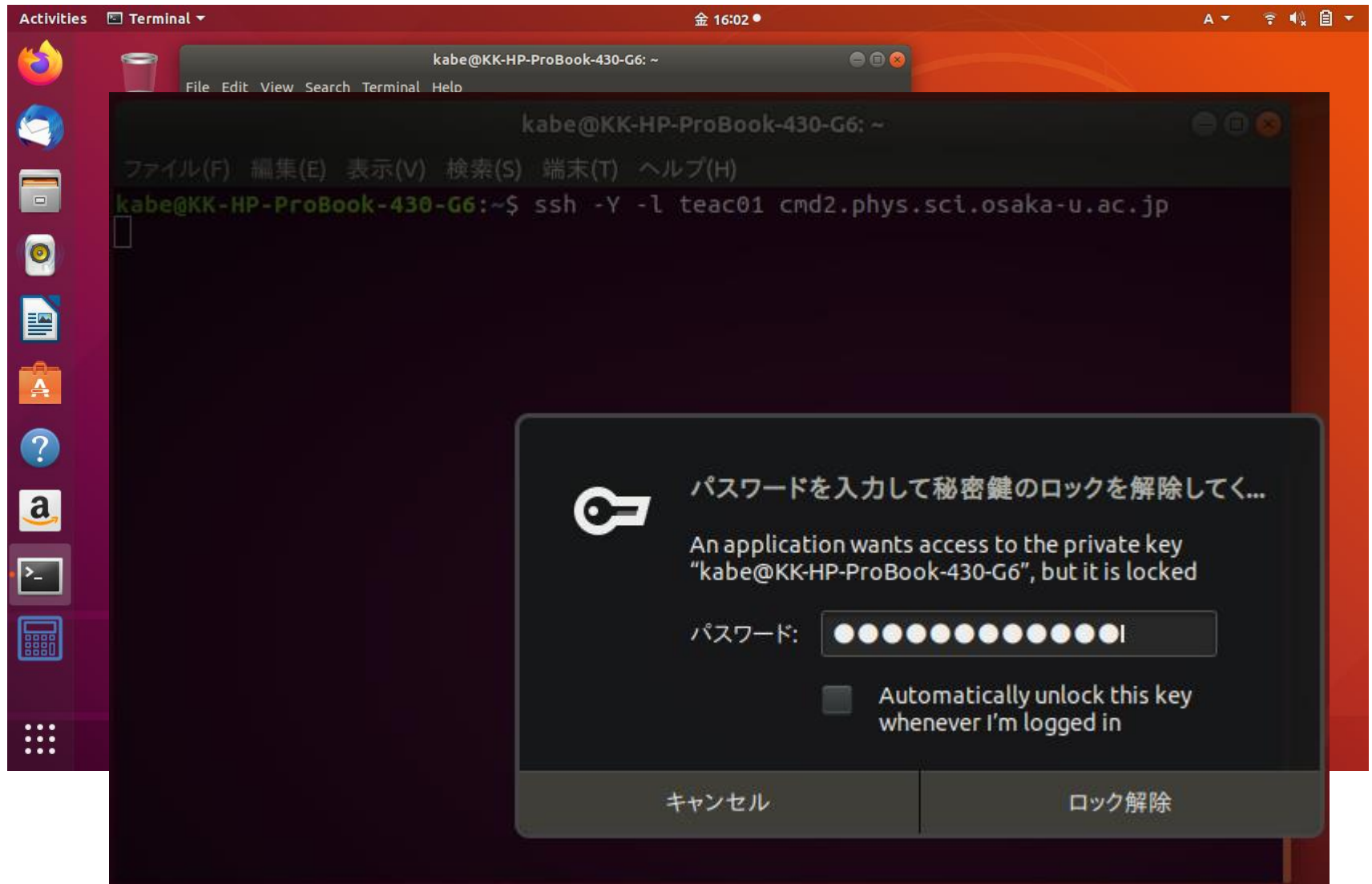
- The typed passphrase is not shown on the screen.

- For the second time, no request for passphrase.

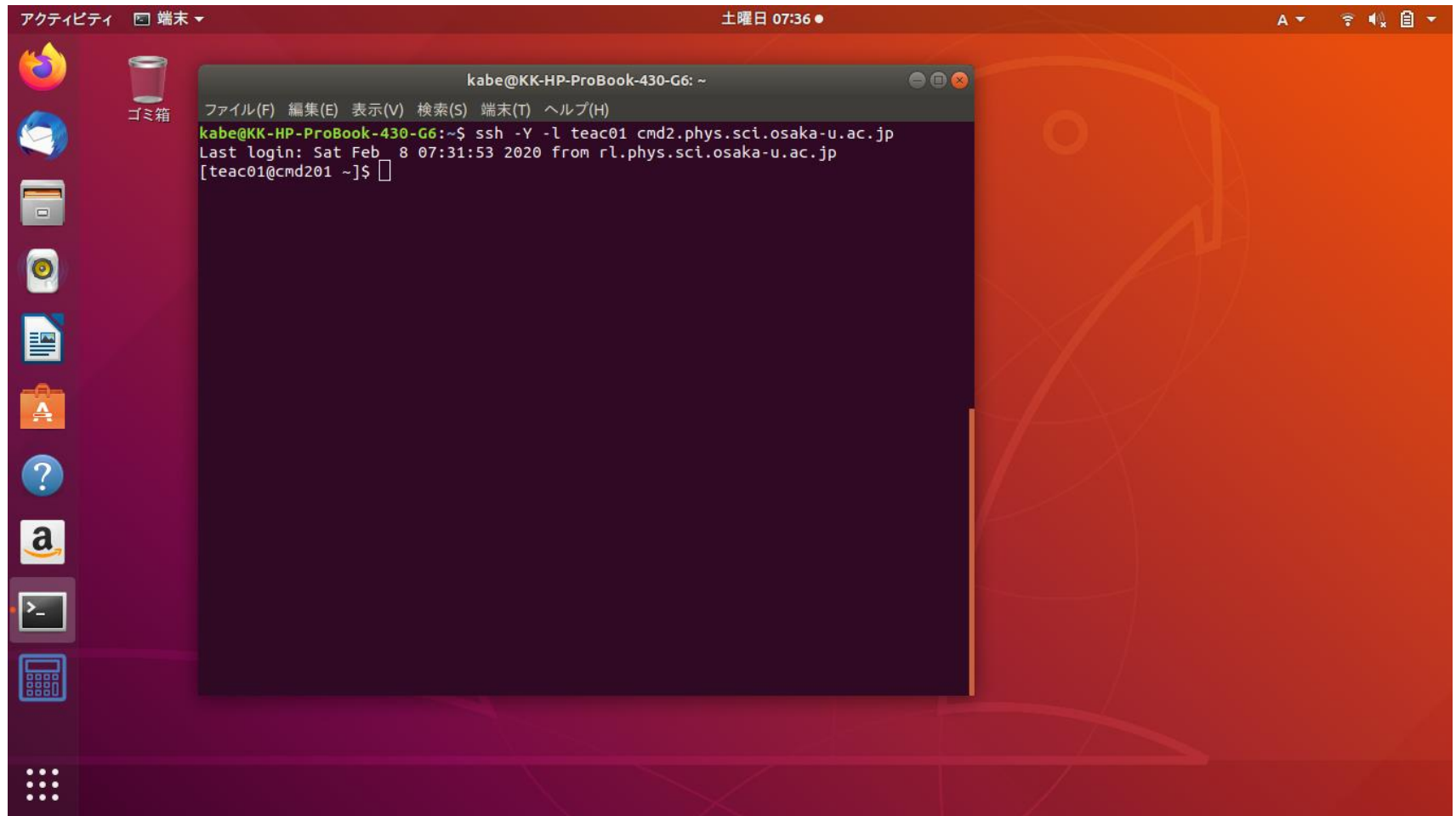
- "ssh" is a unix command:

- `ssh -Y -l "user id" "machine address"`

The first time might open a sub-window.



When the connection is successful,



Two methods for ‘authentication’

RSA public key auth.

- Double key authentication
- Security level : high

Appearance

Change id (stud**) !

```
[teac01@rl01 ~]$ ssh -Y -l teac01 cmd2
```

```
Enter passphrase for key
```

```
'/home/CMD/teac01/.ssh/id_rsa':
```

The passphrase will **not** be echoed back (not seen).

From cmd2 to rl: Phrase on cmd2 is used.

```
[teac01@cmd201 ~]$ ssh -Y -l teac01 rl
```

```
Enter passphrase for key
```

```
'/home/CMD/teac01/.ssh/id_rsa':
```

The passphrase will **not** be echoed back (not seen).

Note: the directory shown is “on the local machine to connect the remote machine”.

RSA & DSA, in a nutshell

RSA was invented by Ron Rivest, Adi Shamir, and Leonard Adleman in 1977. Nowadays, a key length of 4096 bits is used with

```
$ ssh-keygen -t RSA -b 4096
```

DSA (Digital Signature Algorithm) provided by NIST in 1991.

```
$ ssh-keygen -t DSA
```

An example of 'ssh-keygen' :

```
$ ssh-keygen -t RSA -b 4096
```

```
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/kabe/.ssh/id_rsa_2nd.
Your public key has been saved in /home/kabe/.ssh/id_rsa_2nd.pub.
The key fingerprint is:
SHA256:GzYeW5ZkM3CINIflk0opBchB72cHEw2HT0cAJnXoWLk kabe@KK-HP-ProBook-430-G6
The key's randomart image is:
+---[RSA 4096]-----+
|o+...B@0*o.         |
|..o o=BB.+          |
|  o++ o =          |
| ..oEo. o +        |
|  + + .S +         |
| . = .o O          |
|   +               |
+-----[SHA256]-----+
```

Enter file in which to save the key (/home/kabe/.ssh/id_rsa_2nd) :

Enter passphrase (empty for no passphrase) :

Enter same passphrase again :



The public key in id_rsa.pub on the client-host should be saved (added) in .ssh/authorized_keys in the server-host.

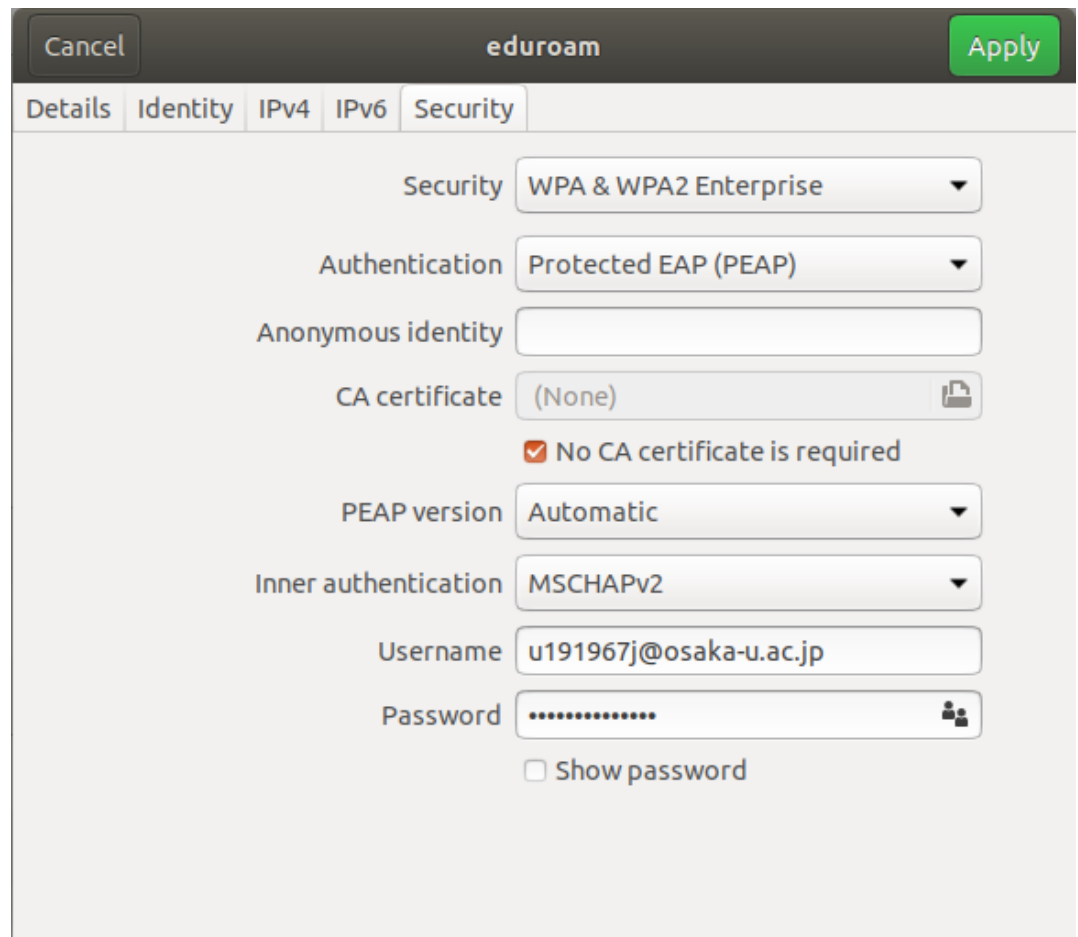
You might have lost connection.

```
cmd@cmdes-HP-530-Notebook-PC-KD087AA-ABJ: ~  
cmd@cmdes-HP-530-Notebook-PC-KD087AA-ABJ:~$ ssh teac01 cmd2.phys.sci.osaka-u.ac.jp  
ssh: Could not resolve hostname teac01: Name or service not known  
cmd@cmdes-HP-530-Notebook-PC-KD087AA-ABJ:~$
```

Please ask help!!

Contents in the right panel might help you.

In consultation with an advisor, you would solve the problem and find “connection”!



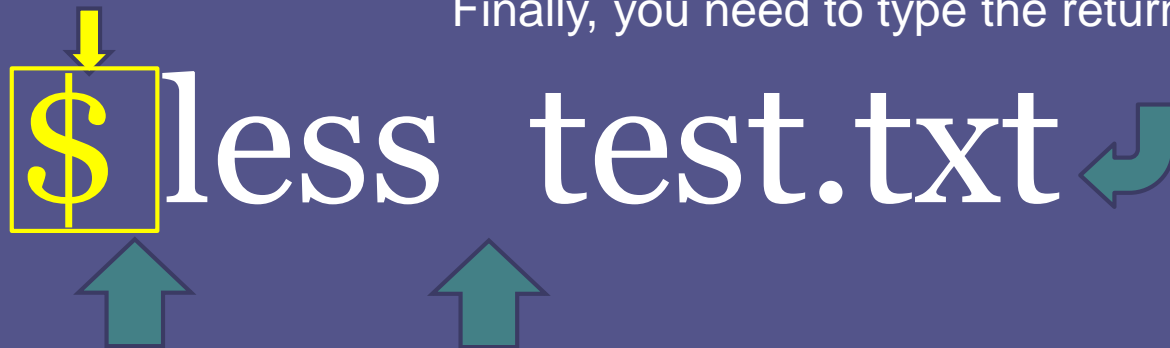
Command minimum

- Typing a UNIX Command
- Login
- cp : copy a file
- Unpack : tar
- Edit a file : emacs
- make : create an application
- Run
- Logout

Key typing for explanation

This is a character automatically shown by the computer, which is called “a prompt”. The character (or a set of words) depends on the setting of the machine.

Finally, you need to type the return key.



The diagram shows a terminal prompt '\$' followed by the text 'less test.txt'. A yellow arrow points down to the '\$' character, which is enclosed in a yellow box. A teal arrow points up to the space between '\$' and 'less'. Another teal arrow points up to the space between 'less' and 'test.txt'. A teal arrow points left to the end of the line, indicating the return key.

There is a space. Type the space key (The long key).

In this case, you may type letters starting from 'l'.

Caution: type “q”, when you want to stop, end, or quit less.

At first, please type

```
$ cp /home/CMD/teaco1/ex.tar .
```

Space !

Space !

Next, please type

```
$ tar xvf ex.tar  
$ cd ex
```

To execute a command, type

```
$ less test.txt
```

Caution: type “q”, when you want to stop, end, or quit less.

This action may be explained as,

Purpose : to see test.txt.

目的 : test.txtの中を見る.

```
$ less test.txt
```

A short manual of “less”

- Move
 - “f” : move forward.
 - “b” : move backward.
- Search
 - “/ [pattern]” : search the pattern.
 - “n” : search again
- Others
 - “q” : quit. (same as :q, :Q, or ZZ.)
 - “r” : refresh the screen.
 - “h” : help.

To compile a program,

\$ make

To run the program,

```
$ ./diag
```

Further, you can use,

```
$ emacs diag.f90 -nw
```

```
$ cd ..
```

```
$ ls -laF
```

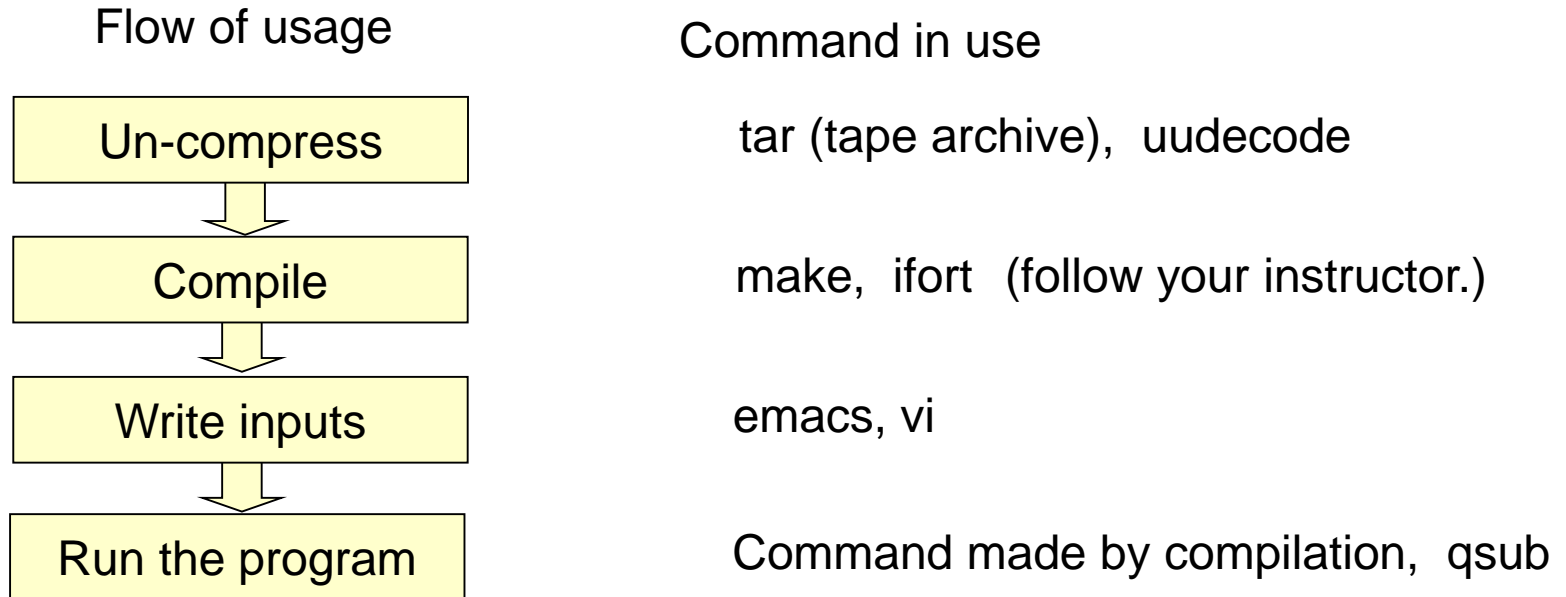
Please see the following pages and “計算機(UNIX)使用法”.

The terminal does hung-up. You can do it.

- No character appears for your keystroke, then
 - Type `Ctrl + q`. Or `Ctrl + s` may restart the input, when the scroll is stopped.
- No prompt (flushing cursor at `/home/x60***>`) appears. Then, you can try one of these.
 - `Ctrl + d` (When you call `cat` without arguments.)
 - `Ctrl + c` (When a command does not stop.)
 - `Ctrl + z` Then, you can search an unfinished command using 'ps' command and stop it by 'kill'. (This action may be required when `Ctrl + c` does not work.)
- If something wrong with the cursor, then
 - `Ctrl + j`.

How to start your job?

- Many programs are packaged and stored in a compressed file. You will perform un-compression.



- Un-compression of a tar-archived file would be,

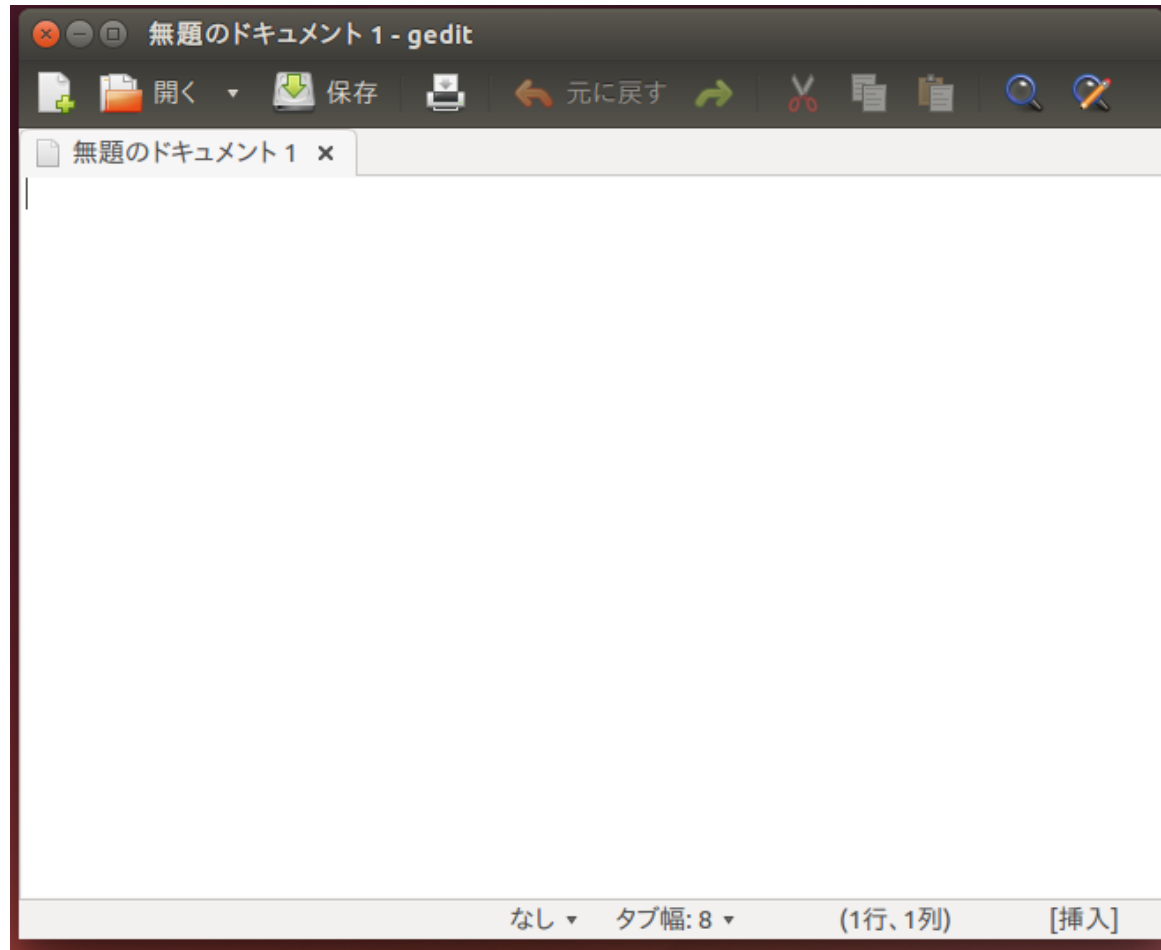
```
[stud01@cmd ~]$ tar xvf CMD-test.tar
```

```
[stud01@cmd ~]$ tar zxvf CMD-test.tgz
```

↙ For zip file

Edit a file by “gedit” !

- If this is the first time, we recommend you to edit a file by “gedit”.



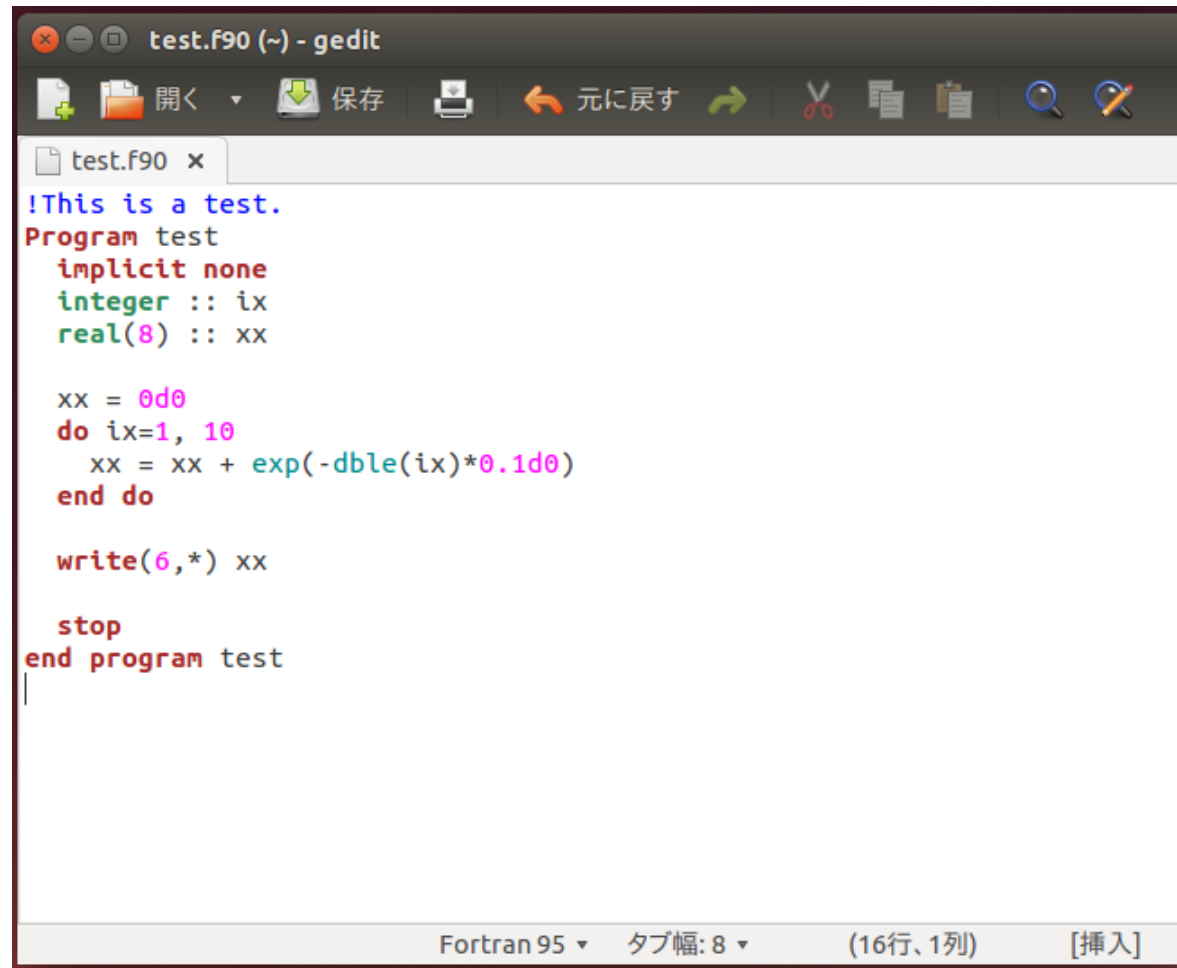
How to use gedit

Put your cursor on the head line, then you will find the menu bar.

テキストファイル(F) 編集(E) 表示(V) 検索(S) ツール(T) ドキュメント(D) ヘルプ(H)



Key words in “a fortran source file” are highlighted.



```
test.f90 (~) - gedit
開く 保存 元に戻す
!This is a test.
Program test
  implicit none
  integer :: ix
  real(8) :: xx

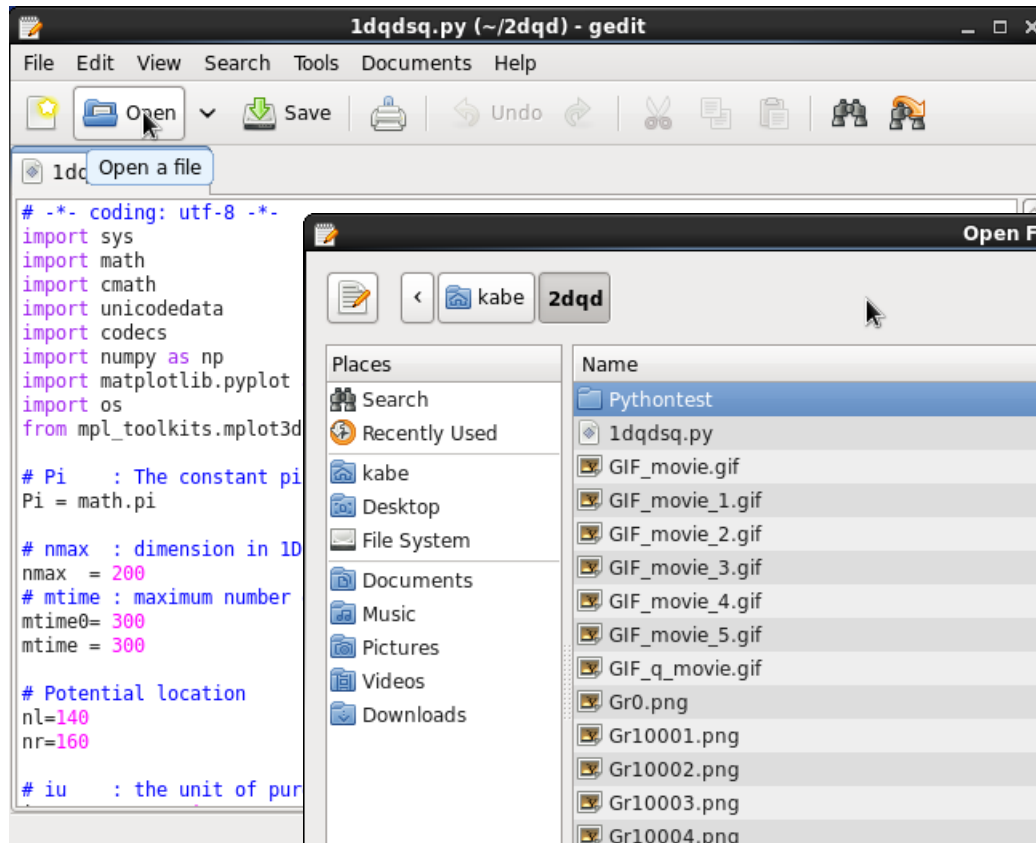
  xx = 0d0
  do ix=1, 10
    xx = xx + exp(-dble(ix))*0.1d0
  end do

  write(6,*) xx

  stop
end program test

Fortran 95  タブ幅: 8  (16行、1列)  [挿入]
```

gedit on GNOME environment



```
# -*- coding: utf-8 -*-
import sys
import math
import cmath
import unicodedata
import codecs
import numpy as np
import matplotlib.pyplot
import os
from mpl_toolkits.mplot3d

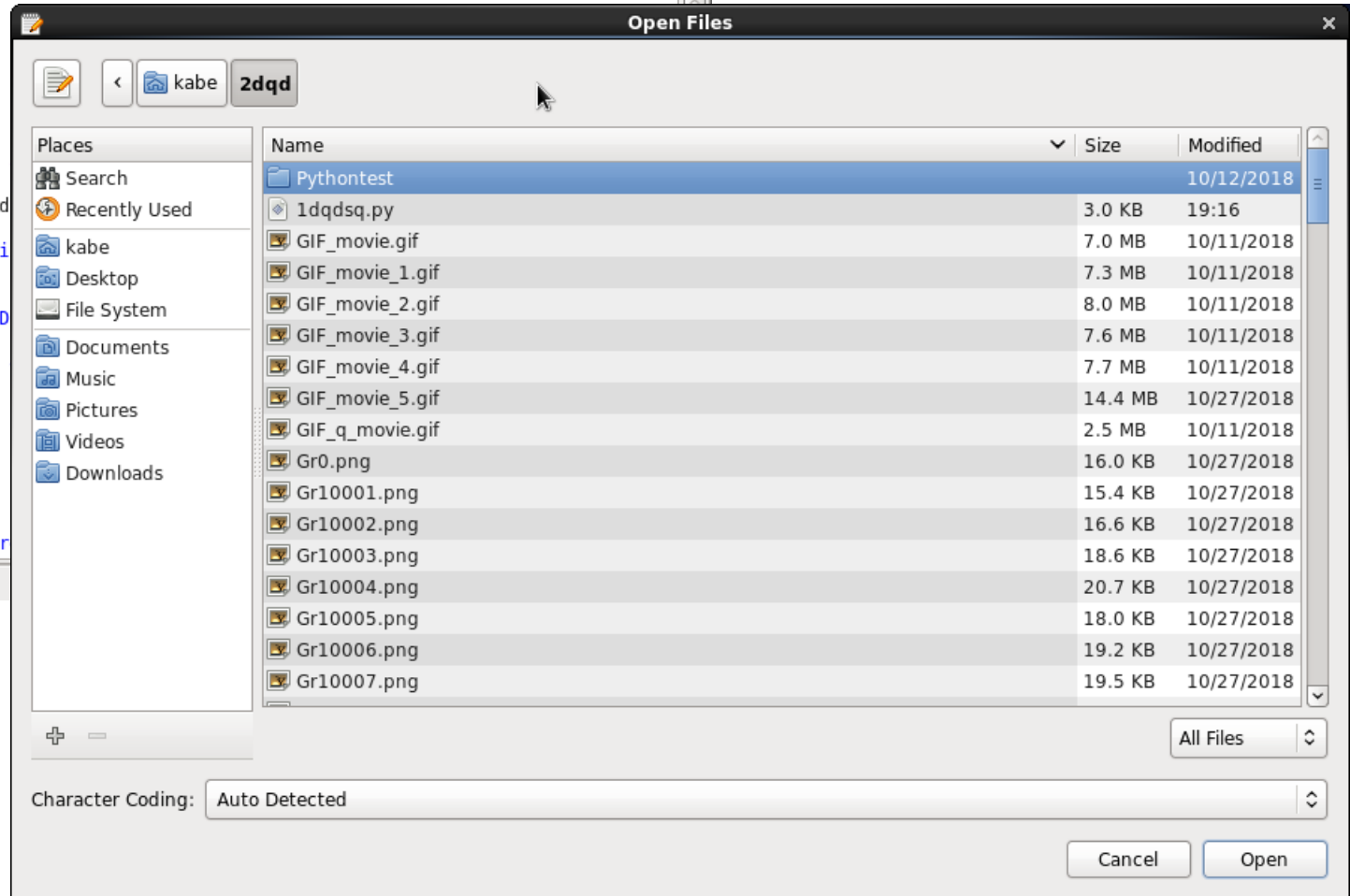
# Pi : The constant pi
Pi = math.pi

# nmax : dimension in 1D
nmax = 200
# mtime : maximum number
mtime0= 300
mtime = 300

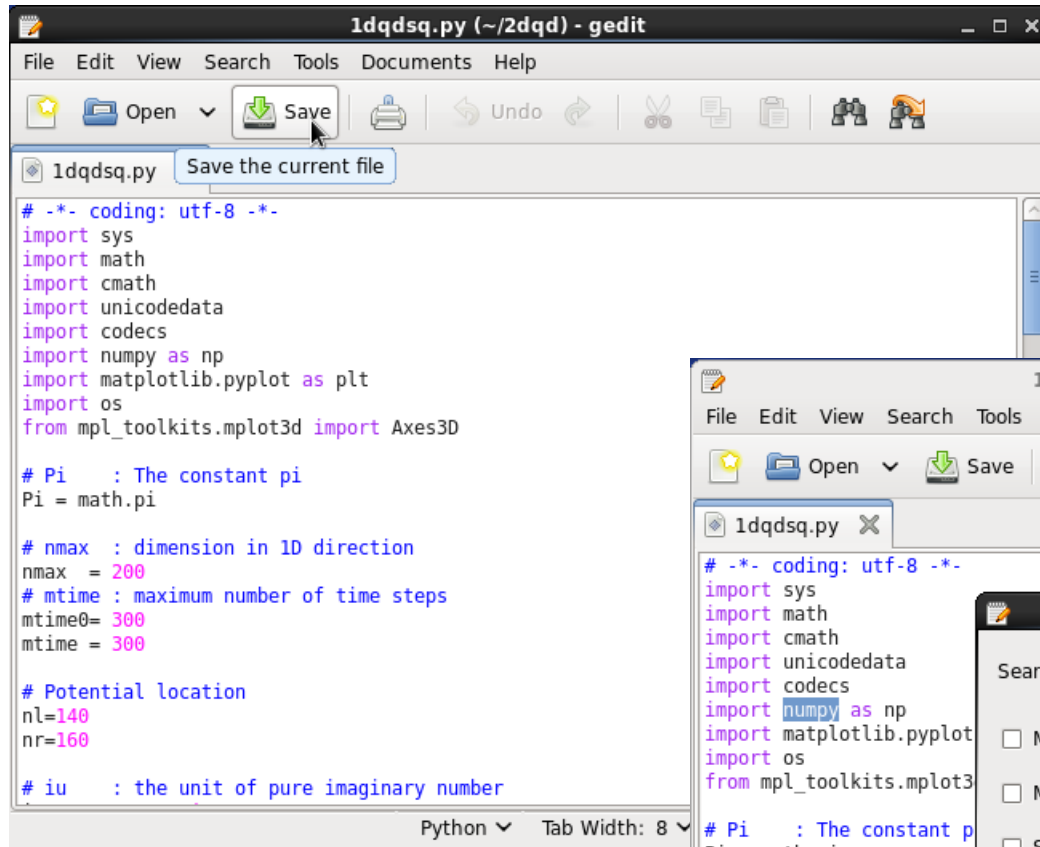
# Potential location
nl=140
nr=160

# iu : the unit of pur
```

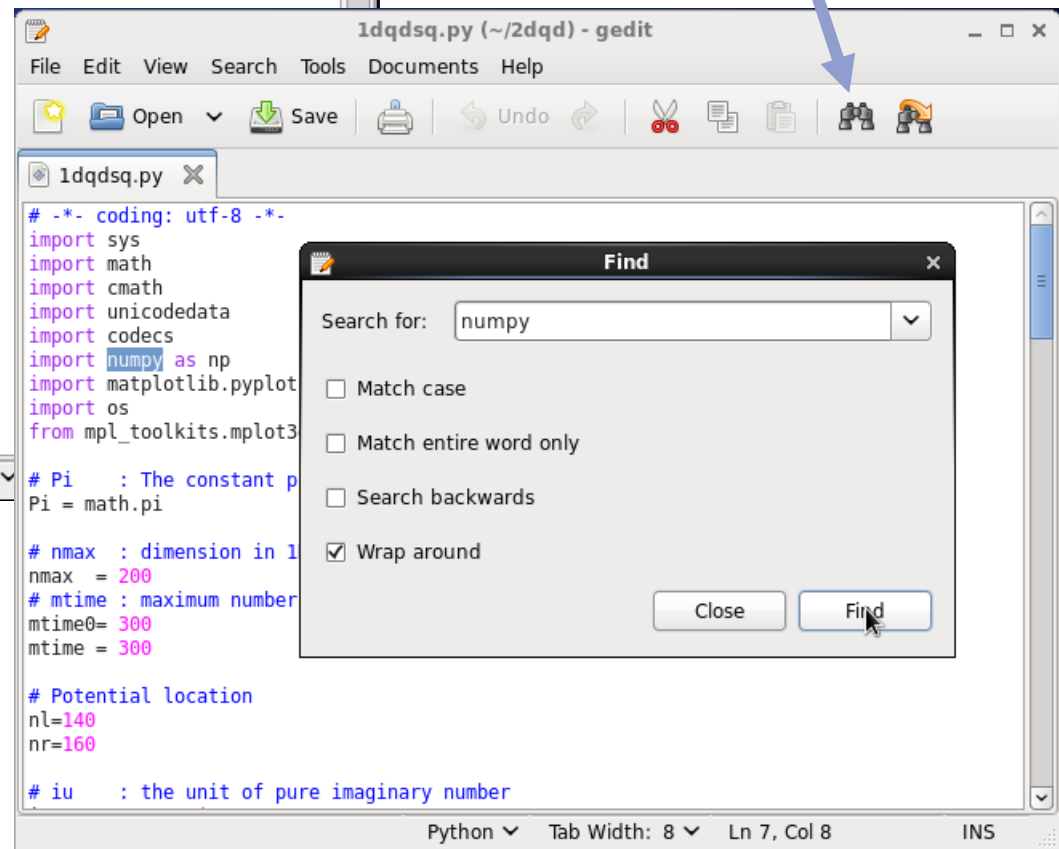
When you push “Open”, a window appears to select a file for edit.



Save, Find, etc. in gedit



You can start "Find" by pushing binoculars.



You can save the buffer contents to the file.

How to use Emacs (basics)

- Let's start Emacs up with new Window.

```
[stud01@cmd ~]$ emacs &  
Don't you find?
```

- In the first page, message to introduce Emacs is given.

- You can start editing a file by typing `Ctrl + x Ctrl + f`.

Please insert a file name at
Find file : ~/

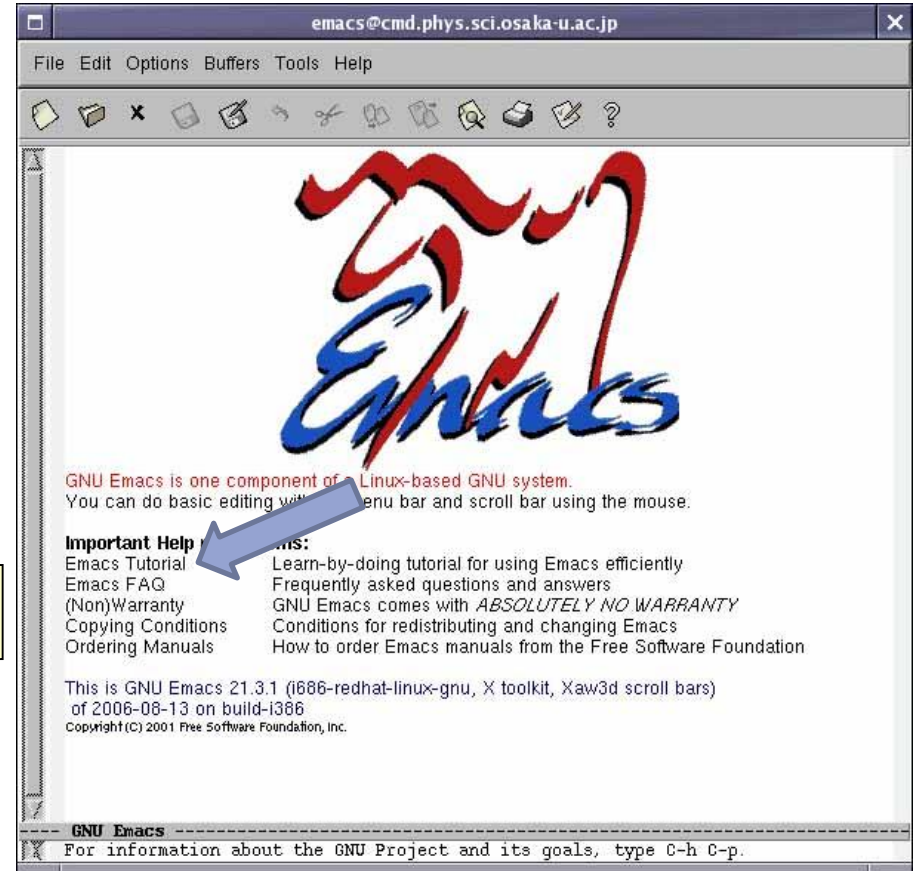
/ represents the home directory.

which is shown in a lower sub-window.

- You may edit test.txt by

```
[stud01@cmd CMD-test]$ emacs test.txt &
```

which allows you to start Emacs up with the file shown.



Name of the target file.

Emacs keystroke I : Ctrl + “1 character”

Key	command action	Key	command action
C+@	set-mark-command	C+o	open-line
C+a	move-beginning-of-line	C+p	previous-line
C+b	backward-char	C+q	quoted-insert
C+c	mode-specific-command-prefix	C+r	insearch-backward
C+d	delete-char	C+s	isearch-forward
C+e	move-end-of-line	C+t	transpose-chars
C+f	forward-char	C+u	universal-argument
C+g	keyboard-quit	C+v	scroll-up
C+h	help-command	C+w	kill-region
C+i	indent-for-tab-command	C+x	Control-X-prefix
C+j	newline-and-indent	C+y	yank
C+k	kill-line	C+z	iconify-or-deiconify-frame
C+l	recenter-top-bottom	C+_	undo
C+m	newline-and-indent	C+SPC	set-mark-command
C+n	next-line	C+/	undo

Emacs keystroke II : Esc + “1 character”

Key	command action
Esc+a	backward-sentence
Esc+b	backward-word
Esc+c	capitalize-word
Esc+d	kill-word
Esc+e	forward-sentence
Esc+f	forward-word
Esc+g	prefix command
Esc+h	mark-paragraph
Esc+i	tab-to-tab-stop
Esc+j	indent-new-comment-line
Esc+k	kill-sentence
Esc+l	downcase-word

Key	command action
Esc+m	back-to-indentation
Esc+o	face-menys-keymap
Esc+q	fill-paragraph
Esc+r	move-to-window-line
Esc+t	transpose-words
Esc+u	upcase-word
Esc+v	scroll-down
Esc+w	kill-ring-save
Esc+x	execute-extended-command
Esc+y	yank-pop
Esc+z	zap-to-char

In addition, we have

Esc	,	>	move to the end of buffer
Esc	,	<	move to the top of buffer

Emacs keystroke III : Ctrl + “2 strokes”

Key	command action
C+x C+b	list-buffers
C+x C+c	save-buffers-kill-emacs
C+x C+e	eval-last-sexp
C+x C+f	find-file
C+x TAB	indent-rigidly
C+x C+r	find-file-read-only
C+x C+s	save-buffer
C+x C+w	write-file
C+x 0	delete-window
C+x 1	delete-other-windows
C+x 2	split-window-vertically
C+x 3	split-window-horizontally

Key	command action
C+x b	switch-to-buffer
C+x d	dired
C+x i	insert-file
C+x k	kill-buffer
C+x o	other-window
C+x u	advertised-undo
C+x z	repeat

- You can do copy or cut&paste using your mouse.
- Command may be called in the GUI menu line.
- To make completion, please type Tab, in a middle of writing a word.
- > may be Shift + ..

Modes of vi & some commands

Let's do start vi up by `[stud01@cmd ~]$ vi newtest.txt`

Command mode
(Just started)

Please type
a (append)
i (insert), or
O, o (insert a line)

Text mode
(You can write!)

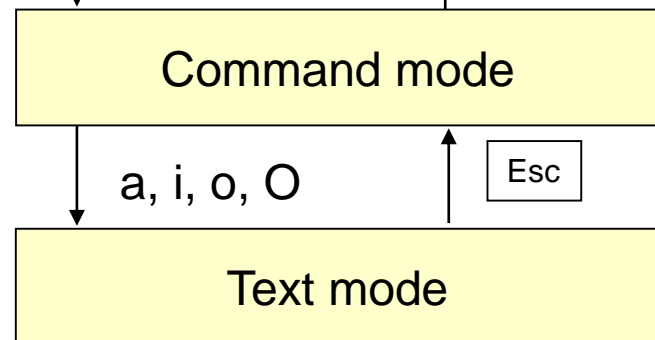
Push `Esc` button after
finishing the input.

Command mode

Select
ZZ (write & quit) or
:w (write) & :q (quit)

`$ vi newtest.txt`

ZZ or
:w & :q



If you have a trouble in vi

- Undo a command just done :
In the command mode (If you are in text mode, type `Esc` and then) push 'u' (undo).
- Re-fresh the screen :
Push `Ctrl + I` in the command mode.
- If you did some unwished operations :
Type '1P' in the command mode.
- If you cannot find a way by doing some solutions above, please consult instructors (teachers & tutors).

Example of “less .bashrc”

- Let's look at contents of a file. Check file lists by “ls -laF.”
-rw-r--r-- 1 stud01 cmd 124 Feb 15 19.34 .bashrc
...
- You can use “cat” to see the contents.
[stud01@cmd ~]\$ cat .bashrc
- You can use “less” command to see the contents of a file.
[stud01@cmd ~]\$ less .bashrc
- Type “q” to end the less command, after checking the contents.

```
# .bashrc
```

```
# User specific aliases and functions
```

```
# Source global definitions
```

```
if [ -f /etc/bashrc ]; then
```

```
    . /etc/bashrc
```

```
fi
```

```
.bashrc (END)
```

Please use “man” command to find why people use “less.”

```
[stud01@cmd ~]$ man less
```

```
[stud01@cmd ~]$ man more
```

Which would you like “more” or “less”?

Please enjoy your unix life!

Thanks a lot.
K. Kusakabe