UNIX講習

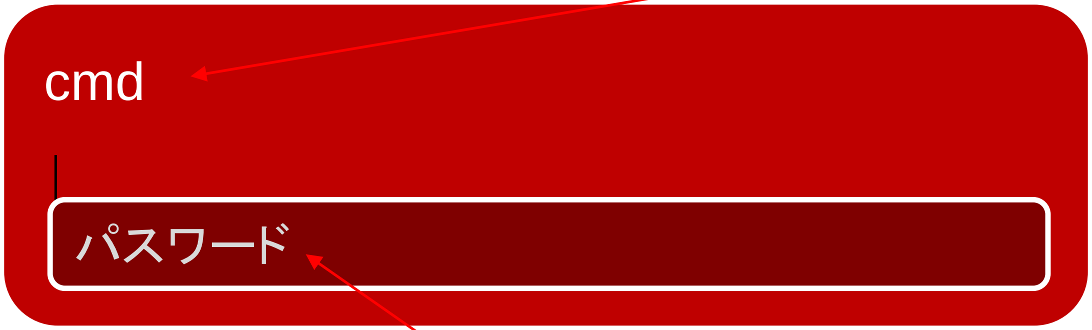
UNIXシステムとコマンドの紹介

大阪大学 大学院基礎工学研究科
物質創成専攻 未来物質領域
草部 浩一

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’.



cmd

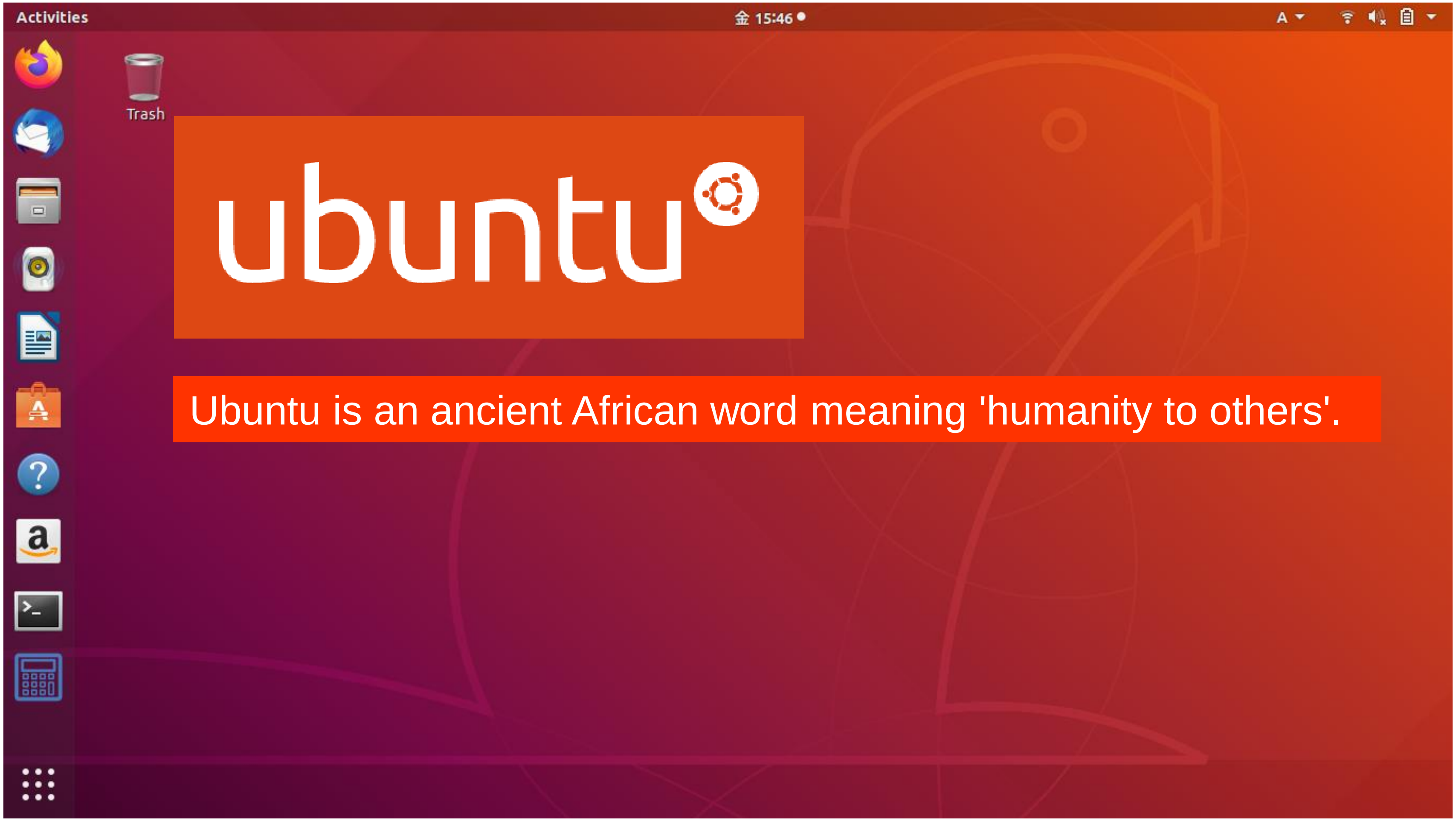
パスワード

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

Another password ‘cmdworkshop’ might work to launch your machine.

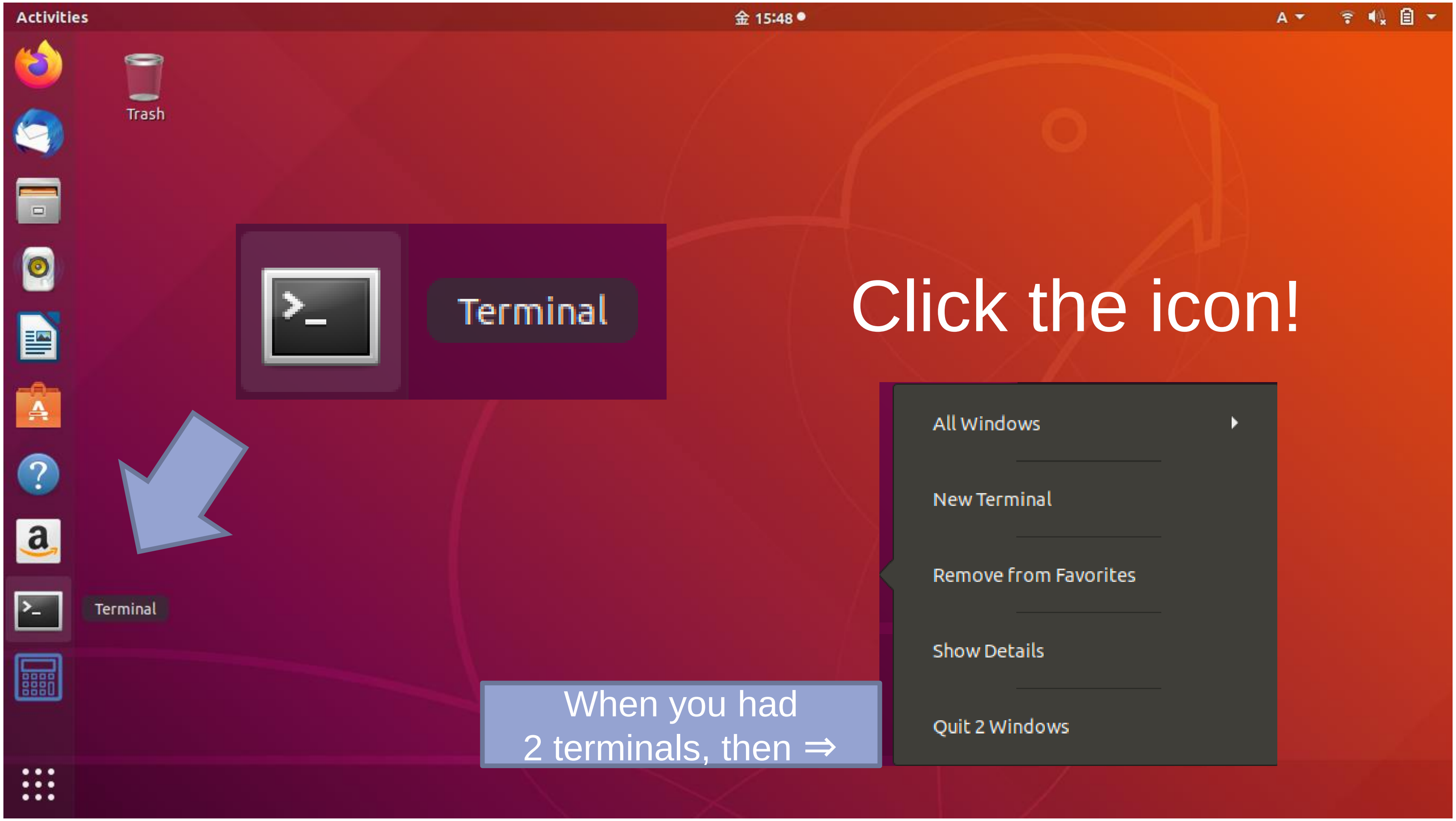
You have a good ‘日本語’ environment, if you start by choosing it.

ubuntu : the spirit of Ubuntu to the world of computers



Ubuntu is an ancient African word meaning 'humanity to others'.

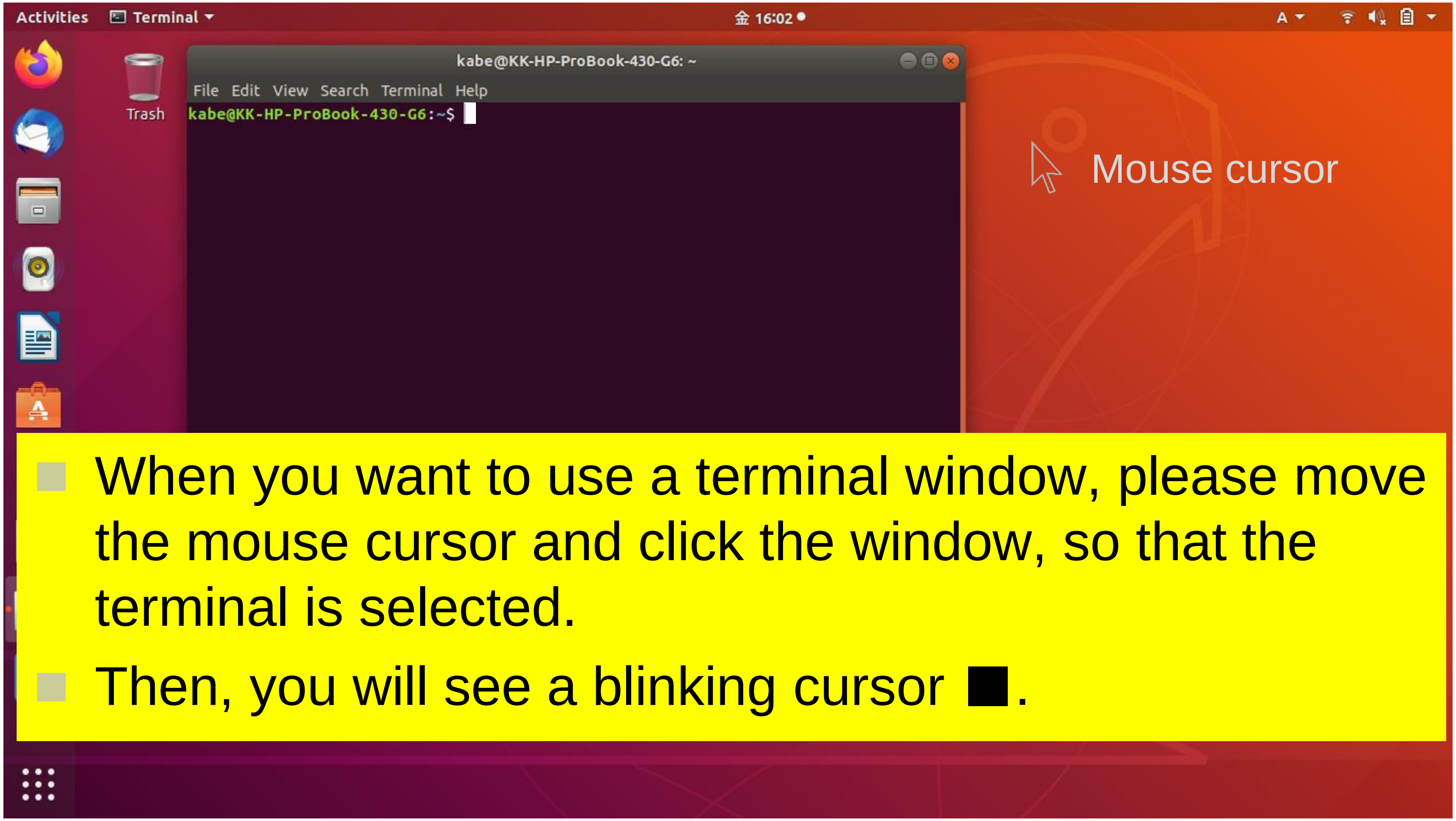
You see the “terminal” icon. Click it.



Click the icon!

When you had 2 terminals, then ⇒

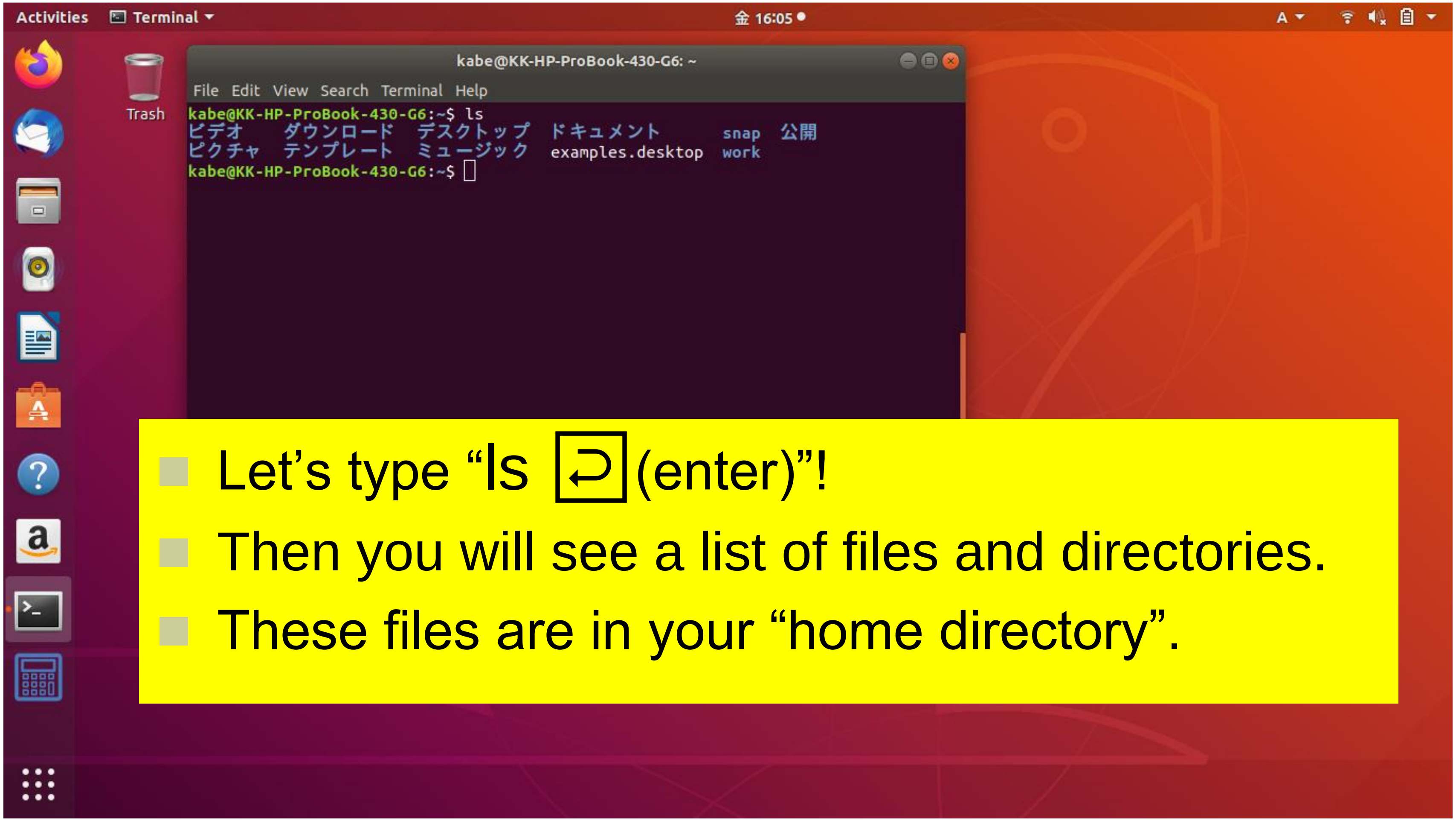
Selection of the terminal


Activities
Terminal
16:02
Trash
kabe@KK-HP-ProBook-430-G6: ~
File Edit View Search Terminal Help
Mouse cursor

```
kabe@KK-HP-ProBook-430-G6:~$ █
```

- 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.

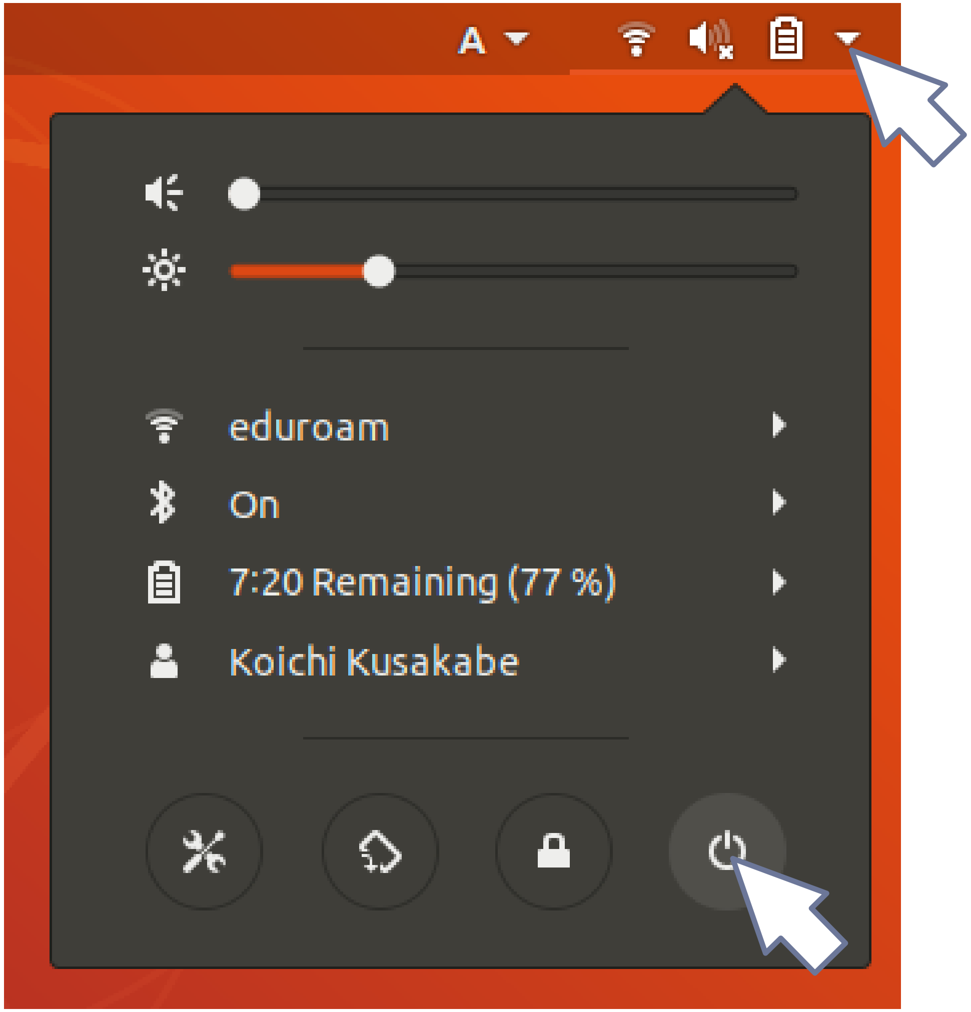

Activities
Terminal
金 16:05
Trash
kabe@KK-HP-ProBook-430-G6: ~
File Edit View Search Terminal Help

```
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:~$ 
```

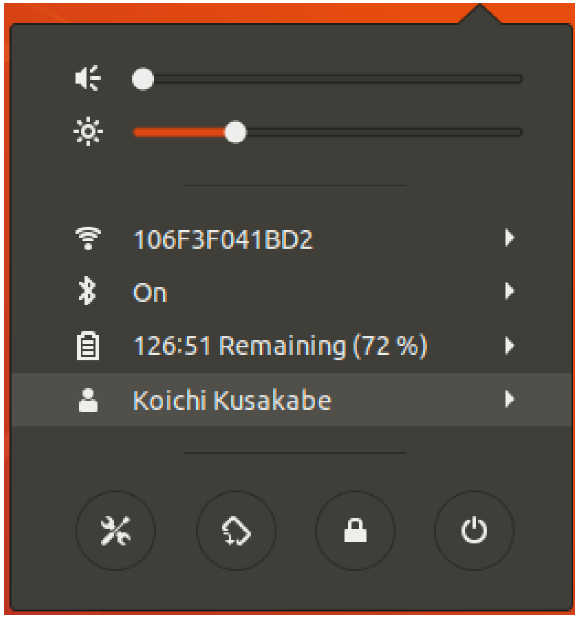
- Let’s type “ls ⏎ (enter)”!
- Then you will see a list of files and directories.
- These files are in your “home directory”.

To start “Log out” or “Shutdown”

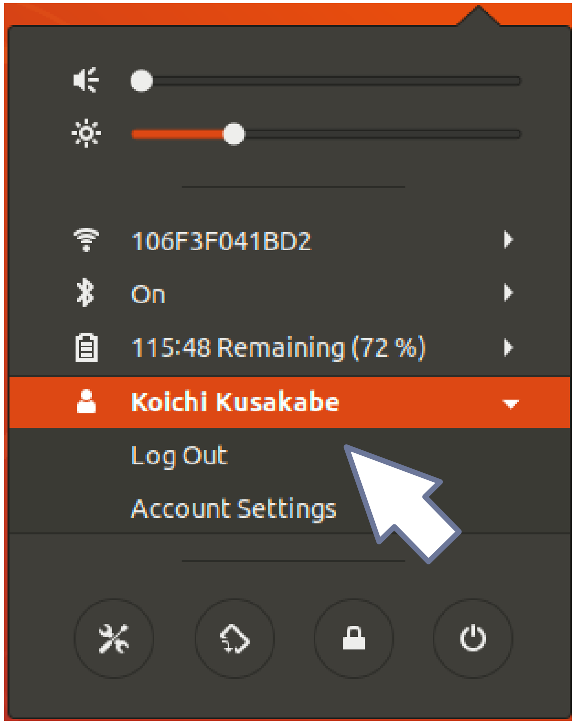
- Type an icon of the system setting in the title bar. You will see a pull down menu.
- You could have a little different style.
- But, it is not so difficult to find a solution solving your demands, once you get “your style”.

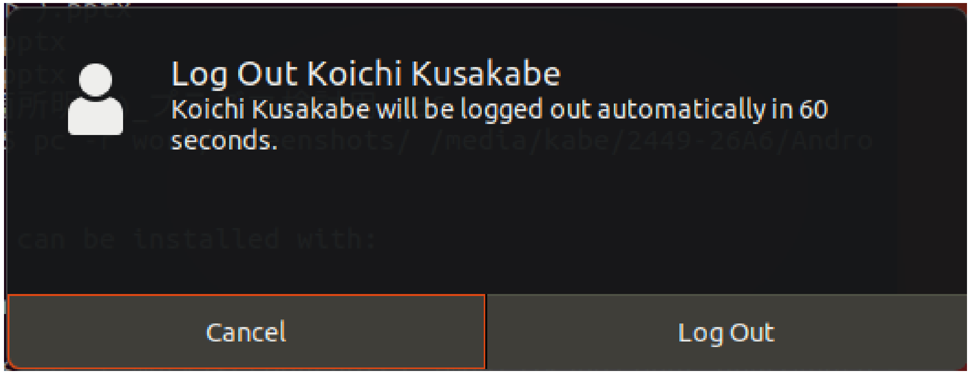


Logout procedure on ubuntu



“Log Out” is hidden
in a submenu.

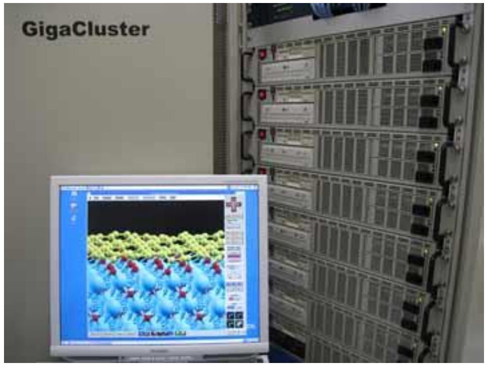




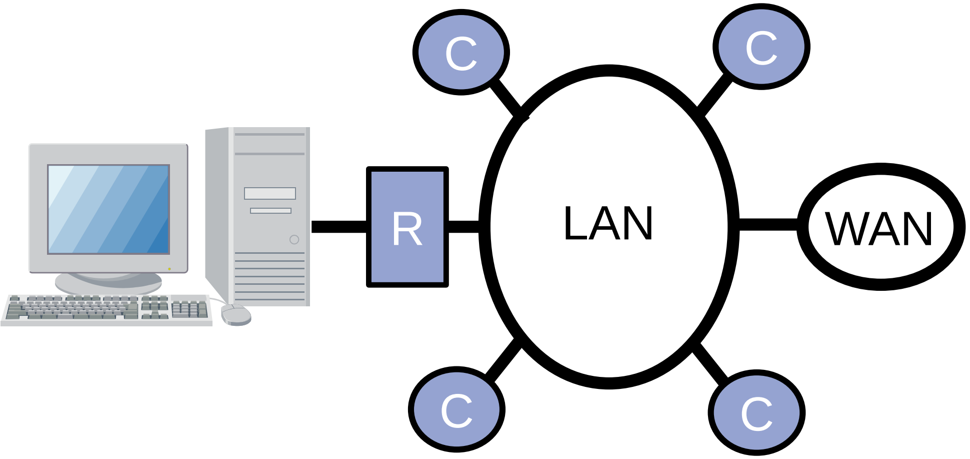
Log Out Koichi Kusakabe

Koichi Kusakabe will be logged out automatically in 60 seconds.

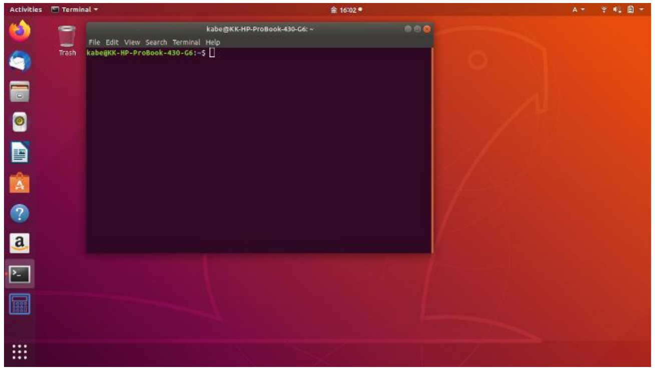
Login : you start connection to the system!



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



Always you would see,



```
kabe@KK-HP-ProBook-430-G6:~$ 
```

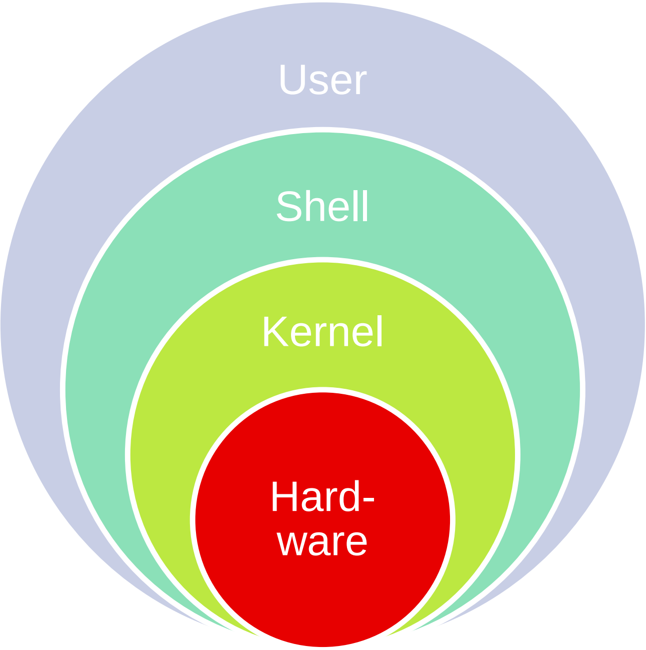
A user → Internet

SSH : Secure Shell

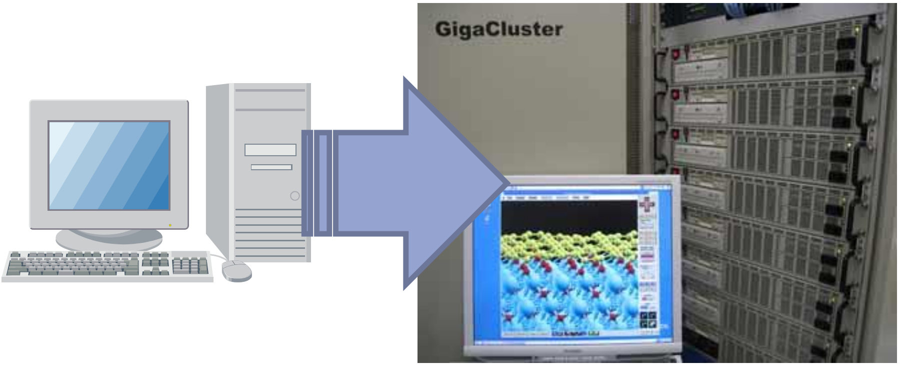
A cryptographical network protocol

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”.

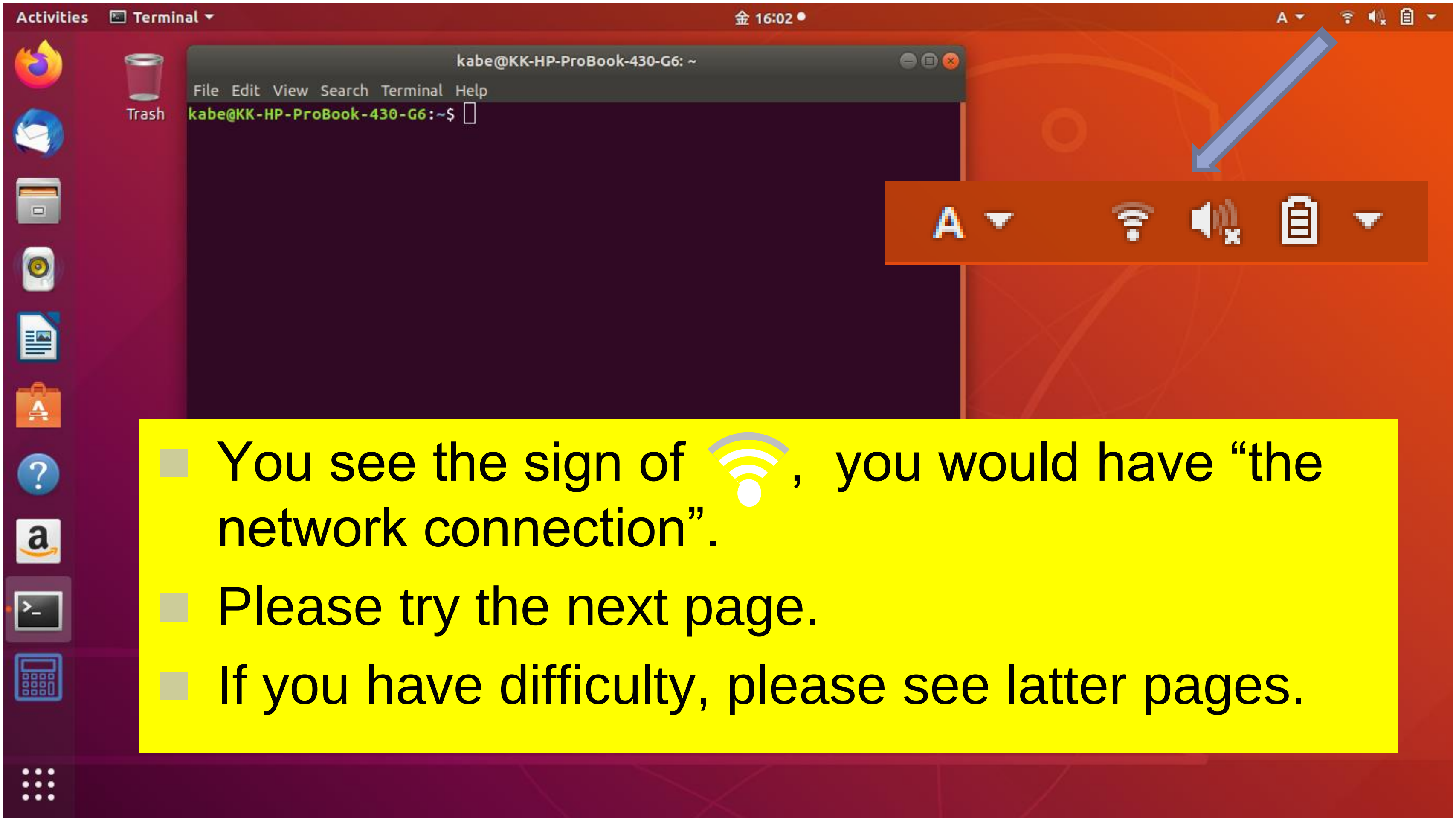


ssh



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,


Activities
Terminal
16:02
Trash
kabe@KK-HP-ProBook-430-G6: ~
File Edit View Search Terminal Help
A

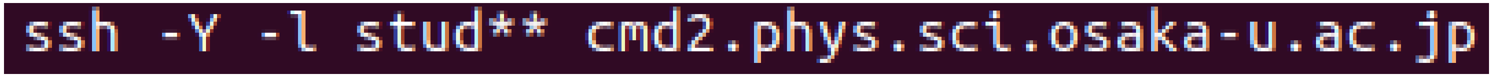
```
kabe@KK-HP-ProBook-430-G6:~$ 
```

- 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” !

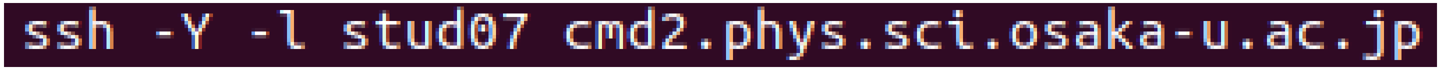
- Find your “user id”: stud** (ex. stud07)
- On a terminal, use “ssh” to log in cmd2 in OU.

Expr. 1



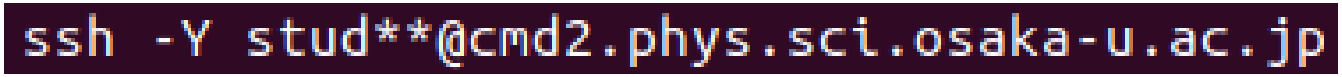
```
ssh -Y -l stud** cmd2.phys.sci.osaka-u.ac.jp
```

Ex. 1



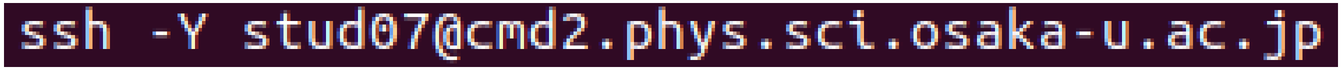
```
ssh -Y -l stud07 cmd2.phys.sci.osaka-u.ac.jp
```

Expr. 2



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

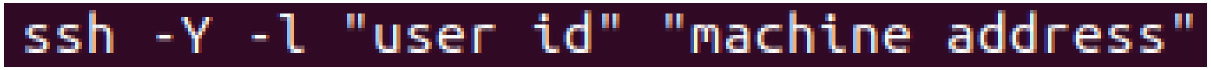
Ex. 2



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

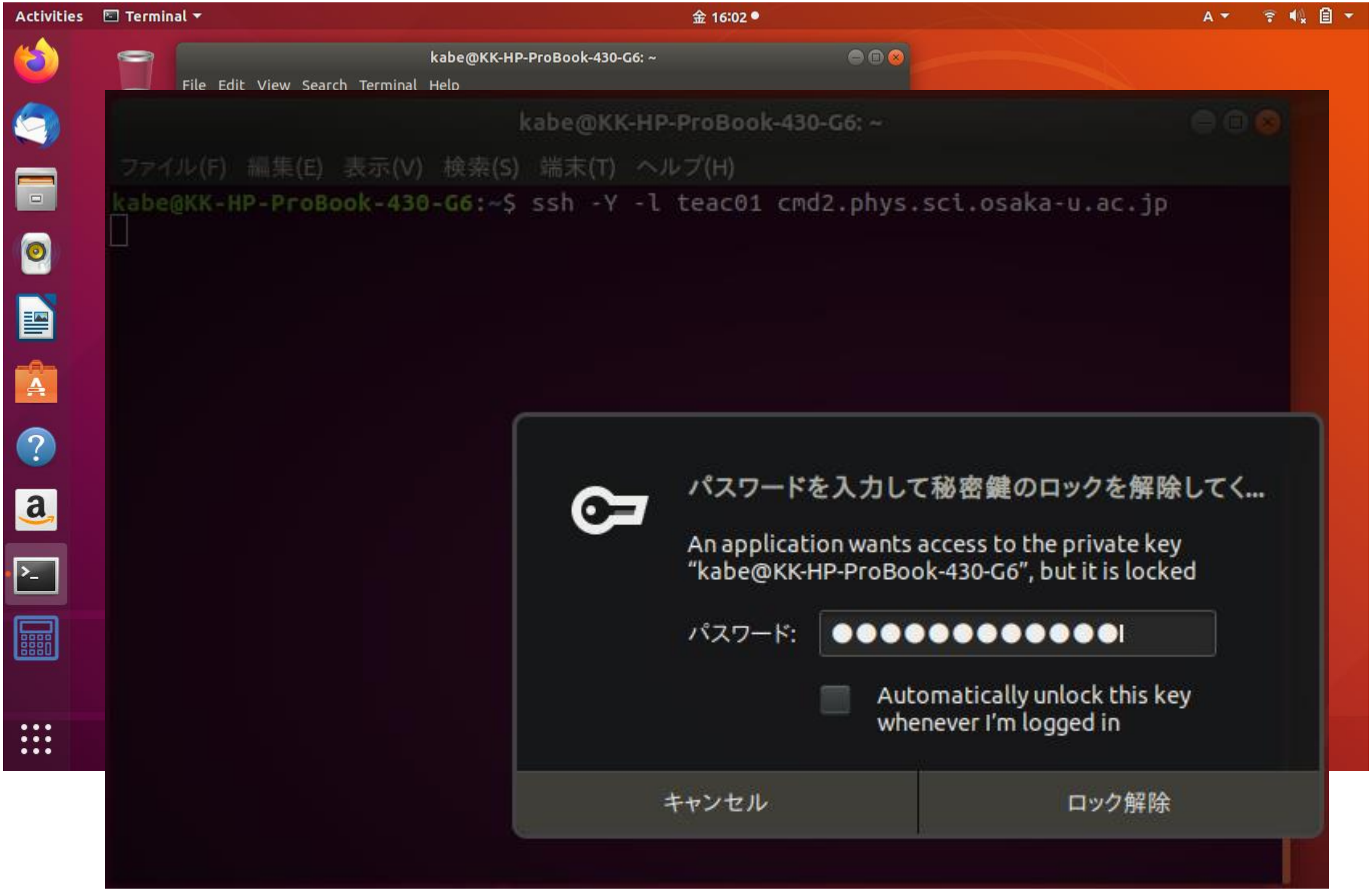
  - Your passphrase is “cmdstud**”.

(“**” 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.


Activities
Terminal
金 16:02
A
kabe@KK-HP-ProBook-430-G6: ~
File Edit View Search Terminal Help
kabe@KK-HP-ProBook-430-G6: ~
ファイル(F) 編集(E) 表示(V) 検索(S) 端末(T) ヘルプ(H)
キャンセル
ロック解除

```
kabe@KK-HP-ProBook-430-G6:~$ ssh -Y -l teac01 cmd2.phys.sci.osaka-u.ac.jp
```

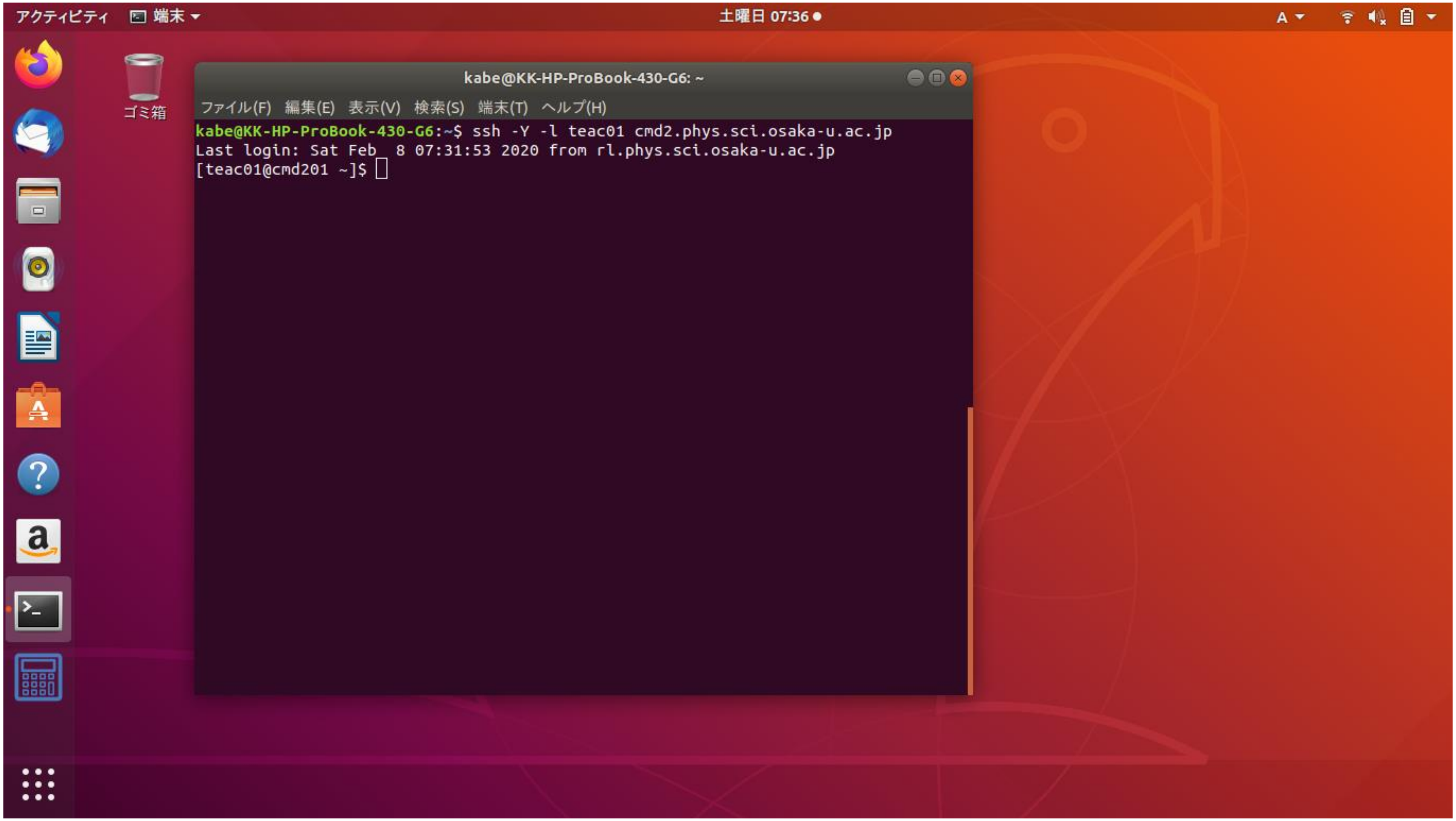
パスワードを入力して秘密鍵のロックを解除してく...

An application wants access to the private key “kabe@KK-HP-ProBook-430-G6”, but it is locked

パスワード: ●●●●●●●●●●●●

□ Automatically unlock this key whenever I’m logged in

When the connection is successful,



```
kabe@KK-HP-ProBook-430-G6:~$ ssh -Y -l teac01 cmd2.phys.sci.osaka-u.ac.jp
Last login: Sat Feb  8 07:31:53 2020 from rl.phys.sci.osaka-u.ac.jp
[teac01@cmd201 ~]$ 
```

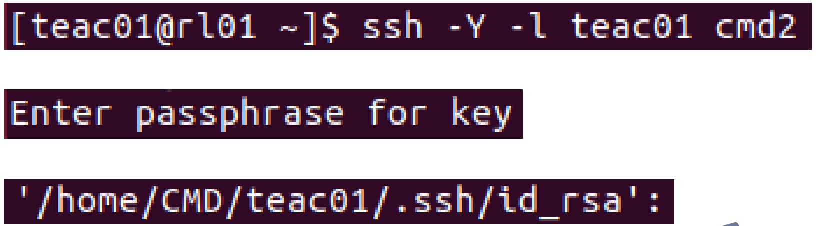
Two methods for ‘authentication’

RSA public key auth.

- Double key authentication
- Security level : high

Appearance

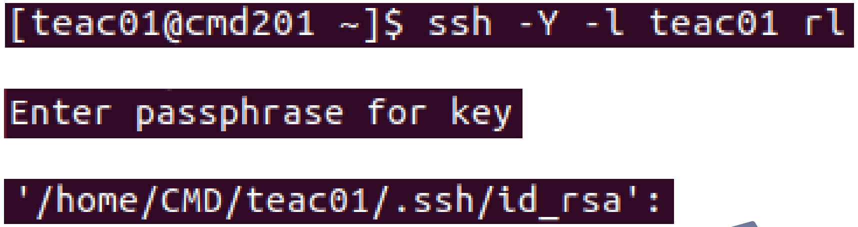
Change id (stud**) !



```
[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 **R**ivest, Adi **S**hamir, and Leonard **A**dleman in 1977. Nowadays, a key length of 4096 bits is used with

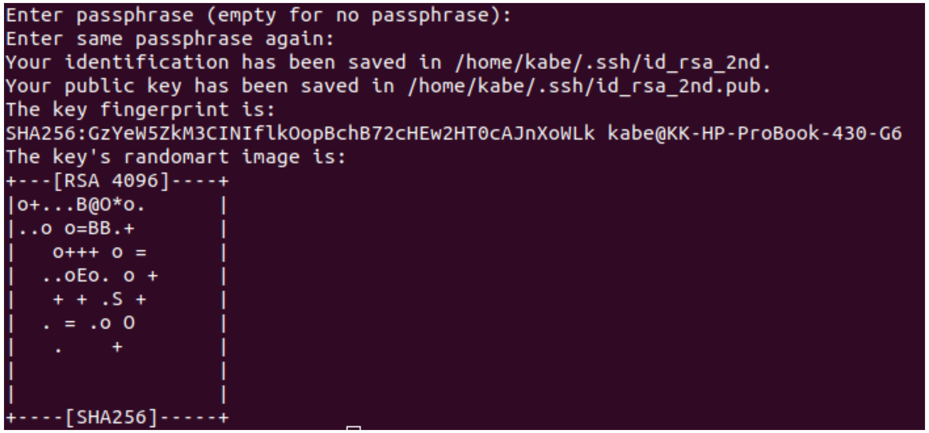
```
$ ssh-keygen –t RSA –b 4096
```

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:GzYeW5ZkM3CINIflkOopBchB72cHEw2HT0cAJnXoWLk kabe@KK-HP-ProBook-430-G6
The key's randomart image is:
+---[RSA 4096]----+
|o+...B@O*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) :

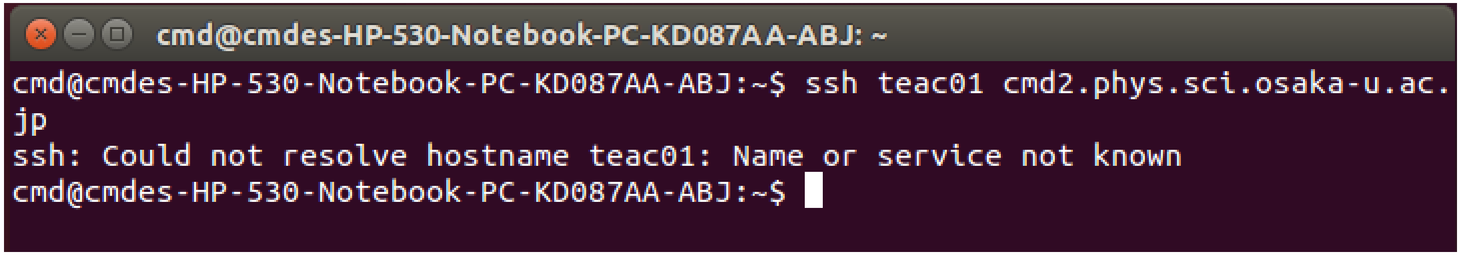
Enter same passphrase again :

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.

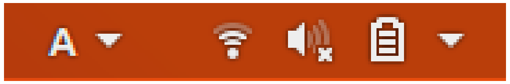


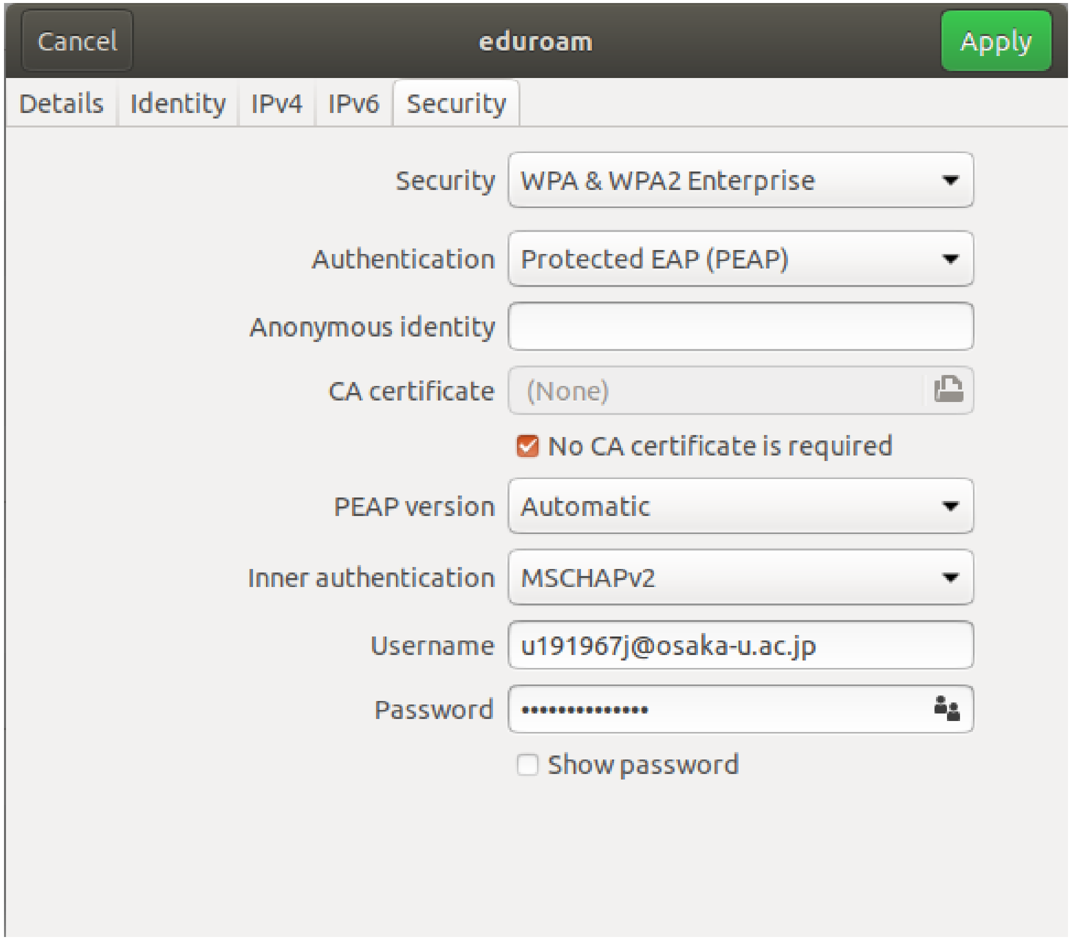
```
cmd@cmdes-HP-530-Notebook-PC-KD087AA-ABJ:~$ ssh teac01 cmd2.phys.sci.osaka-u.ac.
jp
ssh: Could not resolve hostname teac01: Name or service not known
cmd@cmdes-HP-530-Notebook-PC-KD087AA-ABJ:~$ 
```

Please ask help!!

Contents in the right panel might help you.

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





Security: WPA & WPA2 Enterprise

Authentication: Protected EAP (PEAP)

Anonymous identity:

CA certificate: (None)

☑ No CA certificate is required

PEAP version: Automatic

Inner authentication: MSCHAPv2

Username: u191967j@osaka-u.ac.jp

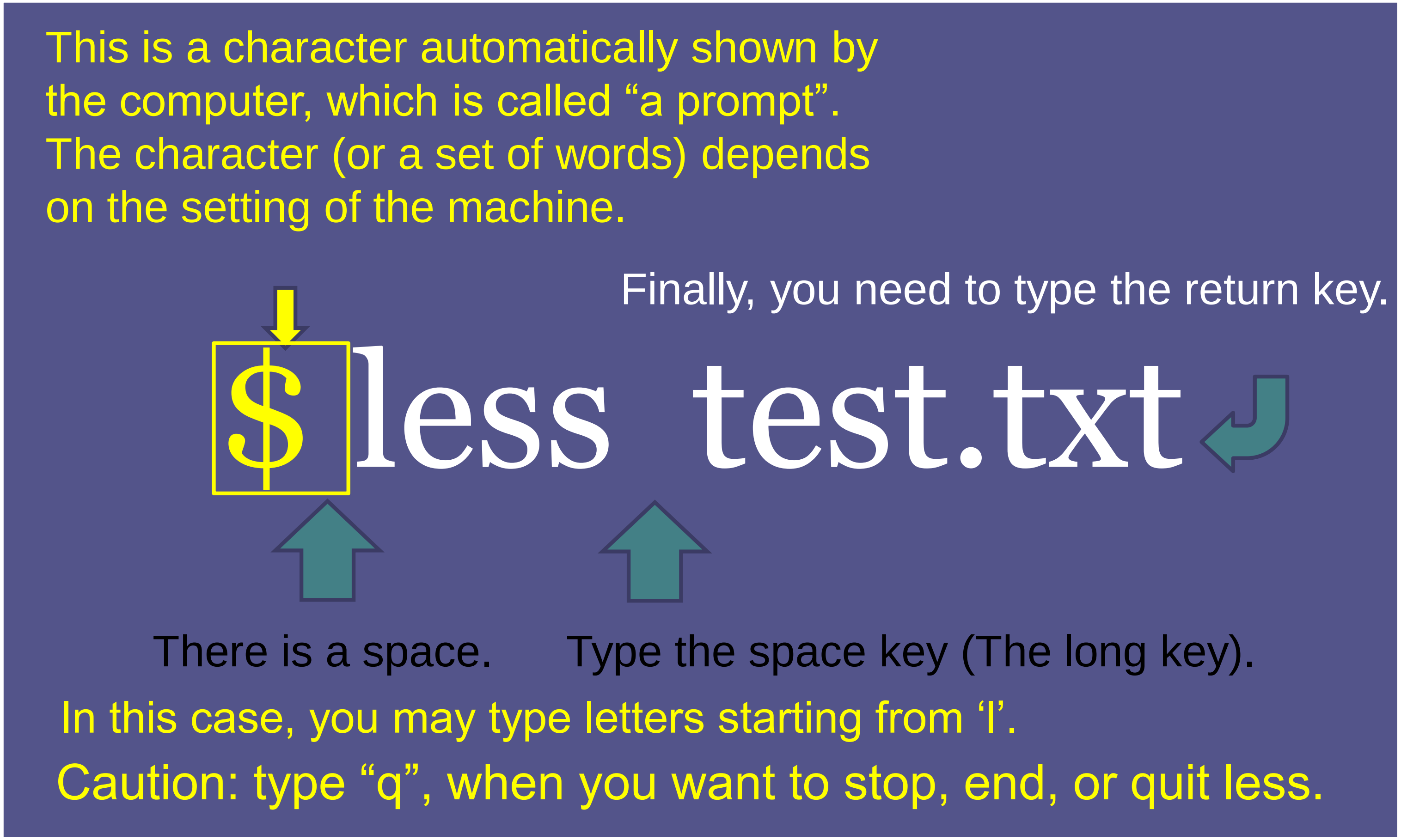
Password: ••••••••••••••

☐ Show password

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.

```
$ less  test.txt
```

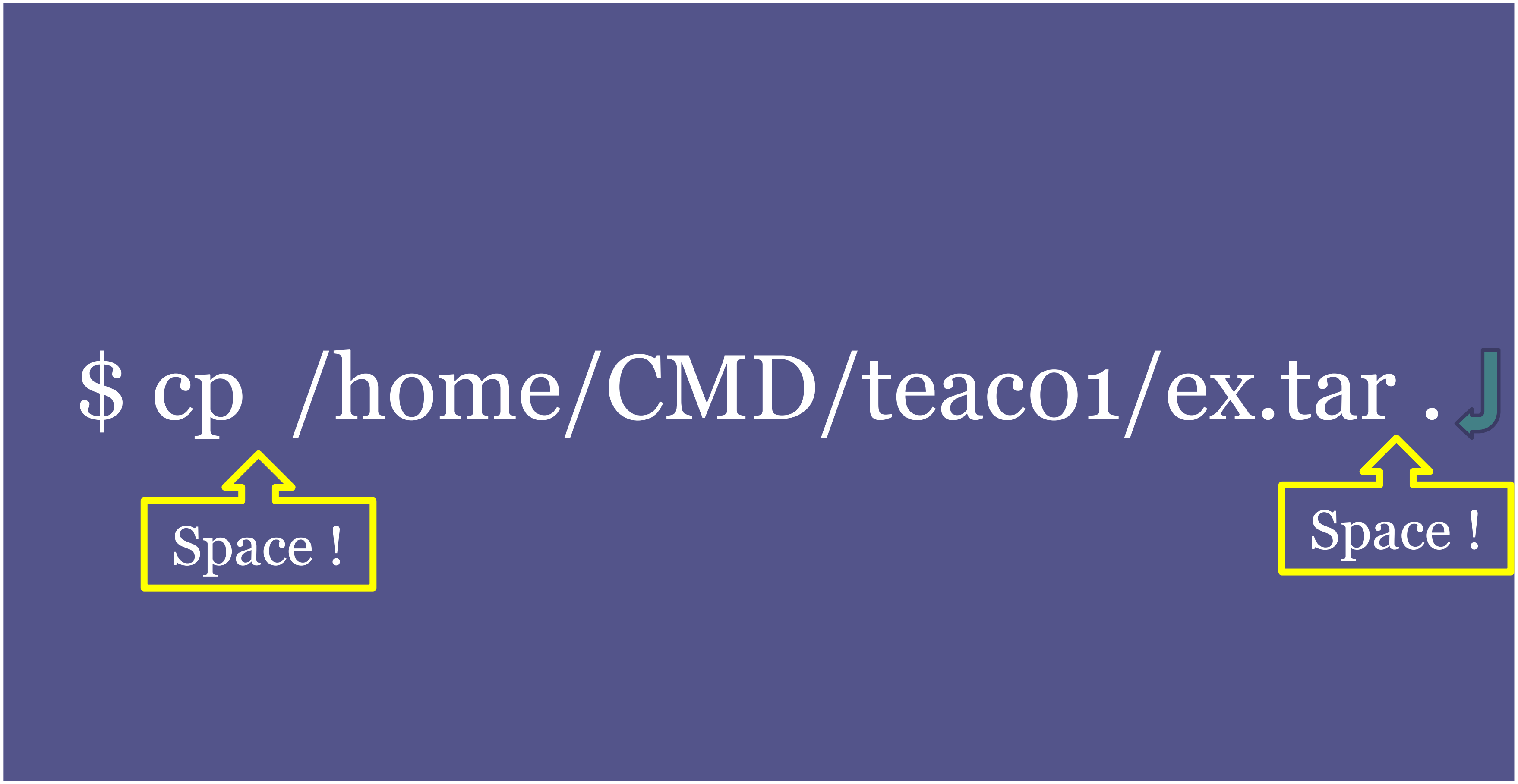
There is a space.

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/teac01/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
```

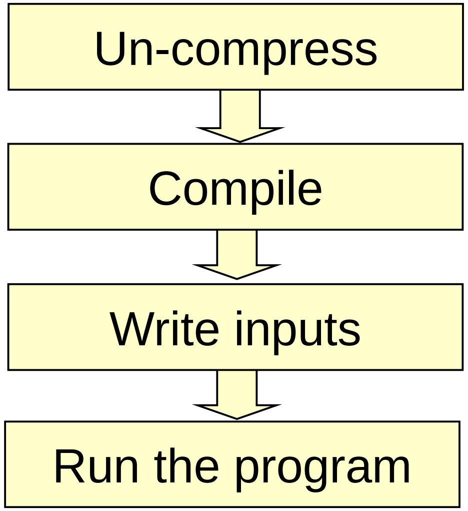
Please see the following pages and “計算機(UNIX)使用法”.

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.



Flow of usage	Command in use
Un-compress	tar (tape archive), uudecode
Compile	make, ifort (follow your instructor.)
Write inputs	emacs, vi
Run the program	Command made by compilation, qsub

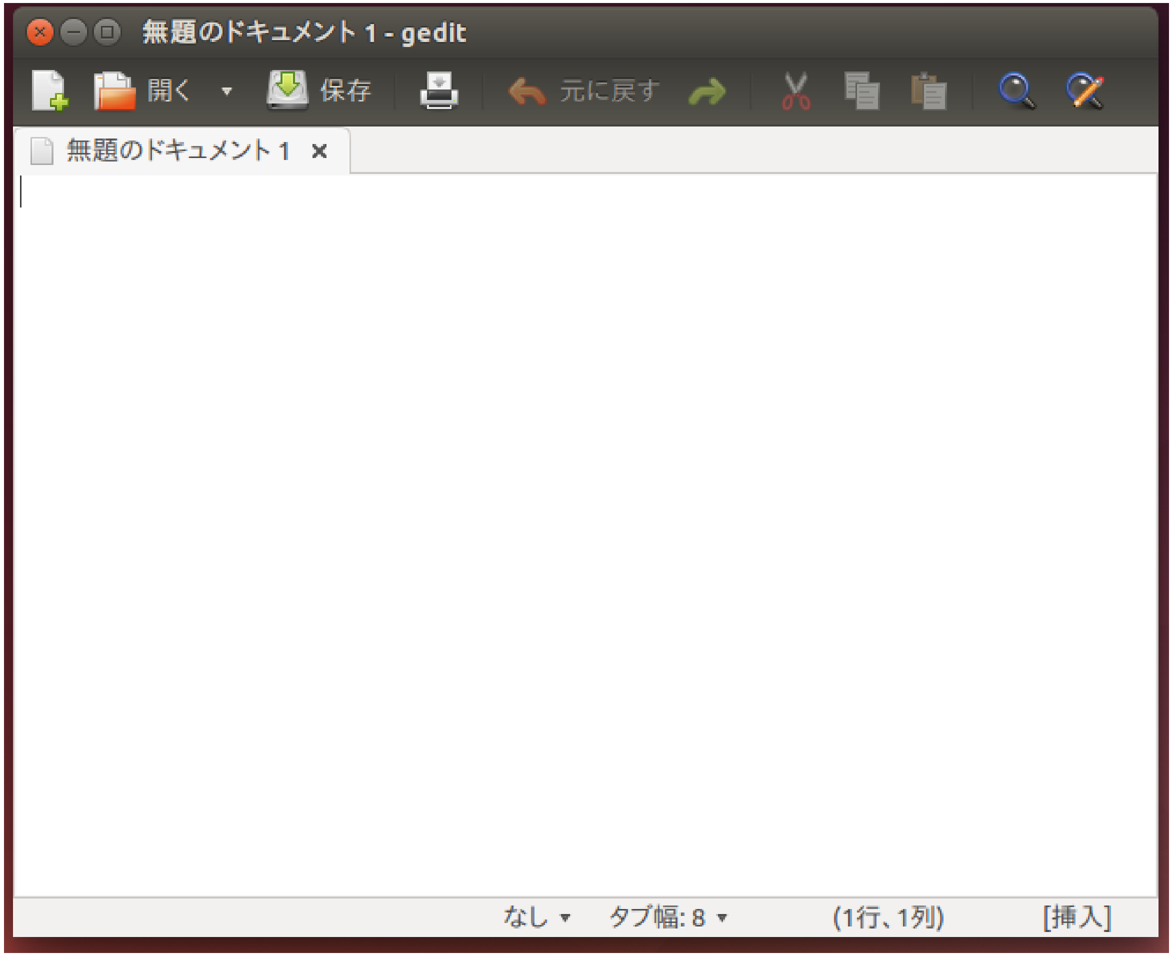
- Un-compression of a tar-archived file would be,

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

For zip file

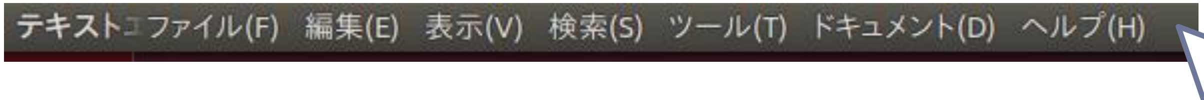
Edit a file by “gedit” !

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

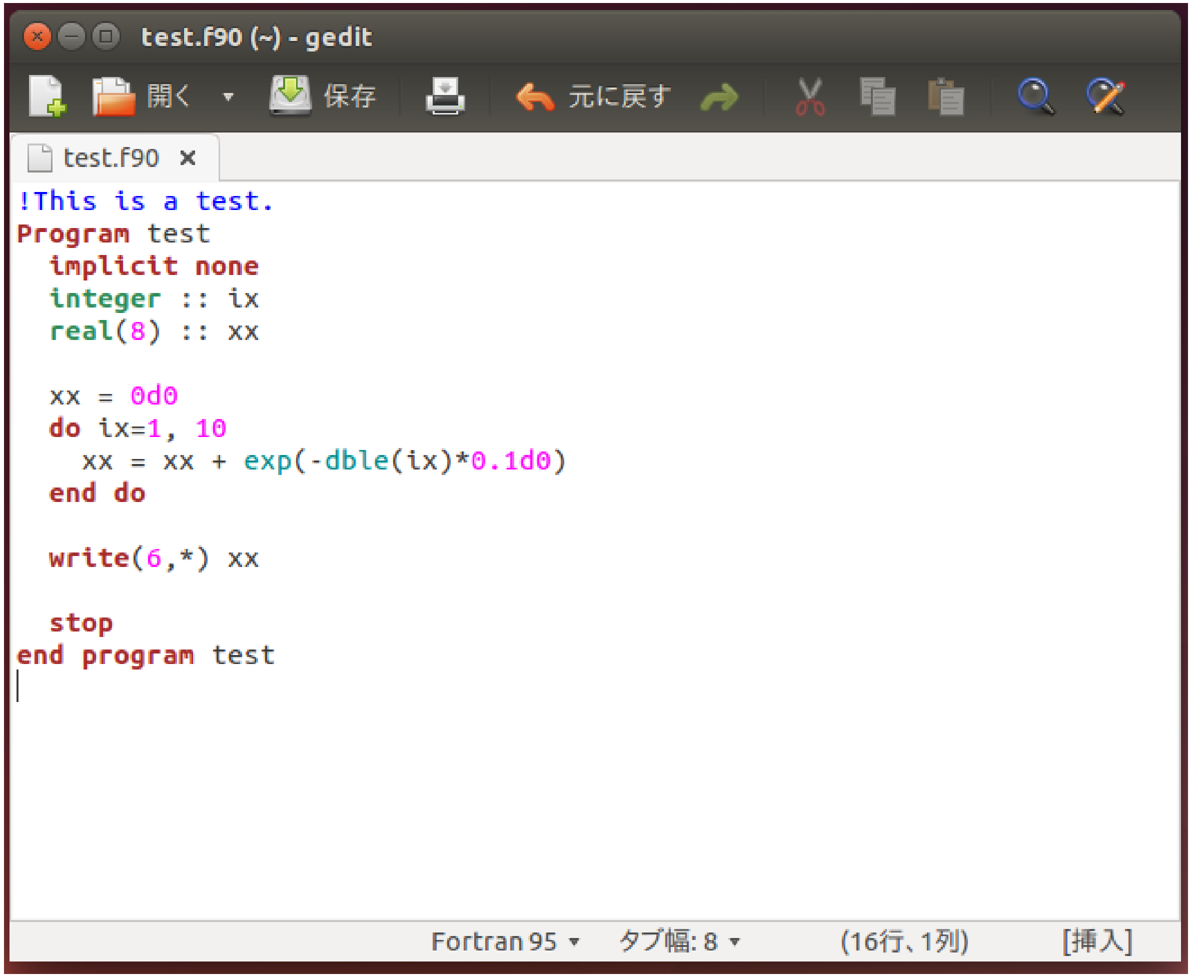


How to use gedit

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


テキストエファイル(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)

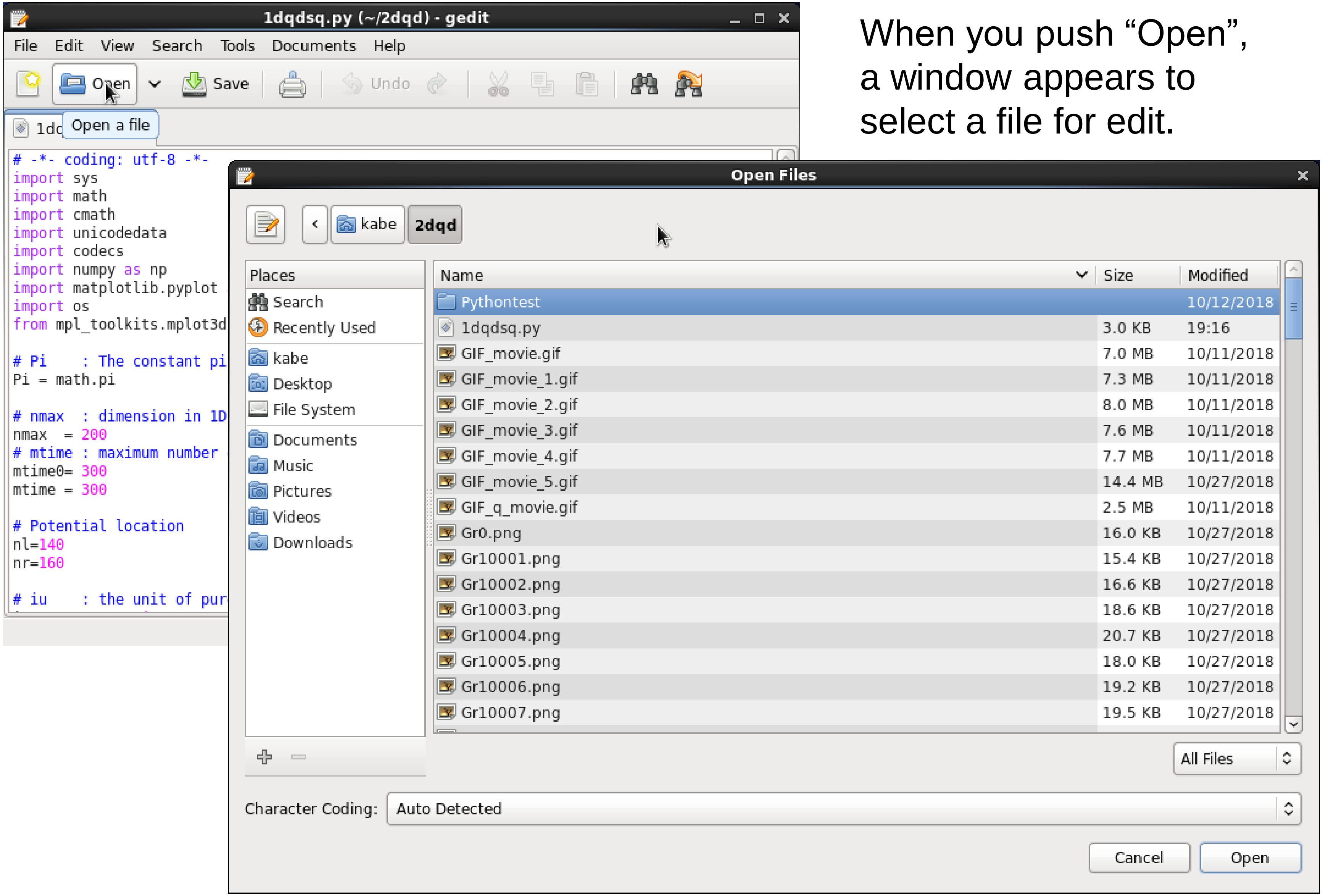
Key words in “a fortran source file” are highlighted.



```
!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
```

gedit on GNOME environment

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

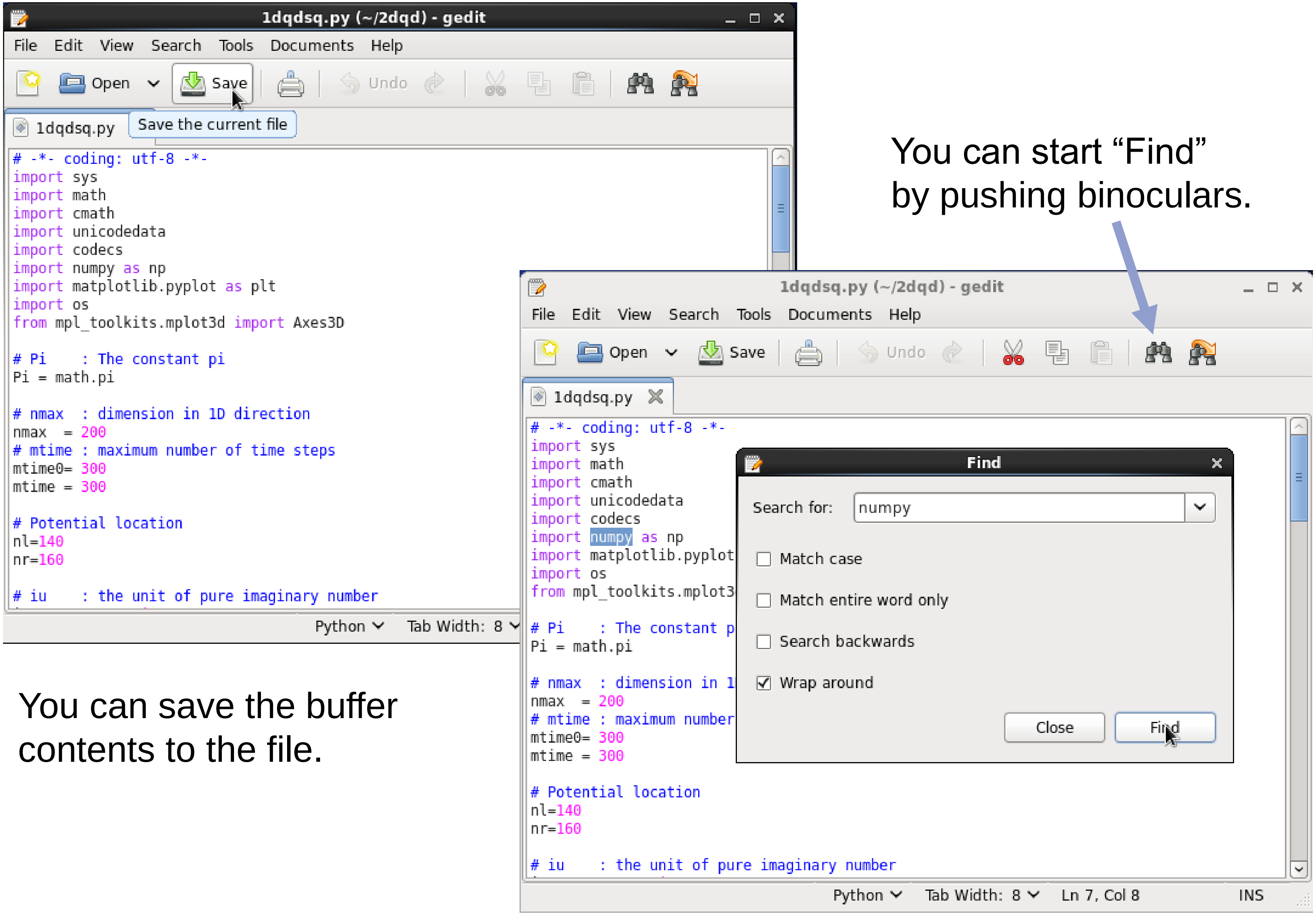


```
# -*- coding: utf-8 -*-
import sys
import math
import cmath
import unicodedata
import codecs
import numpy as np
import matplotlib.pyplot
import os
from mpl_toolkits.mplot3d

# 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
```

Name	Size	Modified
Pythontest		10/12/2018
1dqdsq.py	3.0 KB	19:16
GIF_movie.gif	7.0 MB	10/11/2018
GIF_movie_1.gif	7.3 MB	10/11/2018
GIF_movie_2.gif	8.0 MB	10/11/2018
GIF_movie_3.gif	7.6 MB	10/11/2018
GIF_movie_4.gif	7.7 MB	10/11/2018
GIF_movie_5.gif	14.4 MB	10/27/2018
GIF_q_movie.gif	2.5 MB	10/11/2018
Gr0.png	16.0 KB	10/27/2018
Gr10001.png	15.4 KB	10/27/2018
Gr10002.png	16.6 KB	10/27/2018
Gr10003.png	18.6 KB	10/27/2018
Gr10004.png	20.7 KB	10/27/2018
Gr10005.png	18.0 KB	10/27/2018
Gr10006.png	19.2 KB	10/27/2018
Gr10007.png	19.5 KB	10/27/2018

Character Coding: Auto Detected

Save, Find, etc. in gedit



```
# -*- coding: utf-8 -*-
import sys
import math
import cmath
import unicodedata
import codecs
import numpy as np
import matplotlib.pyplot as plt
import os
from mpl_toolkits.mplot3d import Axes3D

# Pi    : The constant pi
Pi = math.pi

# nmax  : dimension in 1D direction
nmax  = 200
# mtime : maximum number of time steps
mtime0= 300
mtime = 300

# Potential location
nl=140
nr=160

# iu    : the unit of pure imaginary number
```

```
# -*- 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.mplot3

# Pi    : The constant p
Pi = math.pi

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

# Potential location
nl=140
nr=160

# iu    : the unit of pure imaginary number
```

Search for: numpy

☐ Match case

☐ Match entire word only

☐ Search backwards

☑ Wrap around

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.

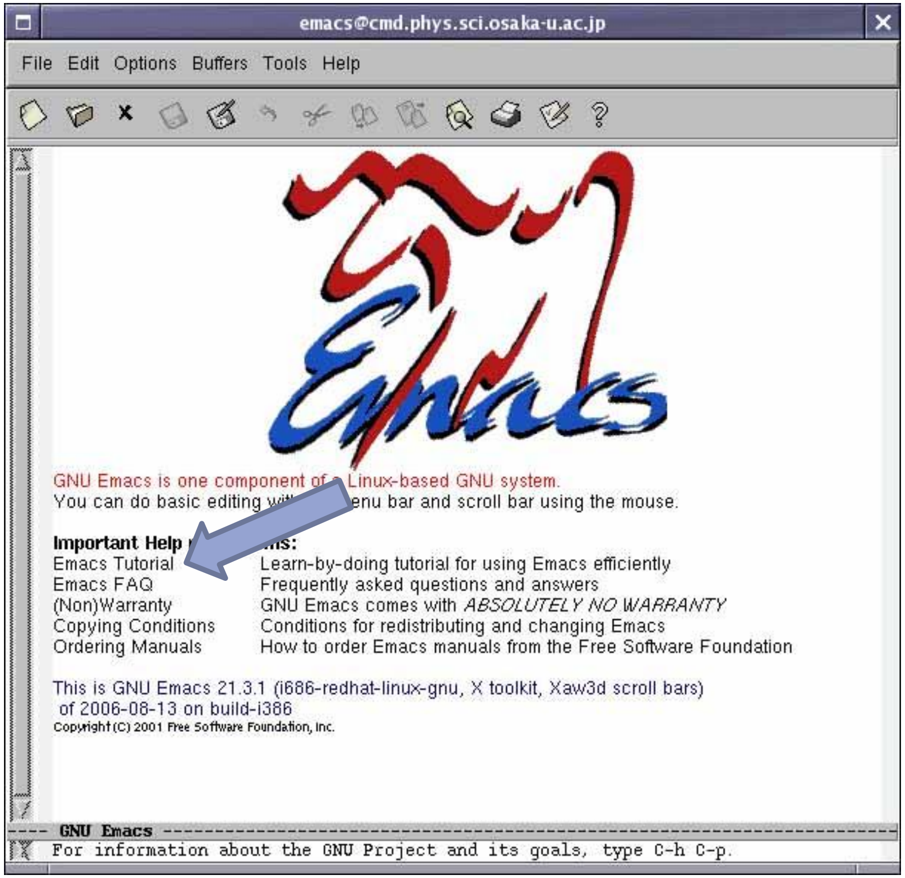
```
[stud01@cmd ~]$ emacs &
Don't you find?
```

- 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.


emacs@cmd.phys.sci.osaka-u.ac.jp
File Edit Options Buffers Tools Help

GNU Emacs is one component of a Linux-based GNU system.
You can do basic editing wi enu bar and scroll bar using the mouse.

Important Help ms:

Emacs Tutorial	Learn-by-doing tutorial for using Emacs efficiently
Emacs FAQ	Frequently asked questions and answers
(Non)Warranty	GNU Emacs comes with *ABSOLUTELY NO WARRANTY*
Copying Conditions	Conditions for redistributing and changing Emacs
Ordering Manuals	How to order Emacs manuals from the Free Software Foundation

This is GNU Emacs 21.3.1 (i686-redhat-linux-gnu, X toolkit, Xaw3d scroll bars)
of 2006-08-13 on build-i386
Copyright (C) 2001 Free Software Foundation, Inc.

```
---- GNU Emacs ----------------------------------------------------------
For information about the GNU Project and its goals, type C-h C-p.
```

- 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
C+@	set-mark-command
C+a	move-beginning-of-line
C+b	backward-char
C+c	mode-specific-command-prefix
C+d	delete-char
C+e	move-end-of-line
C+f	forward-char
C+g	keyboard-quit
C+h	help-command
C+i	indent-for-tab-command
C+j	newline-and-indent
C+k	kill-line
C+l	recenter-top-bottom
C+m	newline-and-indent
C+n	next-line

Key	command action
C+o	open-line
C+p	previous-line
C+q	quated-insert
C+r	insearch-backward
C+s	isearch-forward
C+t	transpose-chars
C+u	universal-argument
C+v	scroll-up
C+w	kill-region
C+x	Control-X-prefix
C+y	yank
C+z	iconify-or-deiconify-frame
C+_	undo
C+SPC	set-mark-command
C+/	undo

Emacs keystroke II : Esc + “1 character”

Key	command action
Esc+a	backward-sentence
Esc+b	backward-ward
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-meny-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”

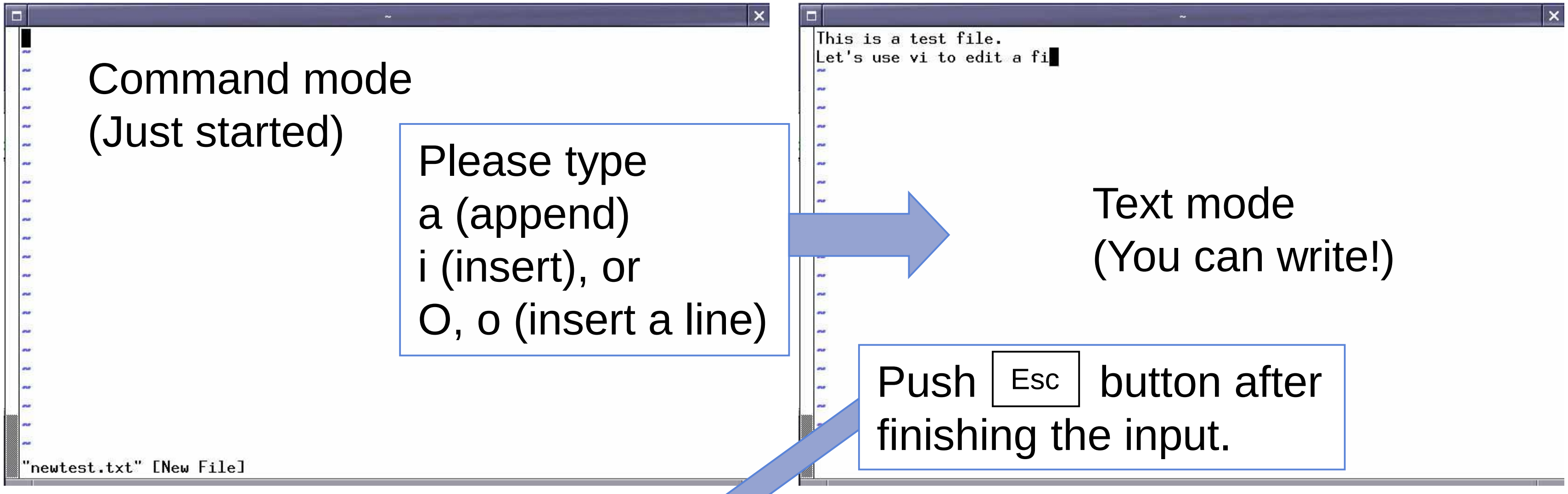
Key	command action
C+x C+b	list-buffers
C+x C+c	save-buffers-kill-emacs
C+x C+e	eval-last-sexp
C+x C+f	find-file
C+x TAB	indent-rigidly
C+x C+r	find-file-read-only
C+x C+s	save-buffer
C+x C+w	write-file
C+x 0	delete-window
C+x 1	delete-other-windows
C+x 2	split-window-vertically
C+x 3	split-window-holizontally

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`



```
"newtest.txt" [New File]
```

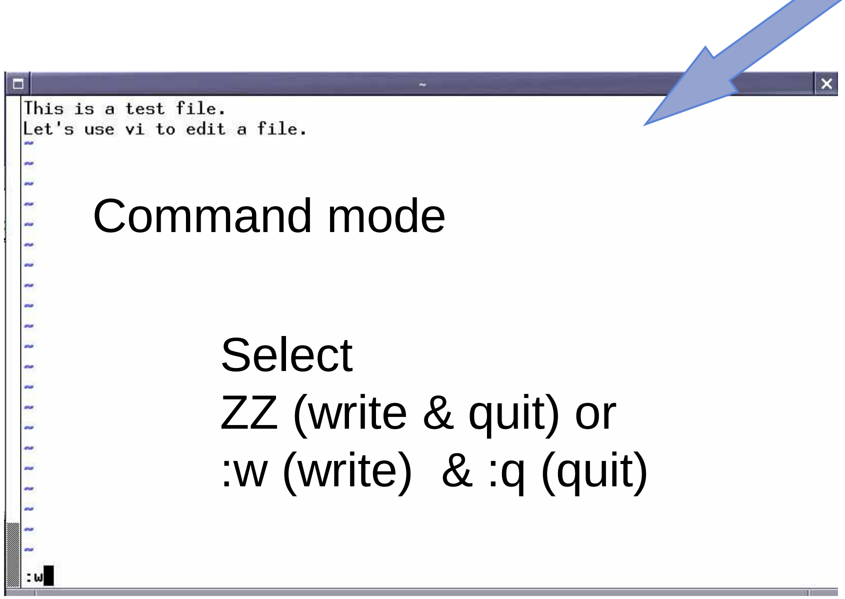
Command mode
(Just started)

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

```
This is a test file.
Let's use vi to edit a fi
```

Text mode
(You can write!)

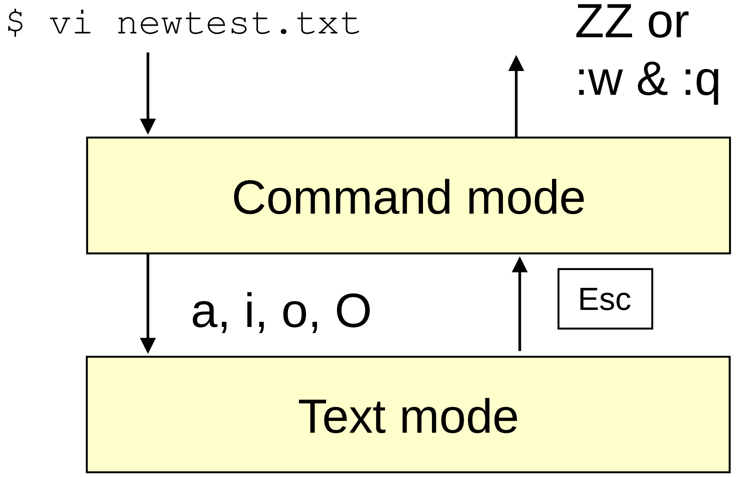
Push Esc button after finishing the input.



```
This is a test file.
Let's use vi to edit a file.

:w
```

Command mode

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



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-flesh the screen ：

  Push Ctrl + l 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”?