Introduction to Linux Commands

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CSCI2100A Data Structures Tutorial 5

Programming Midterm Matters

- The operation system will be Ubuntu, a Linux-based operating system
- You should have basic knowledge in Linux command line

Outline

- Department Linux Servers
- Basic Commands
- Vim Editor
- gcc
- Testing in PC^2

Department Linux Servers

- We recommend Linux14
  - The version of Java is most suitable for PC^2

✦ **Linux Workstations**

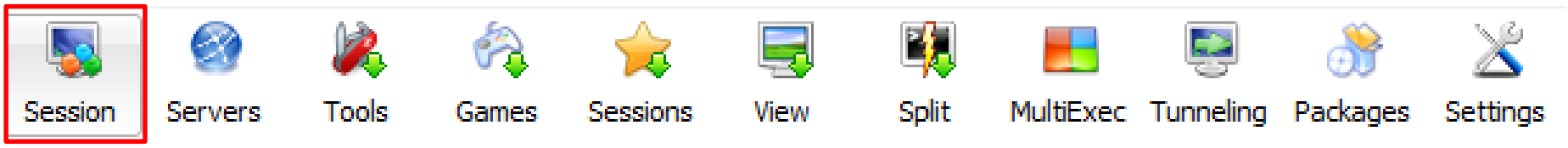
Hostname	No. of Processors	RAM	OS	Login	Qty.	Domain	software
linux1	4	12GB	64bit Debian 7	Remote login using SSH only	1	Teaching	
linux2-4	4	12GB	32bit Debian 7	Remote login using SSH only	3	Teaching	
linux5-8	4	12GB	64bit CentOS 7	Remote login using SSH only	4	Teaching	
linux9-12	12	256GB	64bit CentOS 7	Remote login using SSH only	4	Teaching	python / python3.6
linux13,15-16	8	48GB	64bit CentOS 7	Remote login using SSH only	3	Teaching	python / python3.6
linux14	8	32GB	64bit CentOS 7	Remote login using SSH only	1	Teaching	python / python3.6

Connect to Linux14

- Windows:
  - Mobaxterm
    - https://mobaxterm.mobatek.net/download-home-edition.html
- Mac:
  - Terminal + Xquartz
  - Xquartz is used to forward the GUI
    - https://www.xquartz.org

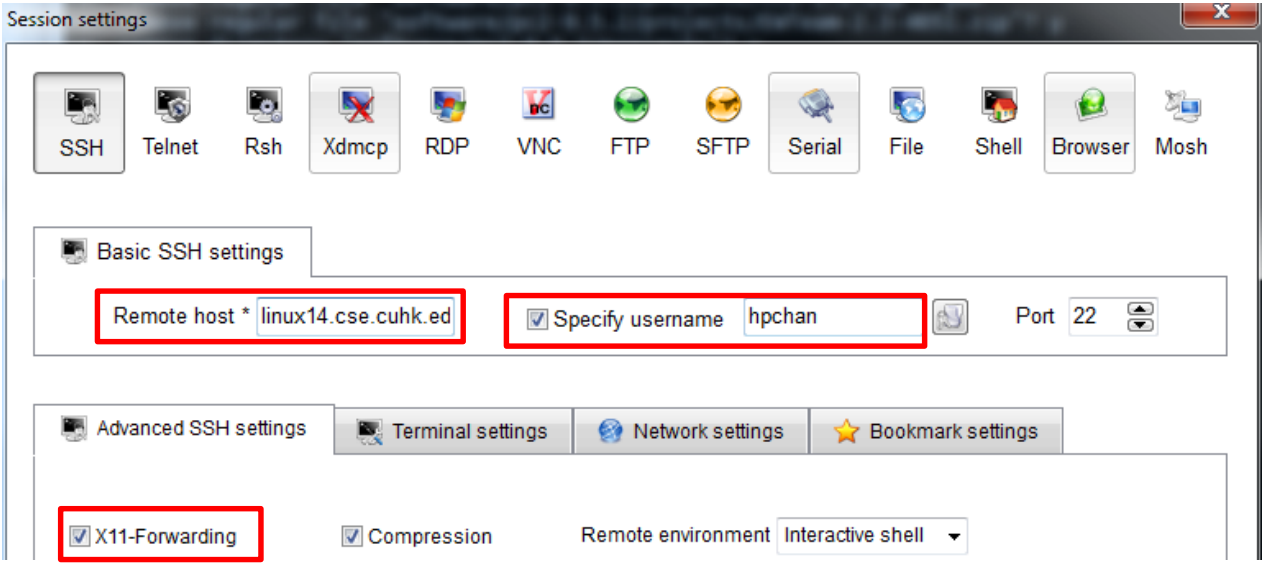
MobaXterm (Windows)

- Connect to CSE VPN if you are not within CSE network. VPN setup tutorial:
- https://corner.cse.cuhk.edu.hk/tech/l2tp-ipsec.html
- Open MobaXterm
- Click the Session button



MobaXterm (Windows)

- Click SSH button
- Fill in “linux14.cse.cuhk.edu.hk” in Remote host
- Fill in your CSE UNIX username in Specify username
- Click Advanced SSH setting and enable X11-Forwarding
- Click OK and type in your password



Terminal (Mac)

- Connect to CSE VPN if you are not within CSE network
- Install Xquartz
- Logout your Mac
- Login your Mac
- Open your terminal
- Type in the following command

  ssh -X [UNIX user name]@linux14.cse.cuhk.edu.hk
- Enter password

Terminal (Mac)

- If you have Host key verification failed
- Type in the following commands
  - cd open ~/.ssh
- Open the known_hosts file
- Remove the line that starts with “linux14.cse.cuhk.edu.hk”

Basic Linux command

Command	Description
pwd	Display the pathname for the current directory.
ls [options]	List directory contents.
cd directorypath	Change to directory. cd .. to back to the parent directory
cp [options] source destination	Copy files and directories.
rm [options] directory	Remove (delete) file(s) and/or directories. rm -r directory to remove non-empty directory
mkdir [options] directory	Create a new directory.
rmdir [options] directory	Delete empty directories.
mv [options] source destination	Rename or move file(s) or directories.
man [command]	Display the help information for the specified command.
cat [filename]	Display file's contents to the standard output device (usually your monitor).
less [options] [filename]	View the contents of a file one page at a time.

Online Basic Linux Commands tutorial

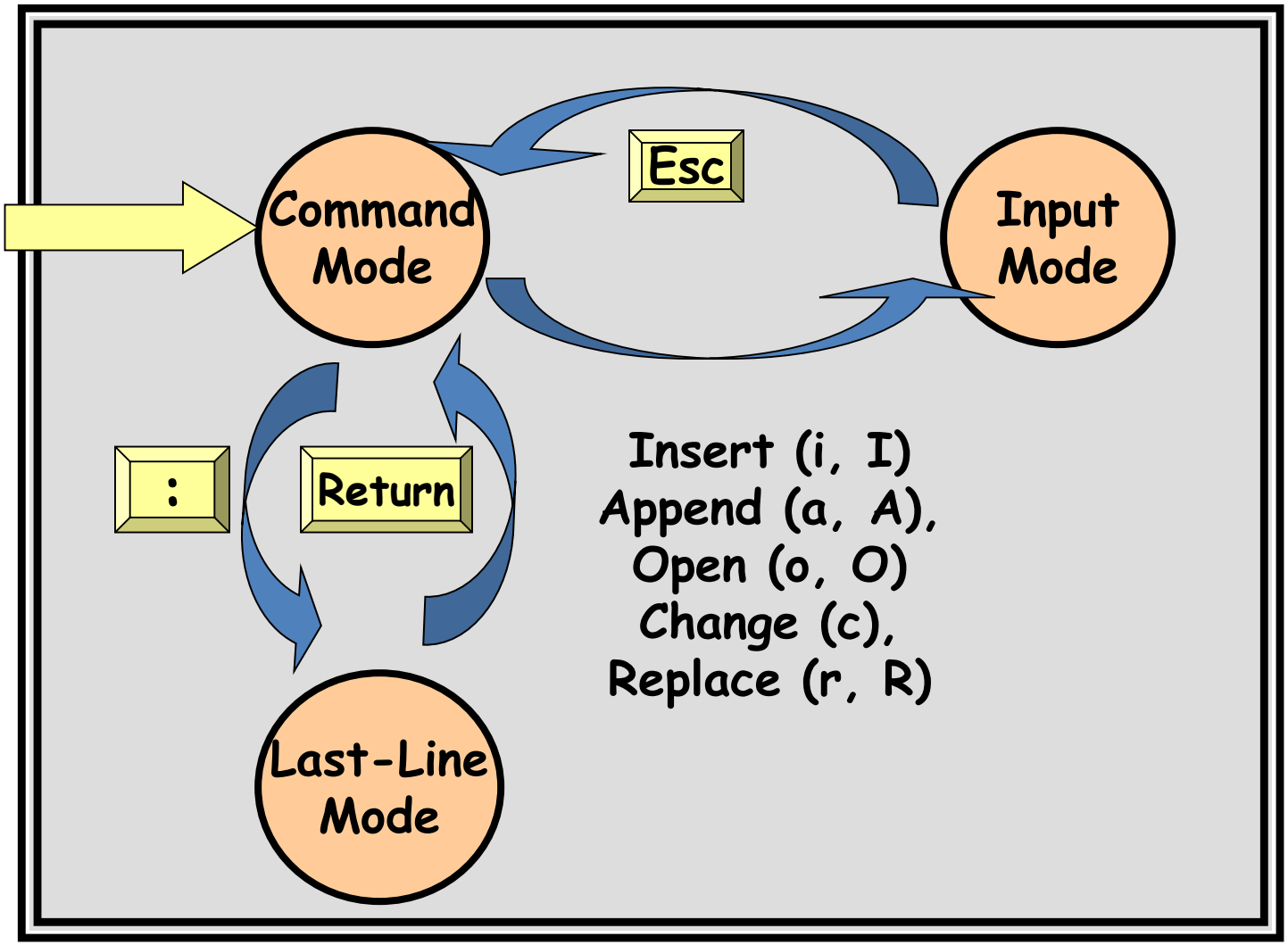
- https://youtu.be/IVquJh3DXUA
- http://www.dummies.com/how-to/content/common-linux-commands.html

The vi Editor

- short for: visual editor
- available on all UNIX systems
  - open source vim (vi improved)
    is part of GNU/Linux
- vi/vim has multiple modes of operation:
  - input mode, command mode, last-line mode
- Command:

  vim [filename]

vi Editing modes



VIM TUTORIAL

- Never start something you can't exit
  - To end vi tutorial in the middle of the session, execute the command :q!
  - :q! = quit without saving
  - :wq = write out (save) and quit
- F1 = help
  - or :help
  - :help <command>
  - :q to exit help window

COMMANDS

- Insert characters
  - i converts to insert mode
  - then type characters
  - blackspace to remove characters
  - <esc> to exit insert mode
- Delete characters
  - x deletes character under the cursor
- Motion in command mode:
  - h,j,k,l: left,up,down,right
  - 0,$: move to begin/end of current line

COMMANDS

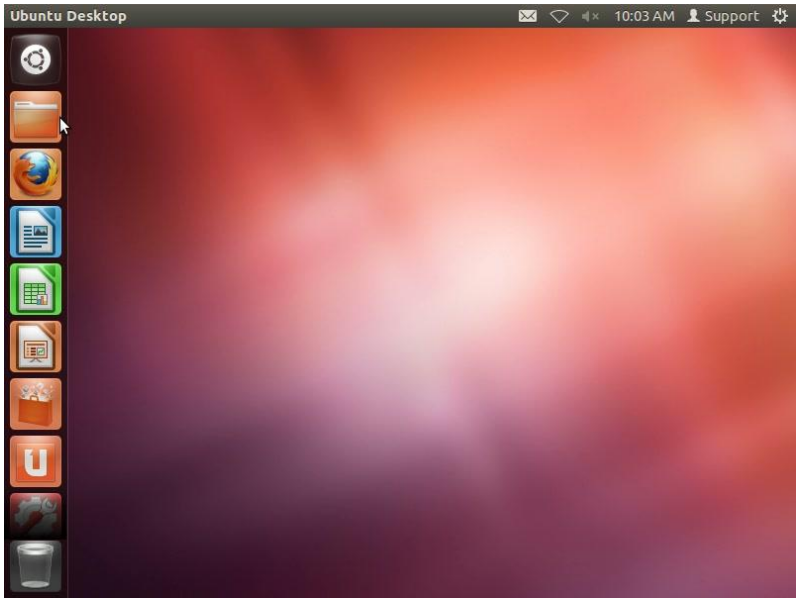
- Insert lines
  - o = open line below cursor
  - O = open line above cursor
  - <esc> to exit insert mode
- Append characters
  - A converts to insert mode at end of a line
  - then type characters
  - <esc> to exit insert mode

Online Resource

- Tutorial
  - http://www.openvim.com/
  - http://tips.webdesign10.com/another-vim-tutorial
- Misc.
  - Great color scheme, highlight keywords, etc.
  - https://github.com/amix/vimrc

Programming Mid-term Matters

- Fortunately, you have a GUI, and a text editor



- But there is no IDE like Visual studio or Xcode
- Still need to command line to debug

gcc

- gcc is the C compiler developed by GNU project
- Widely adopted as the default compiler of UNIX-like systems

gcc

- hello.c

```
#include <stdio.h>
int main()
{
    printf("Hello, world!\n");
    return 0;
}
```

- Compiling hello.c into an executable file called “hello" is:

  gcc hello.c -o hello

- Execute the executable file “hello”:

  ./hello

gcc

- gcc also provides options that help you to optimize or debug your code
- Compile your code with debugging information:

  gcc -g -o garbage garbage.c

- For other optimization/debug options, you may need to check the manual:

  man gcc

Install PC^2 in Linux14

- Go to your home folder

  cd ~

- Create a software folder

  mkdir software

  cd software

- Download PC^2 (may need to use bash shell)

  wget https://pc2.ecs.csus.edu/code/v9/pc2-9.6.0-5102/pc2-9.6.0-5102.zip -e use_proxy=yes -e http_proxy=proxy.cse.cuhk.edu.hk:8000 --no-check-certificate

Install PC^2 in Linux14

- Extract the zip

  unzip pc2-9.6.0-5102.zip

- Go to the folder

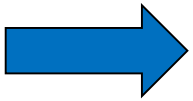
  cd pc2-9.6.0

- Edit the pc2v9.ini using vim

  vim pc2v9.ini

```
[client]

# Site 1
server=localhost:50002
#server=localhost:50002
# Site 2
#server=localhost:51002
# Site 3
# server=localhost:52002
```



```
[client]

# Site 1
server=137.189.90.245:2606
#server=localhost:50002
# Site 2
#server=localhost:51002
# Site 3
# server=localhost:52002
```

Install PC^2 in Linux14

- Copy the changed “pc2v9.ini” file into “bin” folder

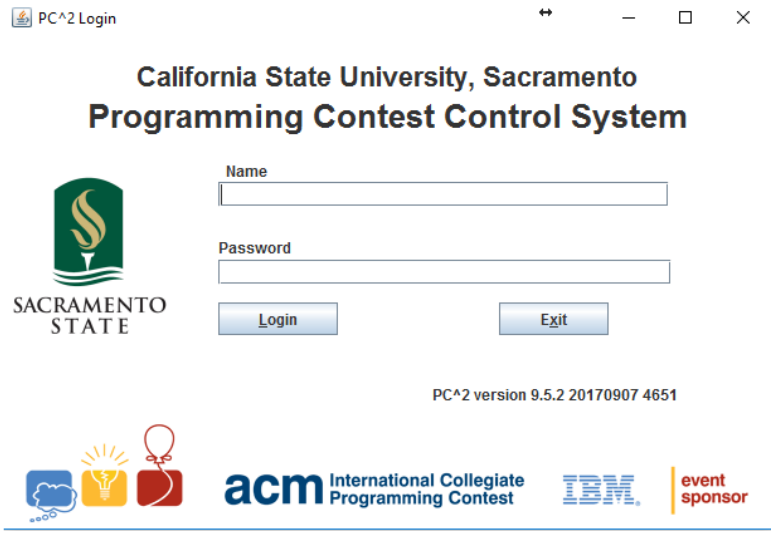
  cp pc2v9.ini bin

- Go to bin folder

  cd bin

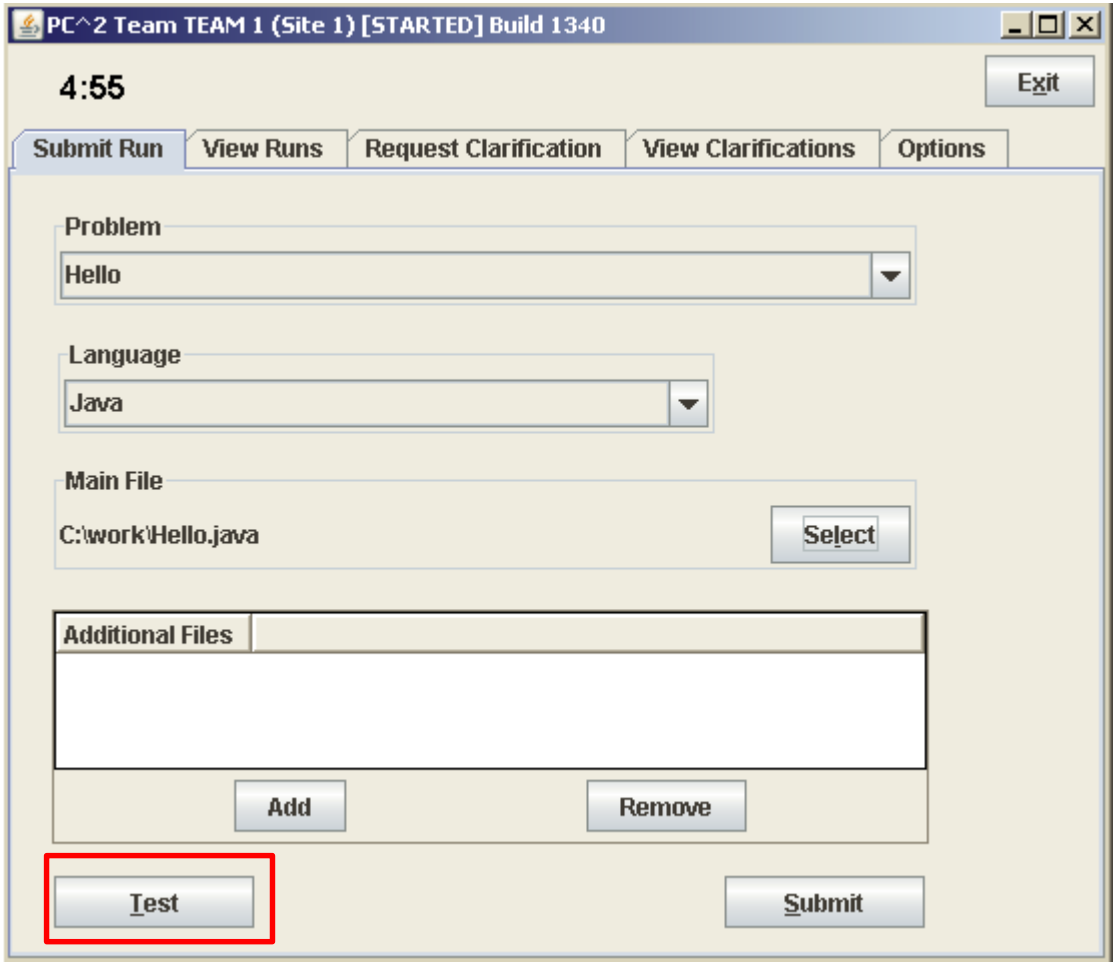
- Run PC2team

  ./pc2team



Test Runs

- Click the **Test** button
- This will make a "**TEST RUN**", meaning it will compile and execute your program *on the* ***local machine (e.g., linux14), but not the judge!***
- Allow you to select a test case file
- Test your code using **your own test cases, but not the test case on the judge**
- Only available in Linux or Mac



Summary

- Get familiar with Linux environment
- In programming mid-term
  - With GUI and text editor
  - PC^2 already installed
  - Need to debug using GCC and/or the test function of PC^2

Appendix of VIM

COMMANDS

- Deletion
  - d$ deletes to end of line
  - dw deletes to beginning of next word
  - de deletes to end of current word
  - d + motion
- Using motions for movement
  - Use any of the motions above
  - Use count for repetition
  - 2w = move cursor two words forward
  - 0 = start of line

COMMANDS

- Using repetition as part of deletion
  - 2dw deletes next two words
- Deleting a line
  - dd = delete line
  - 2dd = delete two lines
- Undo
  - u = undo one command
  - U = restore a line
  - ctrl-R = redo a command

COMMANDS

- p = put back the deleted text (in new place)
  - one of the delete command above + put = cut-and-paste
- More general cut-and-paste
  - v = start visual mode (start block)
  - move cursor to end of block
  - y = yank (copy to buffer)
  - then p = put in new place

COMMANDS

- Location
  - ctrl-g = show position in file
  - G = go to bottom of file
  - gg = go to top of file
  - <number>g = go to line <number>

COMMANDS

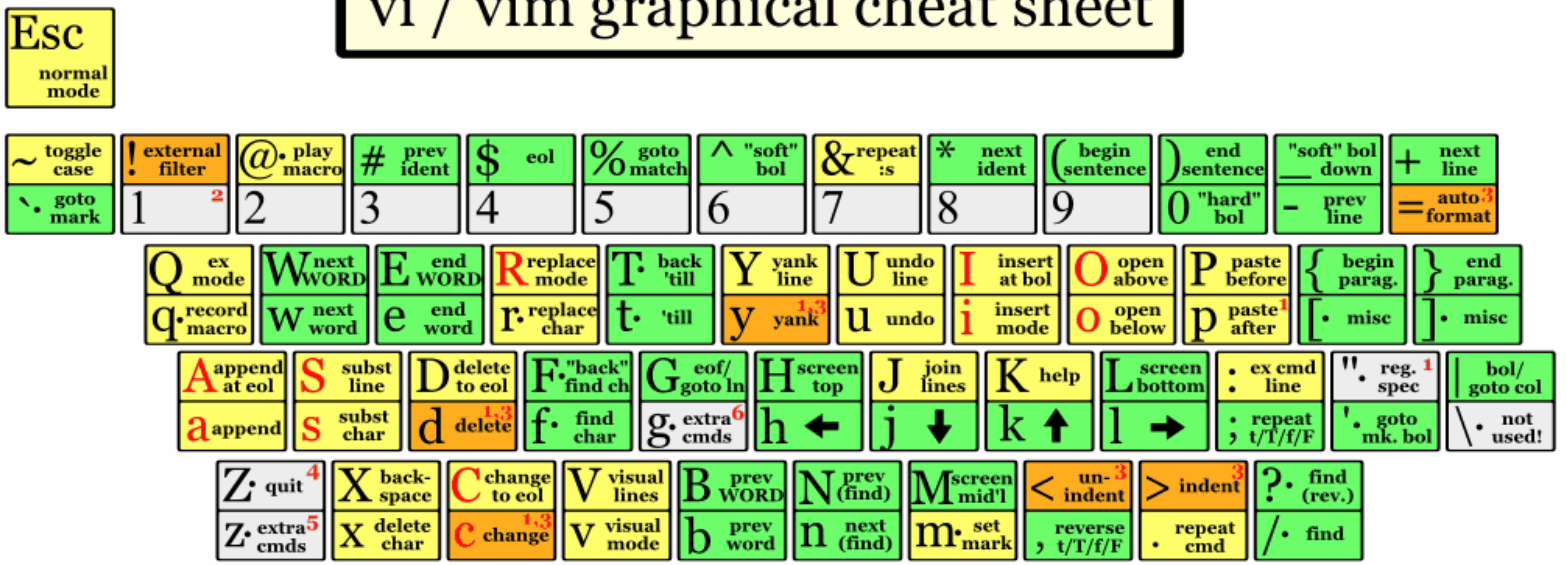
- Search
  - /<phrase> = search
  - /<phrase>\c = ignore case
  - ?<phrase> = search backwards
  - n = repeat search
  - N = repeat search in the other direction
- Search for matching parentheses
  - Put cursor on (, [or {
  - % = go to matching one
  - % = go to first one again

COMMANDS

- Substitute (replace)
  - :s/thee/the = changes first one
  - :s/thee/the/g = changes all (global change)
  - :s/thee/the/gc = change all with query
  - :#,#/thee/the/g = only change within that line range

version 1.1
April 1st, 06

vi / vim graphical cheat sheet



motion moves the cursor, or defines the range for an operator

command direct action command, if red, it enters insert mode

operator requires a motion afterwards, operates between cursor & destination

extra special functions, requires extra input

q· commands with a dot need a char argument afterwards

bol = beginning of line, eol = end of line,
mk = mark, yank = copy

words: `quux(foo, bar, baz);`
WORDs: `quux(foo, bar, baz);`

Main command line commands ('ex'):

:w (save), :q (quit), :q! (quit w/o saving)
:e f (open file f),
:%s/x/y/g (replace 'x' by 'y' filewide),
:h (help in vim), :new (new file in vim),

Other important commands:

CTRL-R: redo (vim),
CTRL-F/-B: page up/down,
CTRL-E/-Y: scroll line up/down,
CTRL-V: block-visual mode (vim only)

Visual mode:

Move around and type operator to act on selected region (vim only)

Notes:

(1) use "x before a yank/paste/del command to use that register ('clipboard') (x=a..z,*) (e.g.: "ay$ to copy rest of line to reg 'a')

(2) type in a number before any action to repeat it that number of times (e.g.: 2p, d2w, 5i, d4j)

(3) duplicate operator to act on current line (dd = delete line, >> = indent line)

(4) ZZ to save & quit, ZQ to quit w/o saving

(5) zt: scroll cursor to top, zb: bottom, zz: center

(6) gg: top of file (vim only), gf: open file under cursor (vim only)

For a graphical vi/vim tutorial & more tips, go to **www.viemu.com** - home of ViEmu, vi/vim emulation for Microsoft Visual Studio

Customizing vim

- Modify the ~/.vimrc file
- Some common syntax
  - set nu
  - set syntax=on
  - set history=1000