Learning Unix/Linux

Based on slides from: Eric Bishop

Introduction: What is Unix?

- An operating system
- Developed at AT&T Bell Labs in the 1960’s
- Command Line Interpreter
- GUIs (Window systems) are now available

Introduction: Unix vs. Linux

- Unix was the predecessor of Linux
- Linux is a variant of Unix
  - So is Mac OS X, so much of this tutorial applies to Macs as well
- Linux is open source

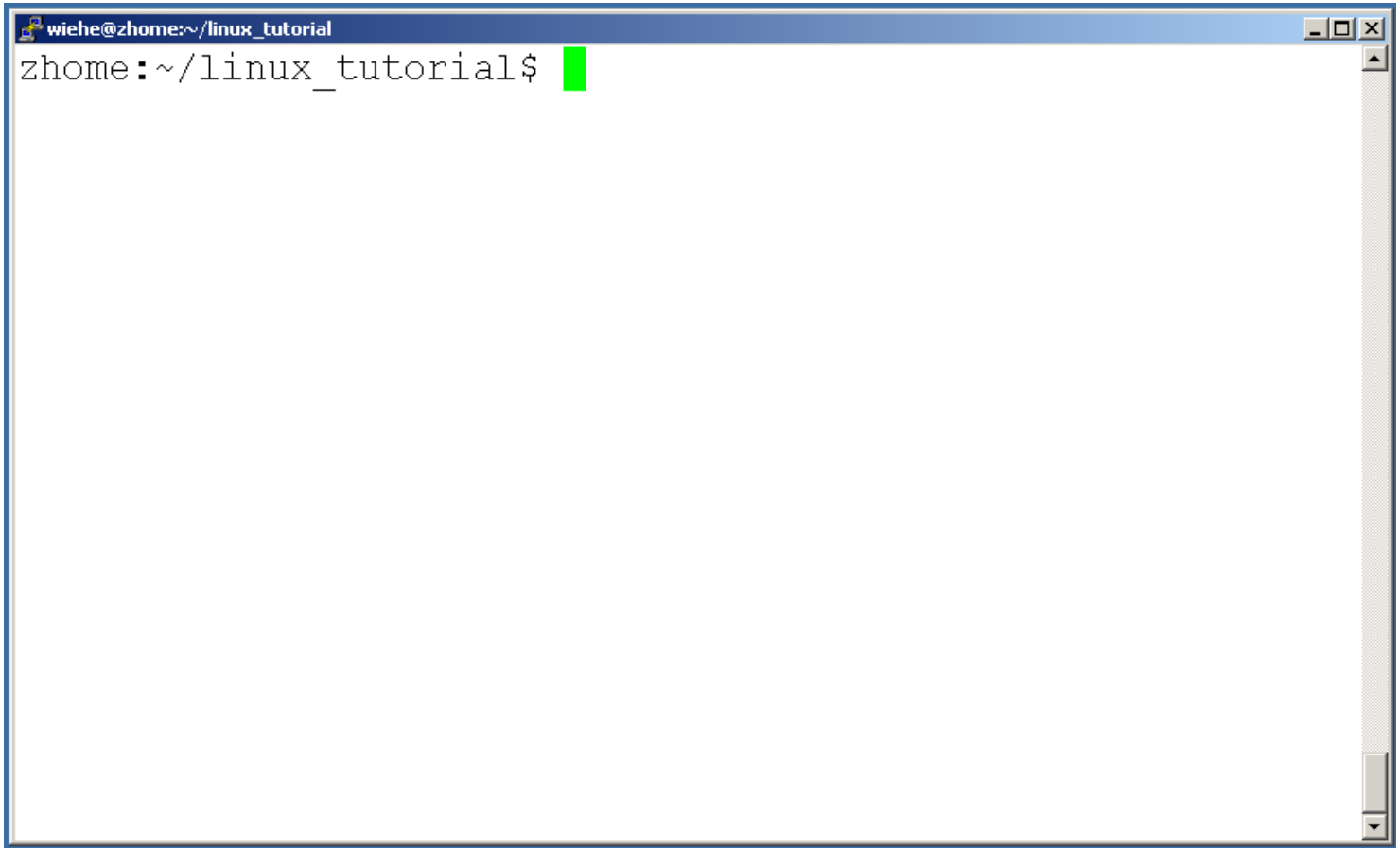
Introduction: Why Unix/Linux?

- Linux is free
- It's fully customizable
- It's stable (i.e. it almost never crashes)

- These characteristics make it an ideal OS for programmers and scientists

Connecting to a Unix/Linux system

- Open up a terminal:



Connecting to a Unix/Linux system

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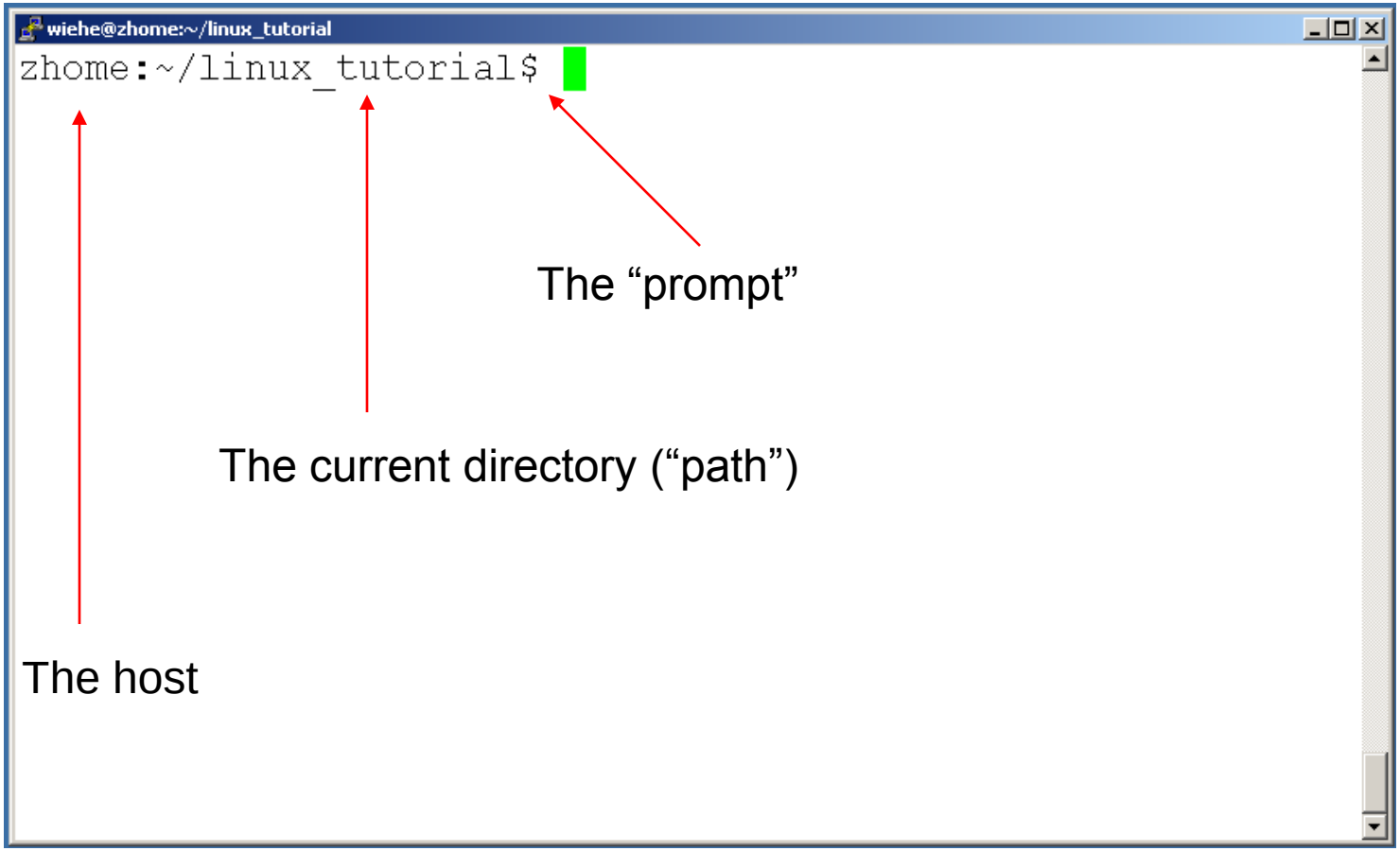


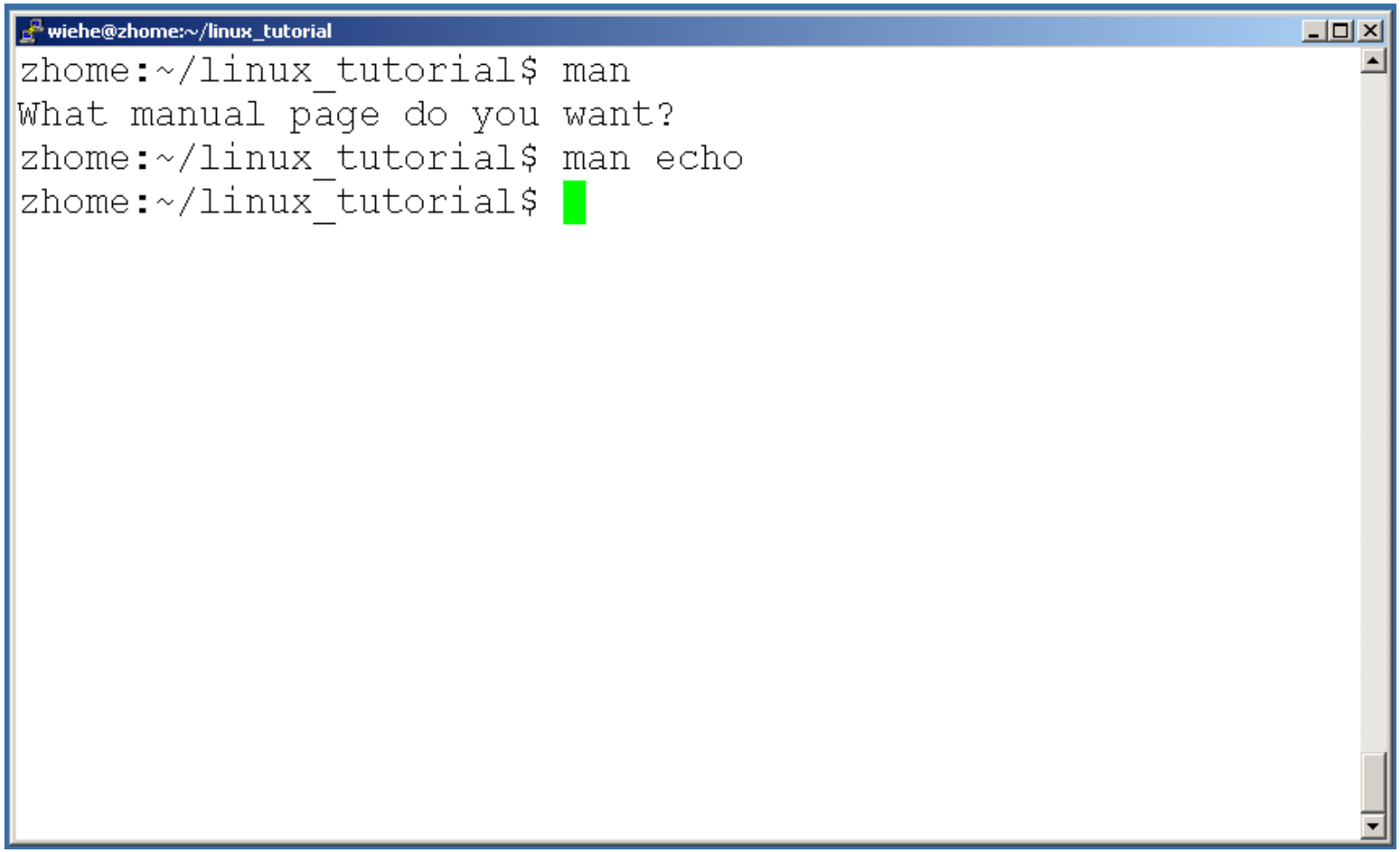
What exactly is a “shell”?

- After logging in, Linux/Unix starts another program called the **shell**
- The shell interprets commands the user types and manages their execution
  - The shell communicates with the internal part of the operating system called the **kernel**
  - The most popular shells are: tcsh, csh, korn, and bash
  - The differences are most times subtle
  - For this tutorial, we are using bash
- Shell commands are **CASE SENSITIVE!**

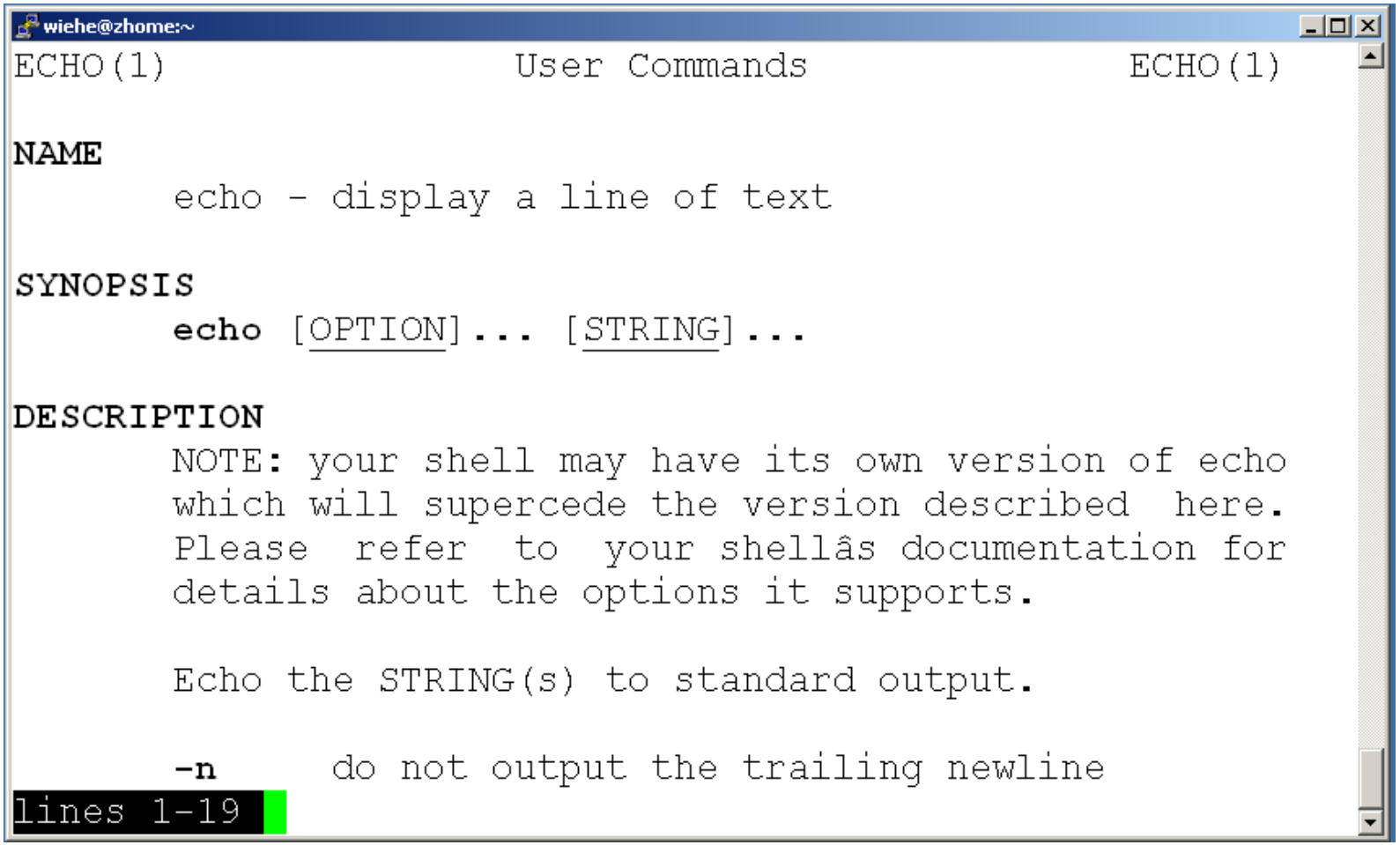
Help!

- Whenever you need help with a command type “man” and the command name

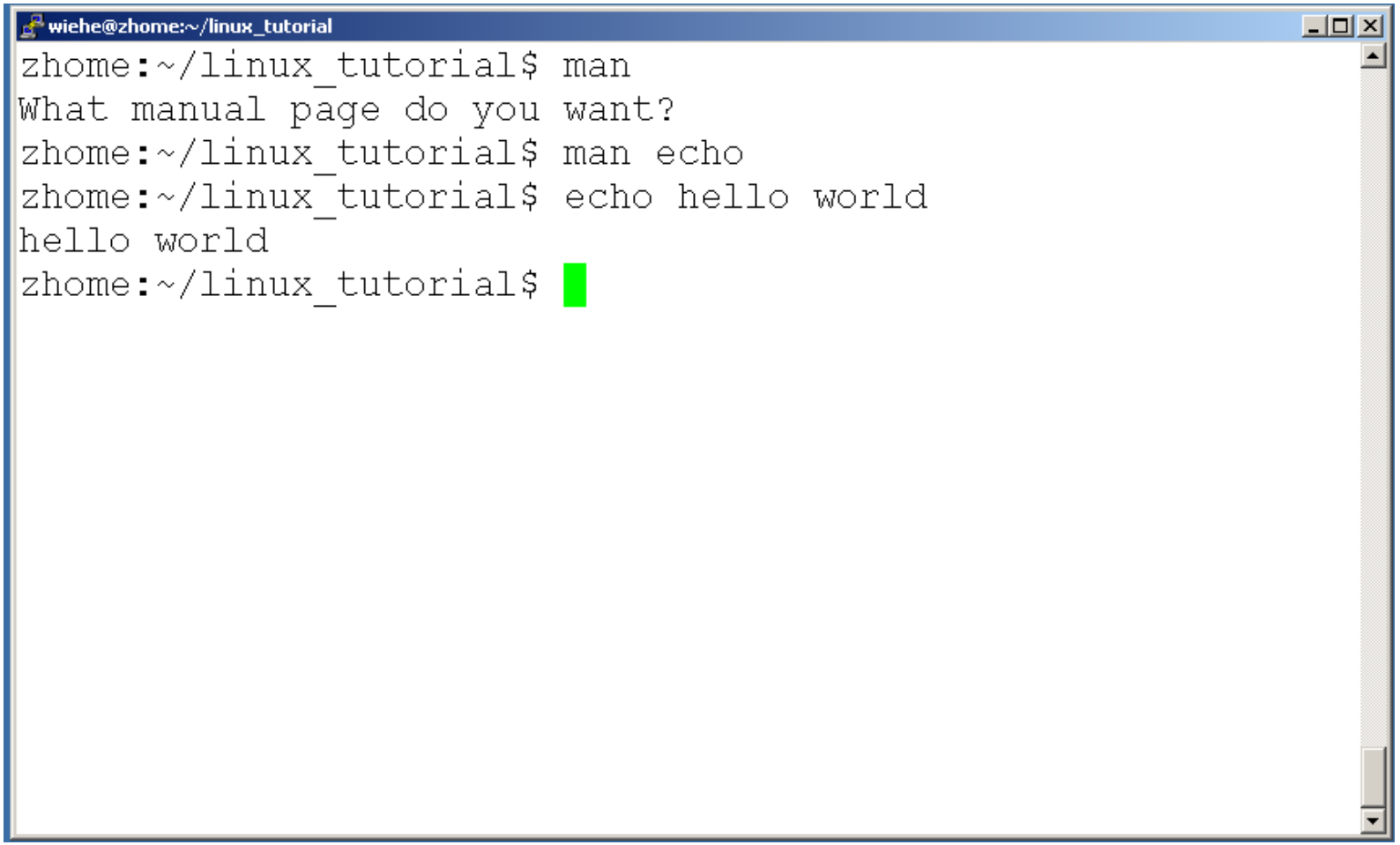
Help!


wiehe@zhome:~/linux_tutorial
zhome:~/linux_tutorial$ man
What manual page do you want?
zhome:~/linux_tutorial$ man echo
zhome:~/linux_tutorial$

Help!

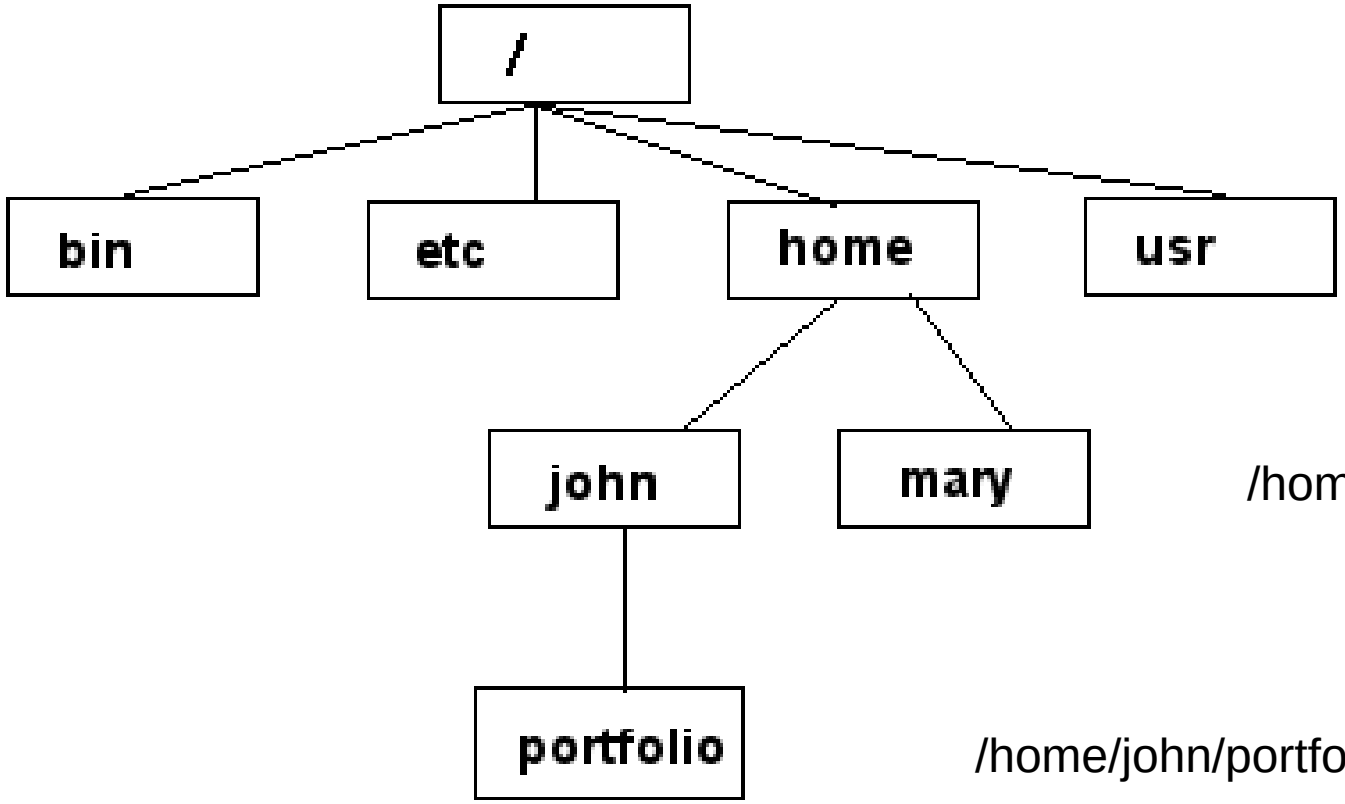

wiehe@zhome:~
ECHO(1) User Commands ECHO(1)
NAME
echo - display a line of text
SYNOPSIS
echo [OPTION]... [STRING]...
DESCRIPTION
NOTE: your shell may have its own version of echo which will supercede the version described here. Please refer to your shellâs documentation for details about the options it supports.
Echo the STRING(s) to standard output.
-n do not output the trailing newline
lines 1-19

Help!


wiehe@zhome:~/linux_tutorial
zhome:~/linux_tutorial$ man
What manual page do you want?
zhome:~/linux_tutorial$ man echo
zhome:~/linux_tutorial$ echo hello world
hello world
zhome:~/linux_tutorial$

Unix/Linux File System

NOTE: Unix file names are **CASE SENSITIVE!**



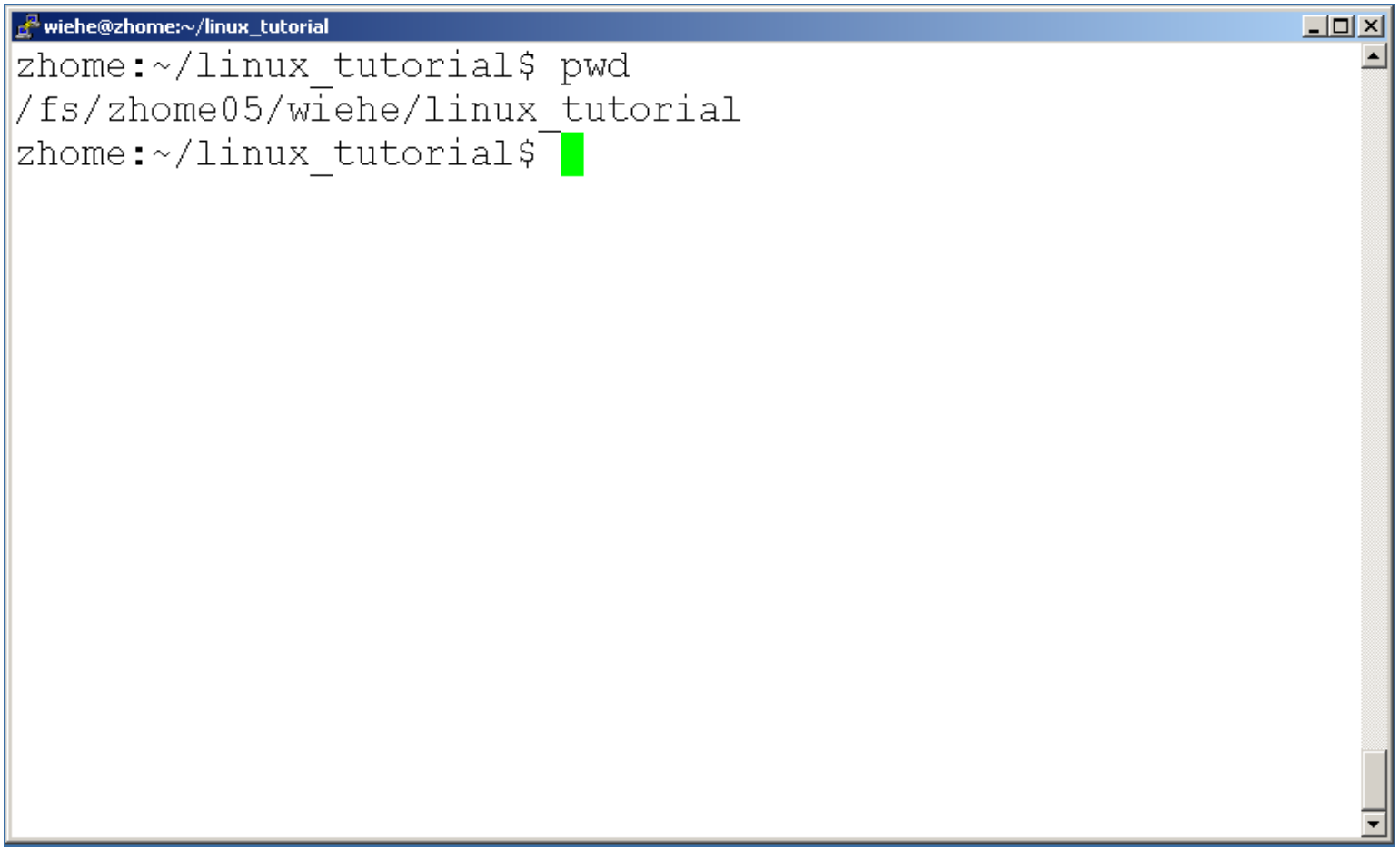
/home/mary/

/home/john/portfolio/

The Path

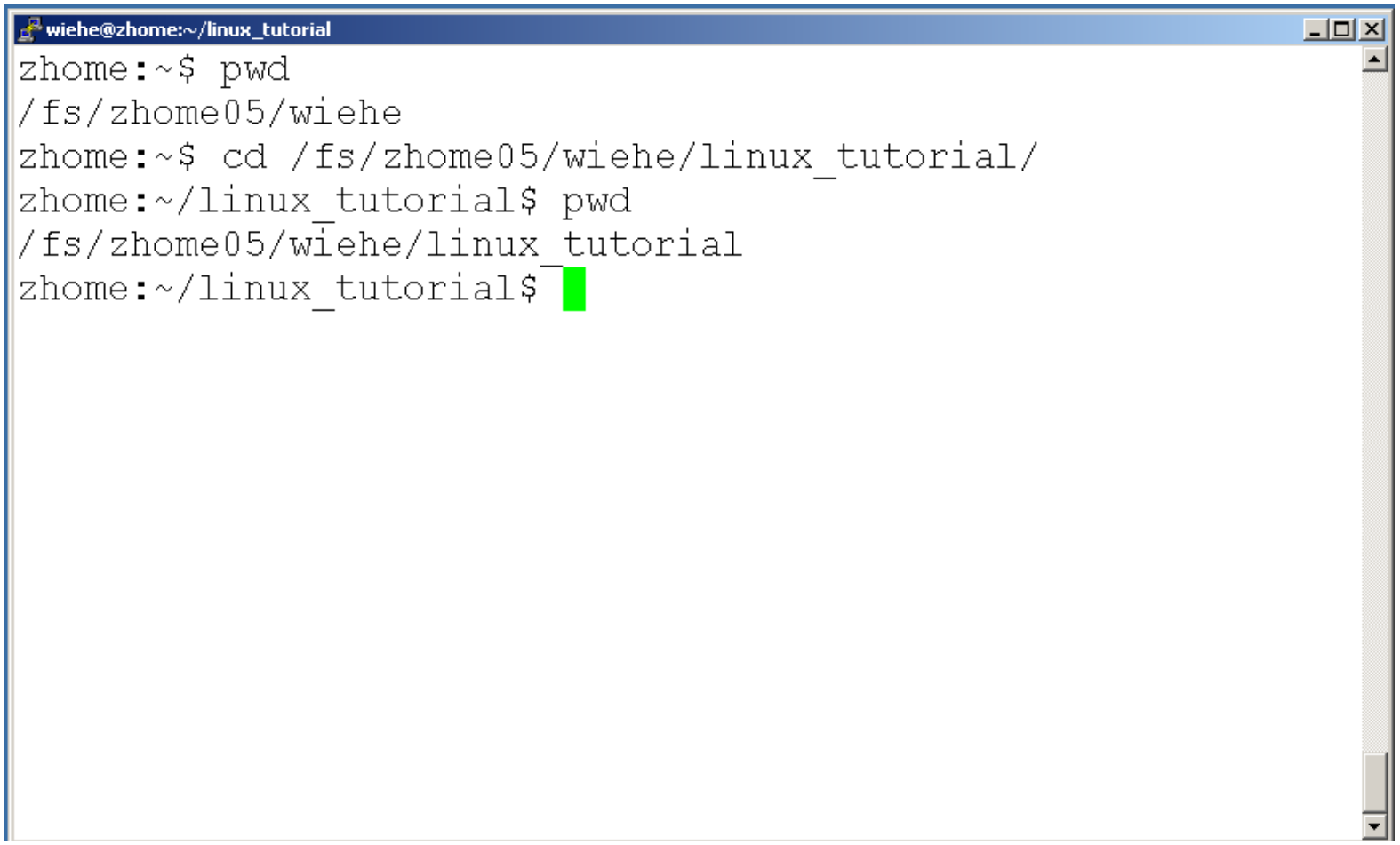
Command: pwd

- To find your current path use “pwd”



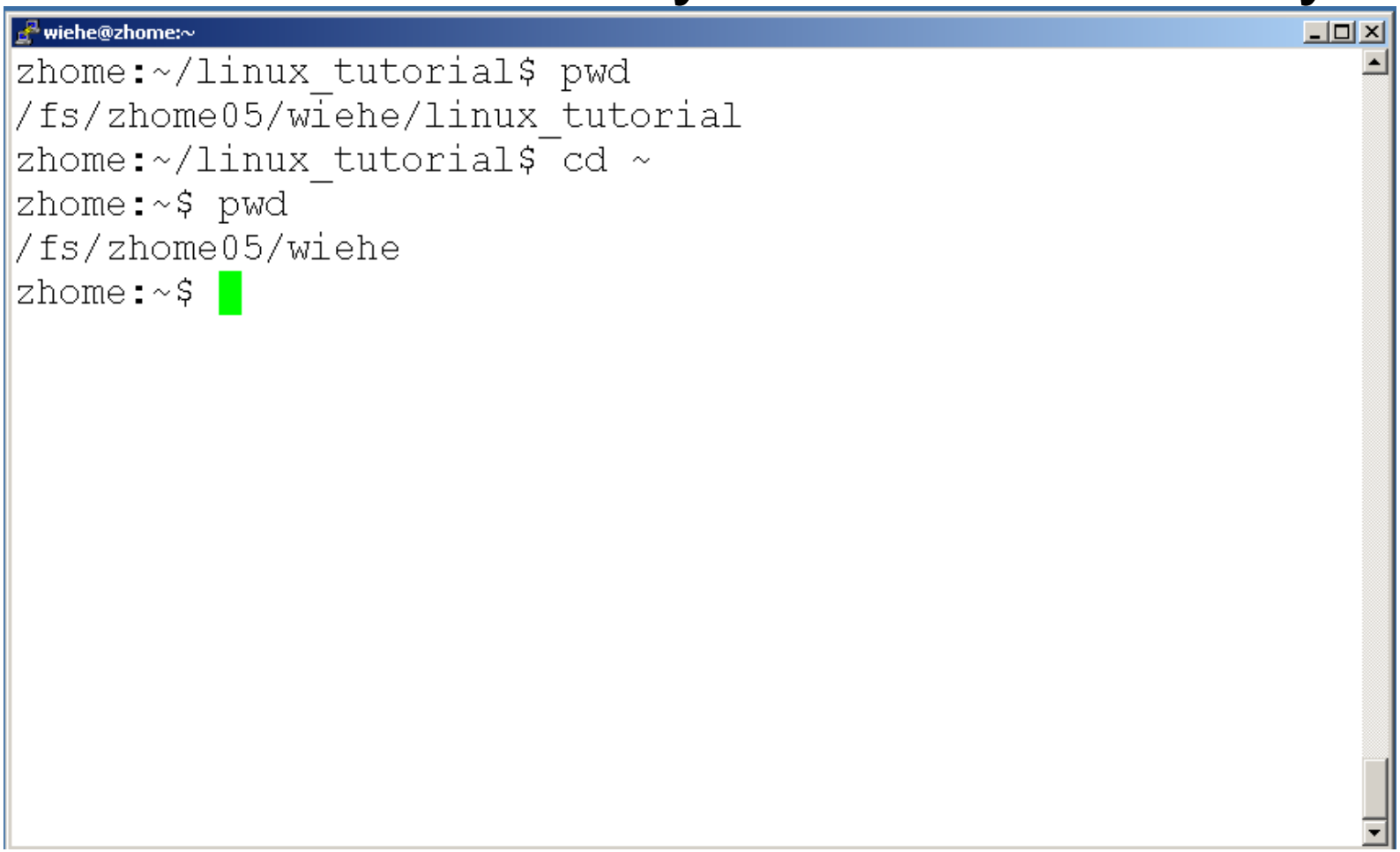
Command: cd

- To change to a specific directory use “cd”



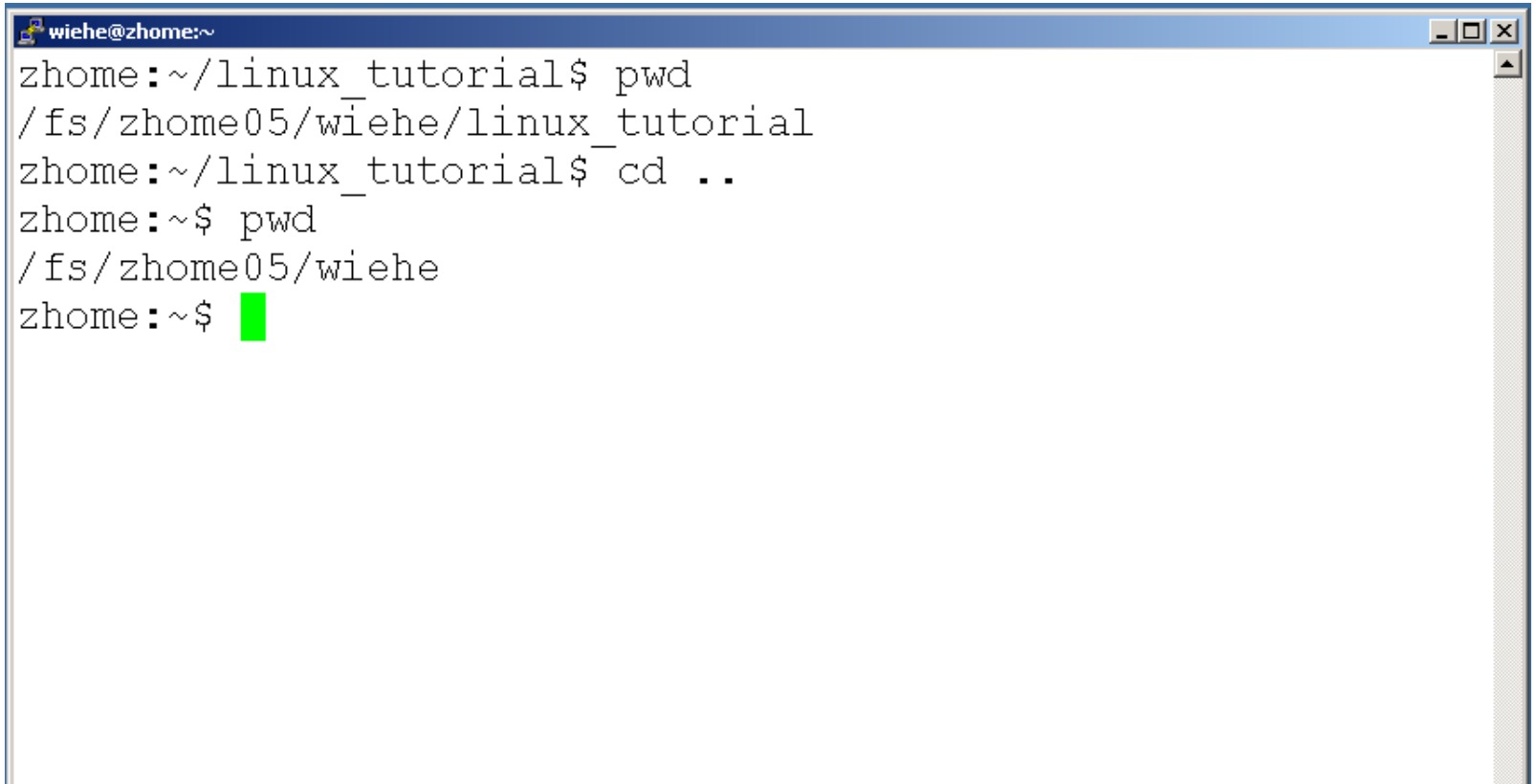
Command: cd

- “~” is the location of your home directory



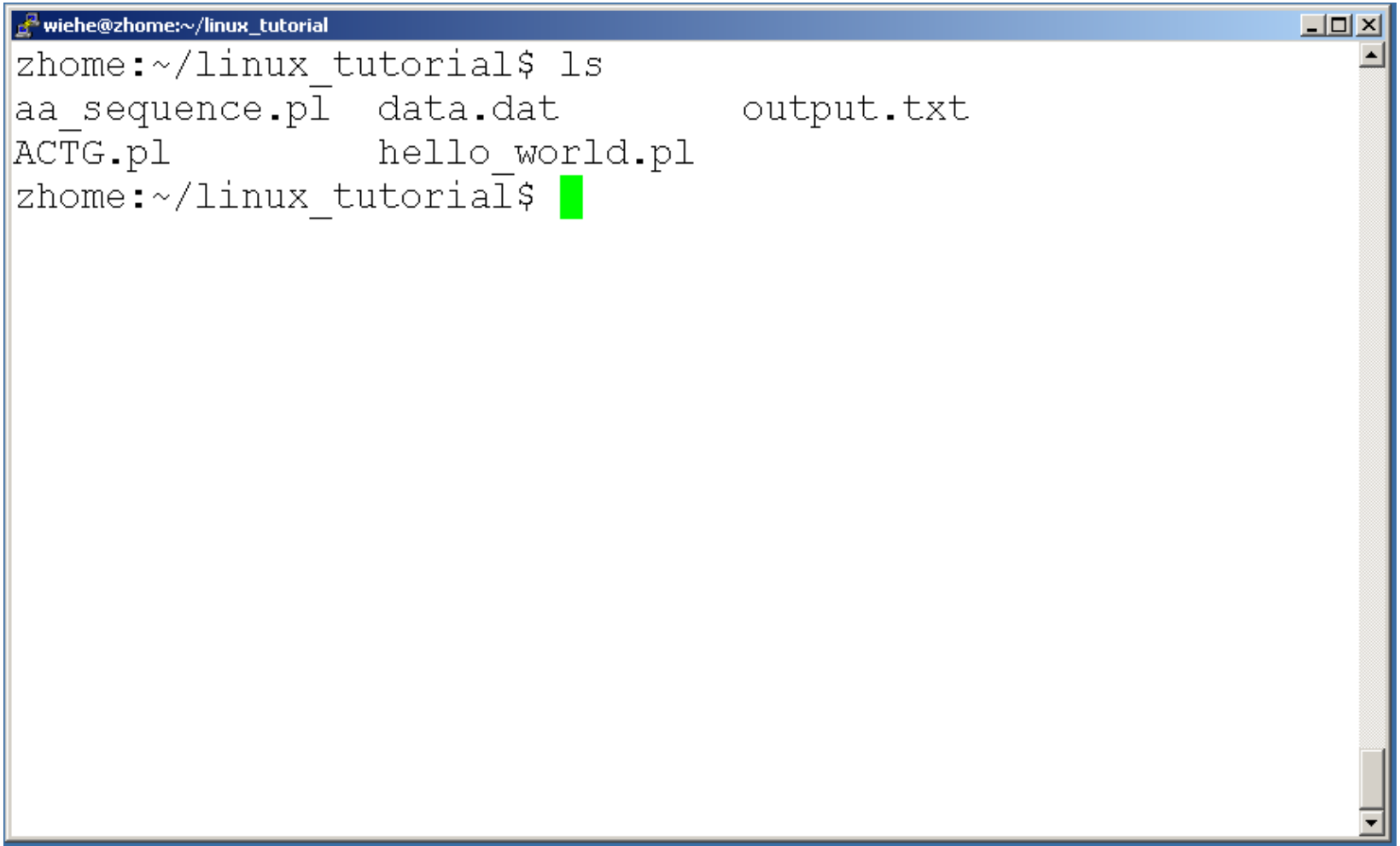
Command: cd

- ".." is the location of the directory below current one



Command: ls

- To list the files in the current directory use “ls”

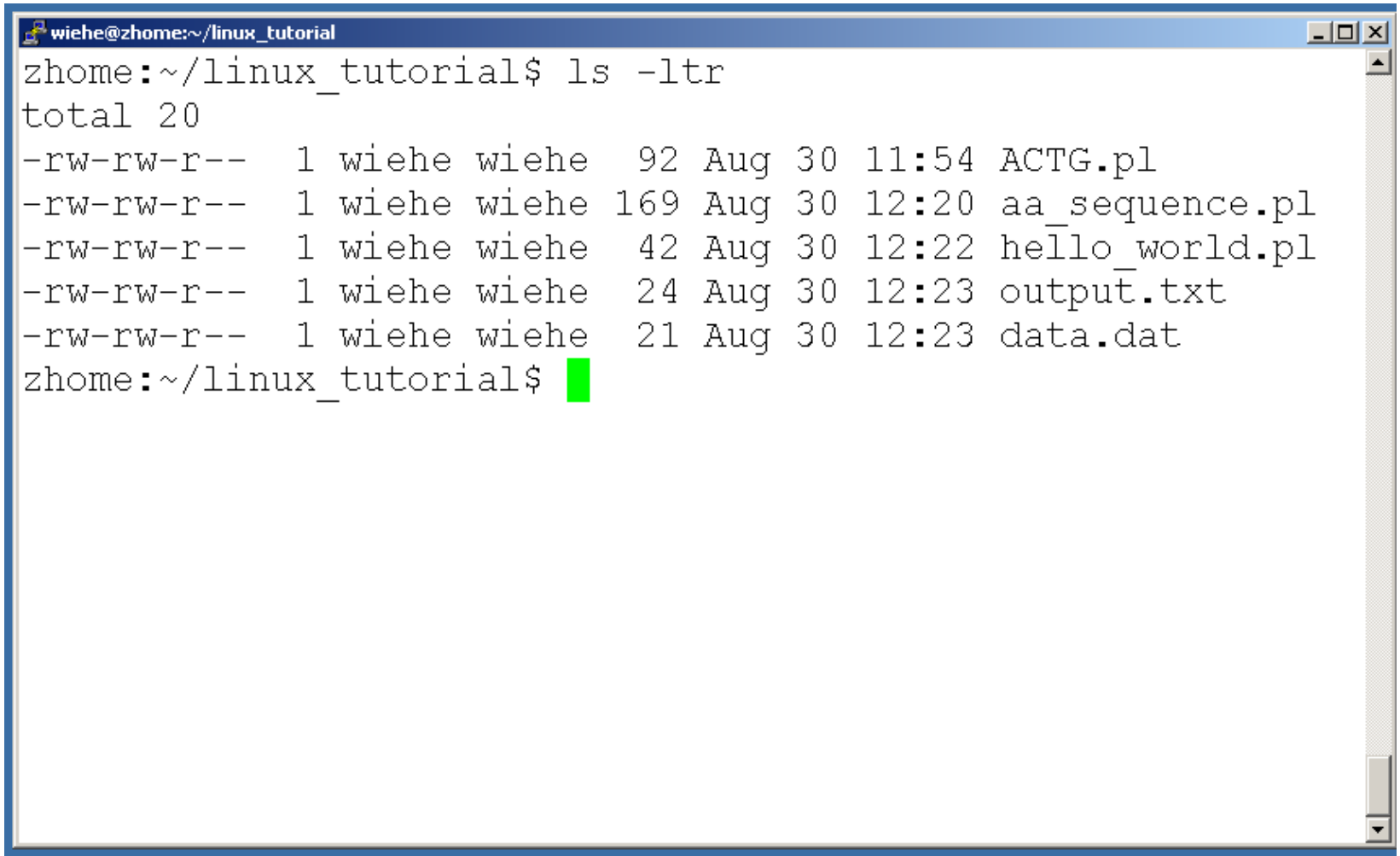


Command: ls

- ls has many options
  - -l long list (displays lots of info)
  - -t sort by modification time
  - -S sort by size
  - -h list file sizes in human readable format
  - -r reverse the order
- “man ls” for more options
- Options can be combined: “ls -ltr”

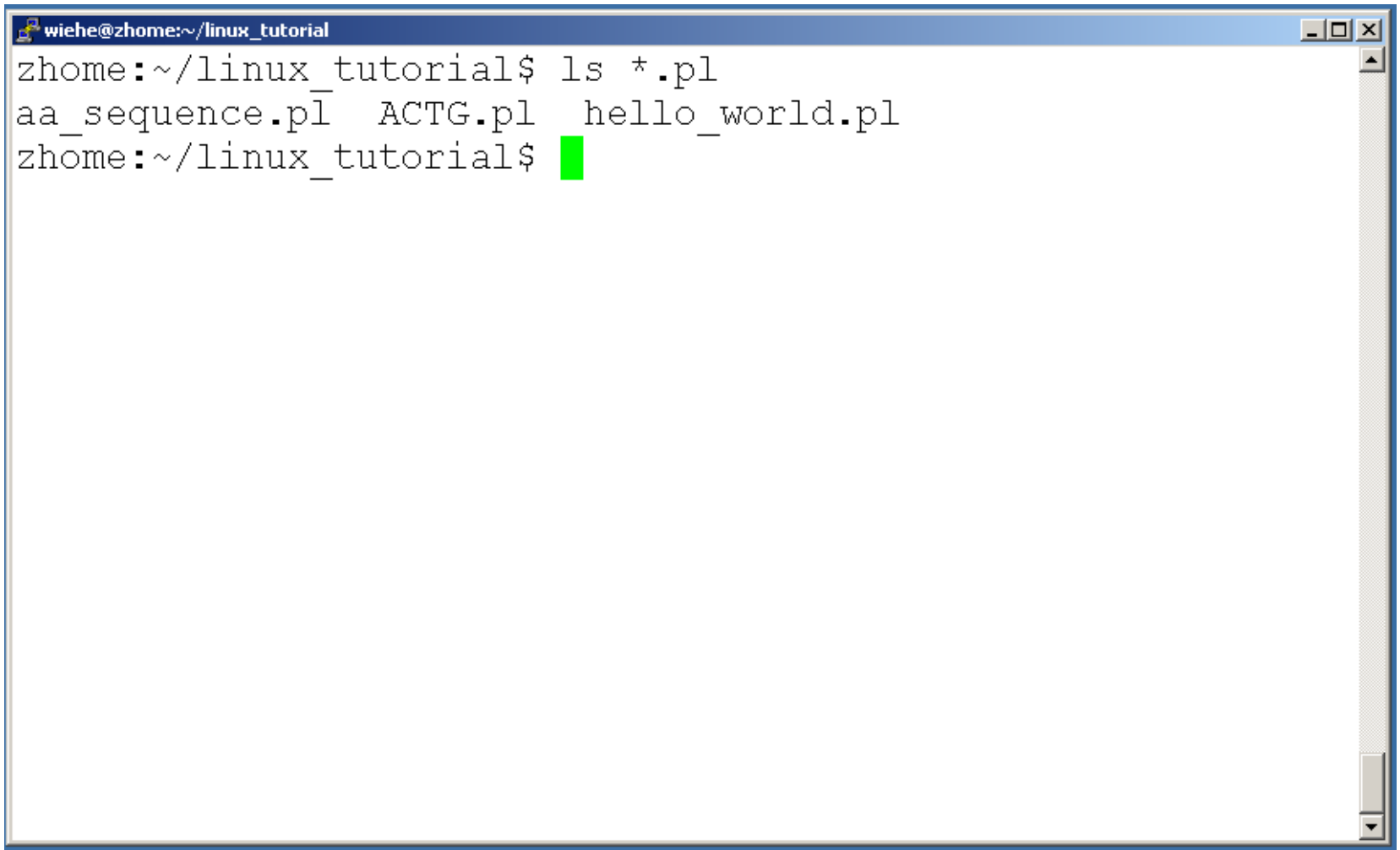
Command: ls -ltr

- List files by time in reverse order with long listing



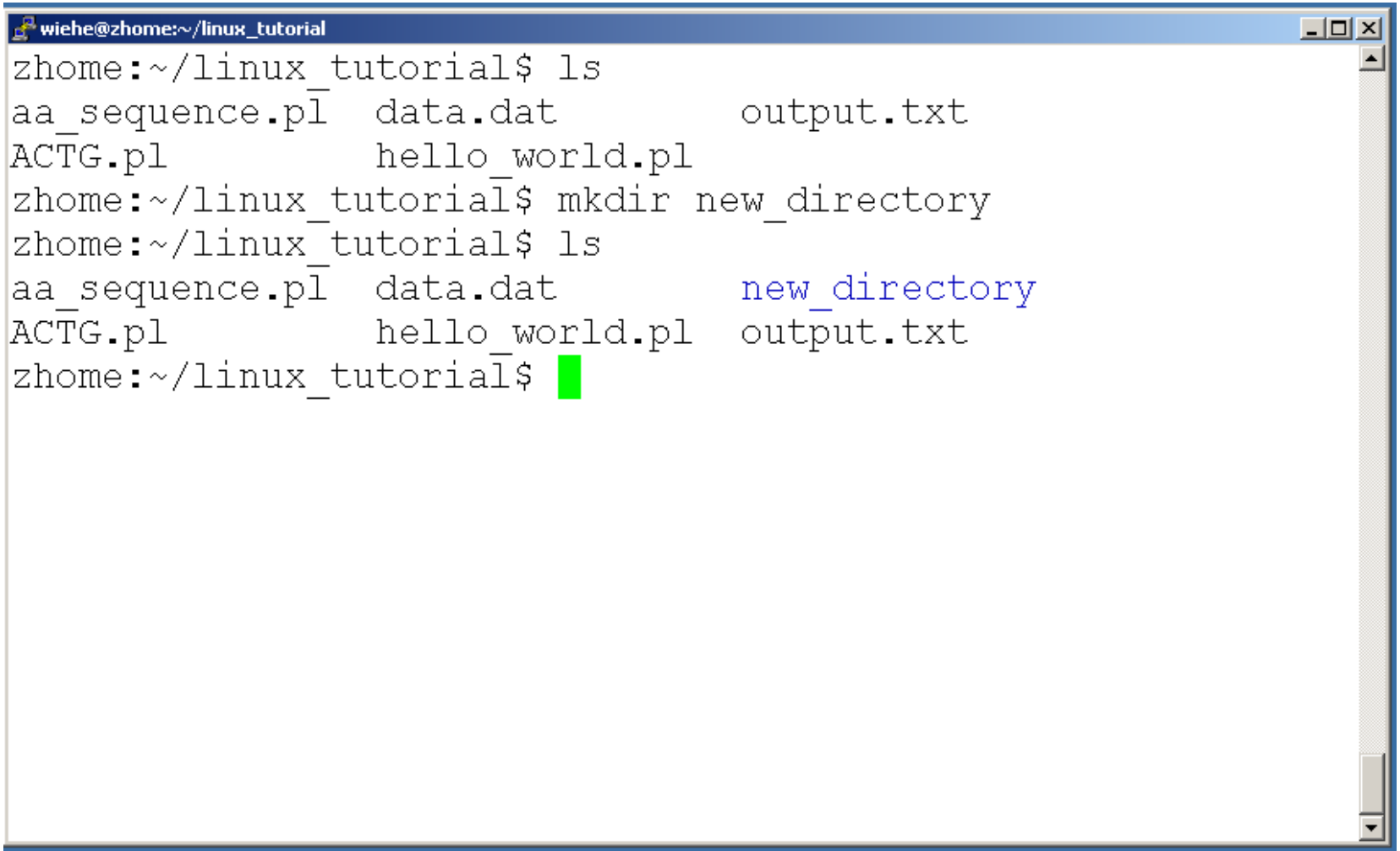
General Syntax: *

- “*” can be used as a wildcard in unix/linux



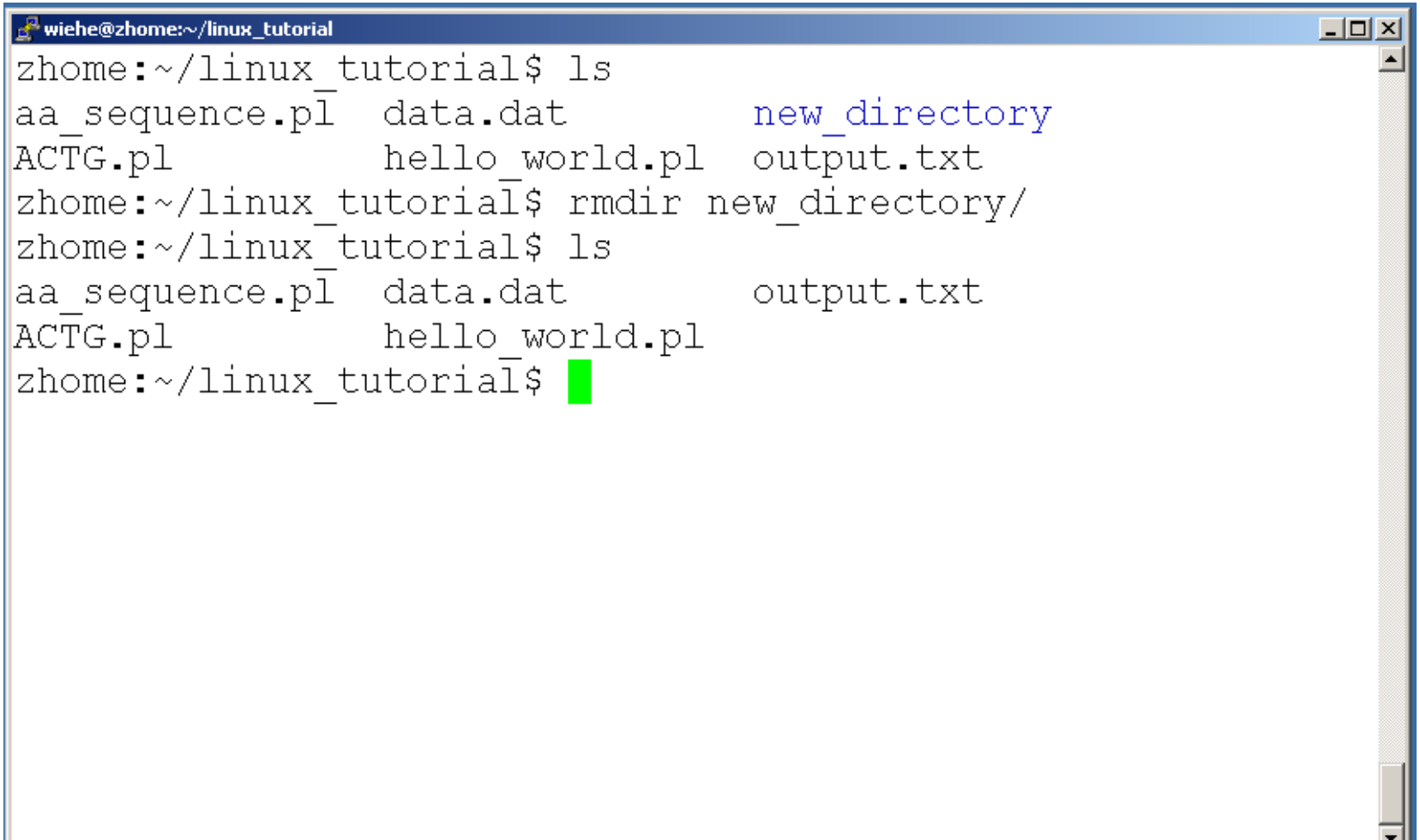
Command: mkdir

- To create a new directory use “mkdir”



Command: rmdir

- To remove and empty directory use “rmdir”



Working environments

- Writing C code:
  - IDE (Integrated development environment): emacs, eclipse, code::blocks, qtcreator etc.
  - Any text editor + SHELL commands.
  - Visual Studio – not recommended as does not support C99 and it is YOUR responsibility to migrate the code to linux.

Displaying a file

- Various ways to display a file in Unix
  - cat
  - less
  - head
  - tail

Command: cat

- Dumps an entire file to standard output
- Good for displaying short, simple files

Command: less

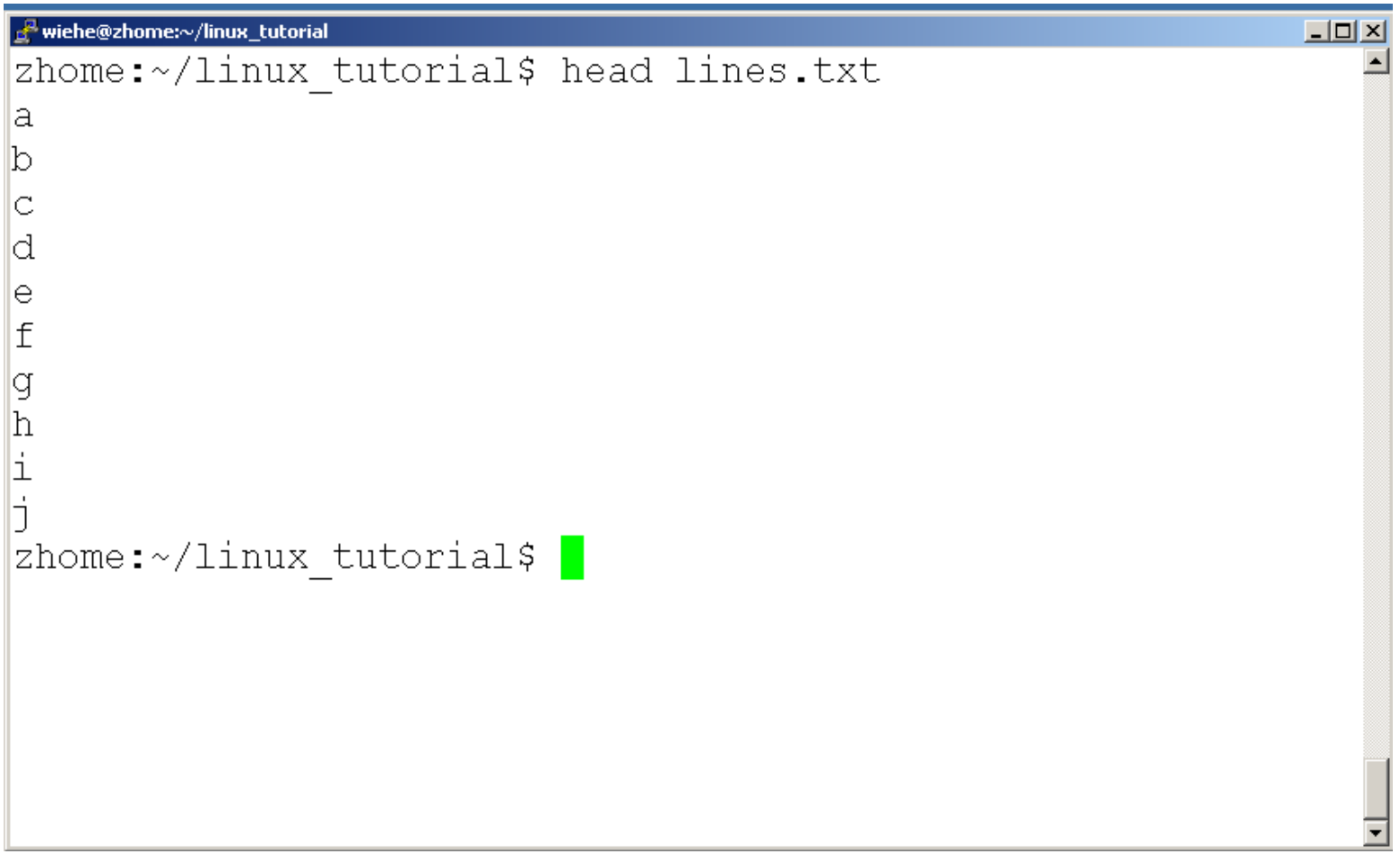
- “less” displays a file, allowing forward/backward movement within it
  - return scrolls forward one line, space one page
  - y scrolls back one line, b one page
- use “/” to search for a string
- Press q to quit

Command: head

- “head” displays the top part of a file
- By default it shows the first 10 lines
- -n option allows you to change that
- “head -n50 file.txt” displays the first 50 lines of file.txt

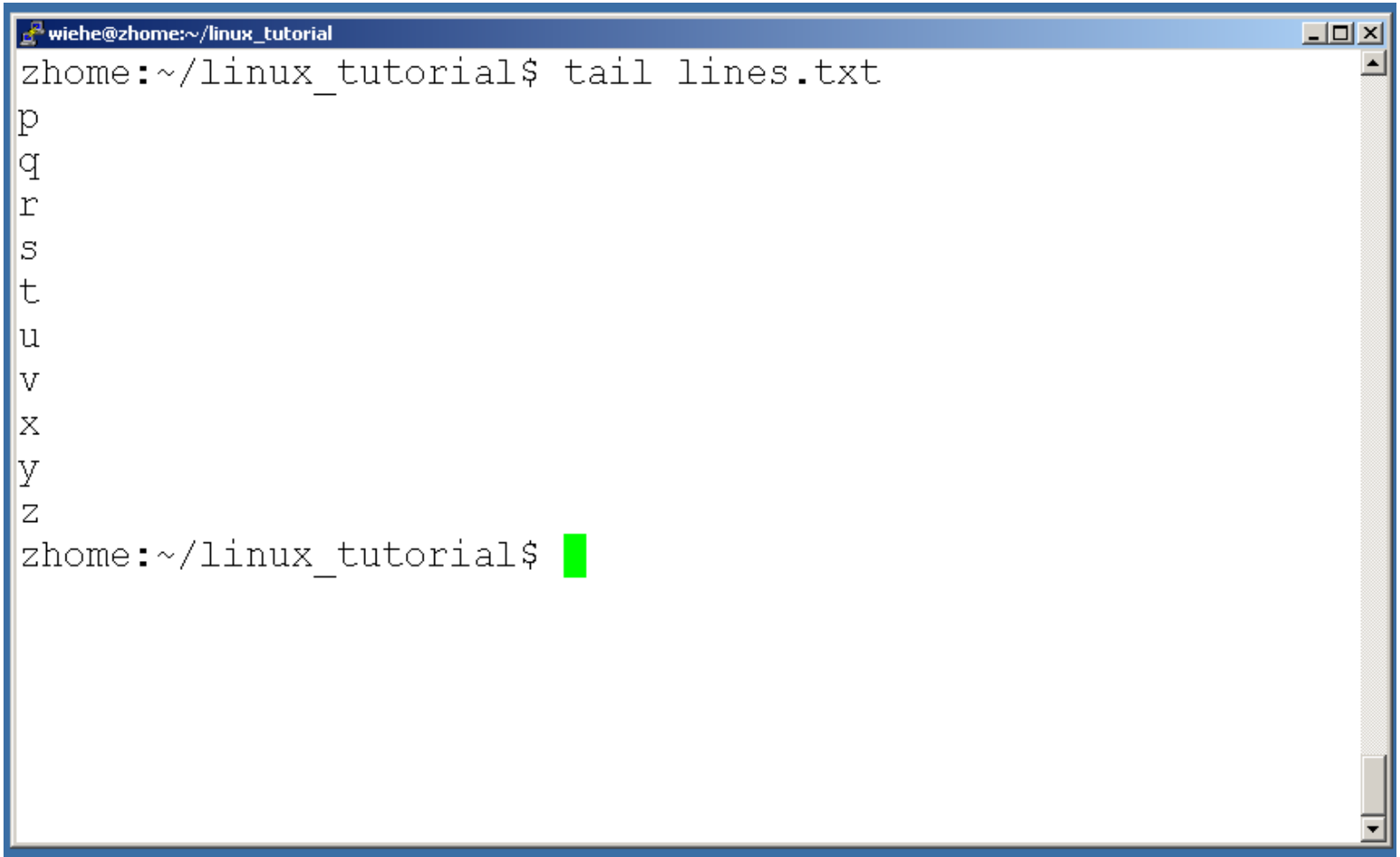
Command: head

- Here's an example of using "head":



Command: tail

- Same as head, but shows the last lines

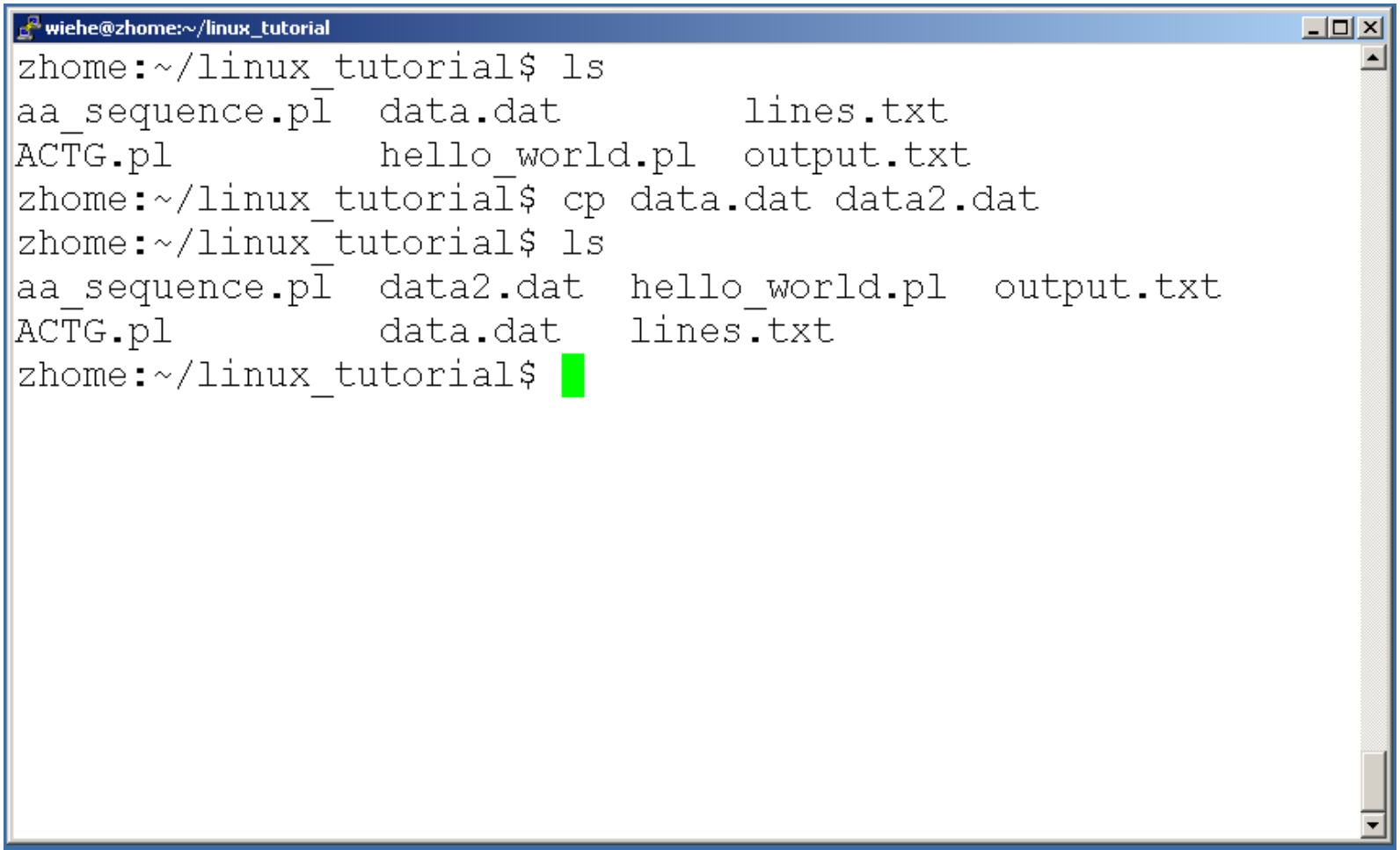


File Commands

- Copying a file: cp
- Move or rename a file: mv
- Remove a file: rm

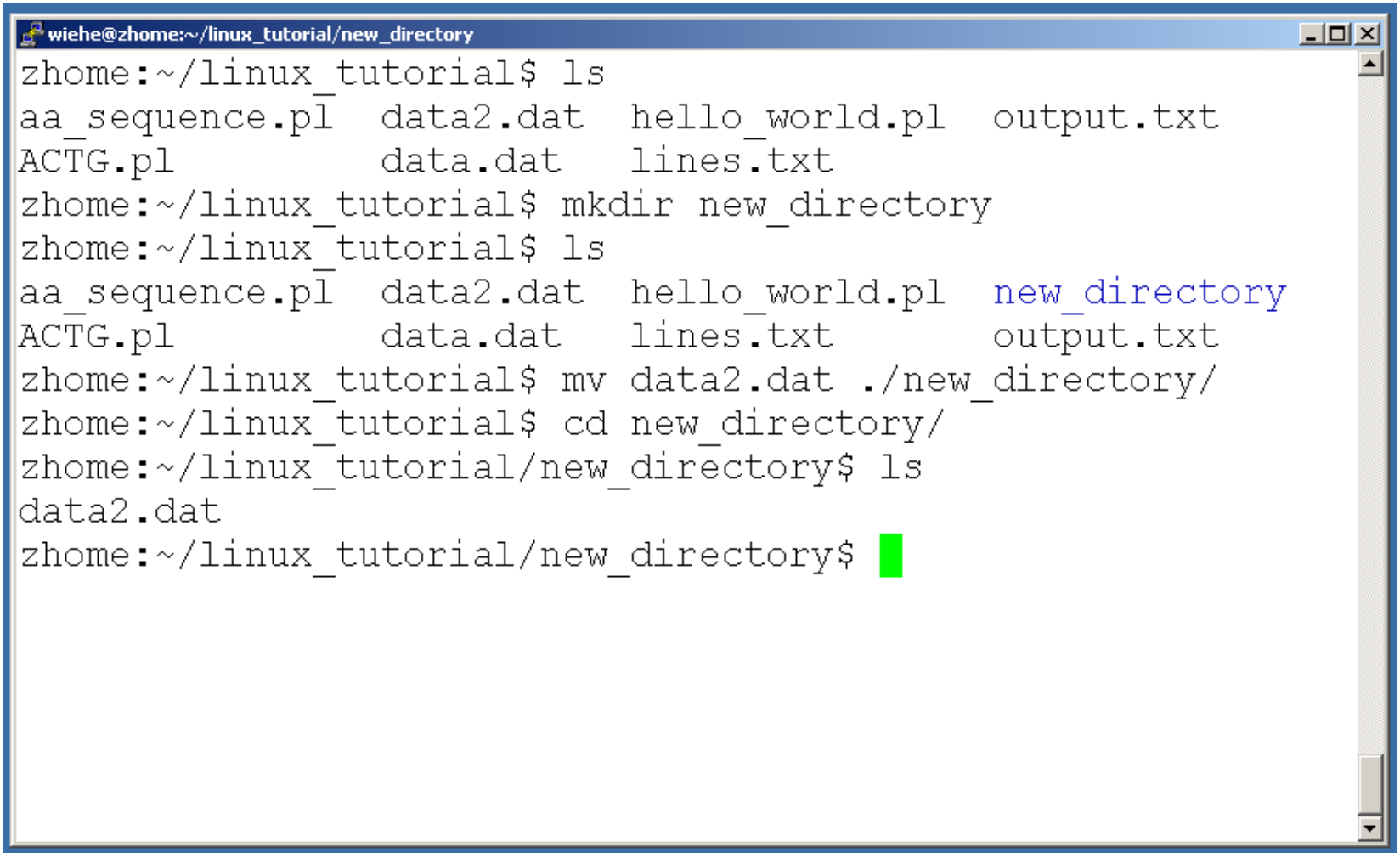
Command: cp

- To copy a file use “cp”



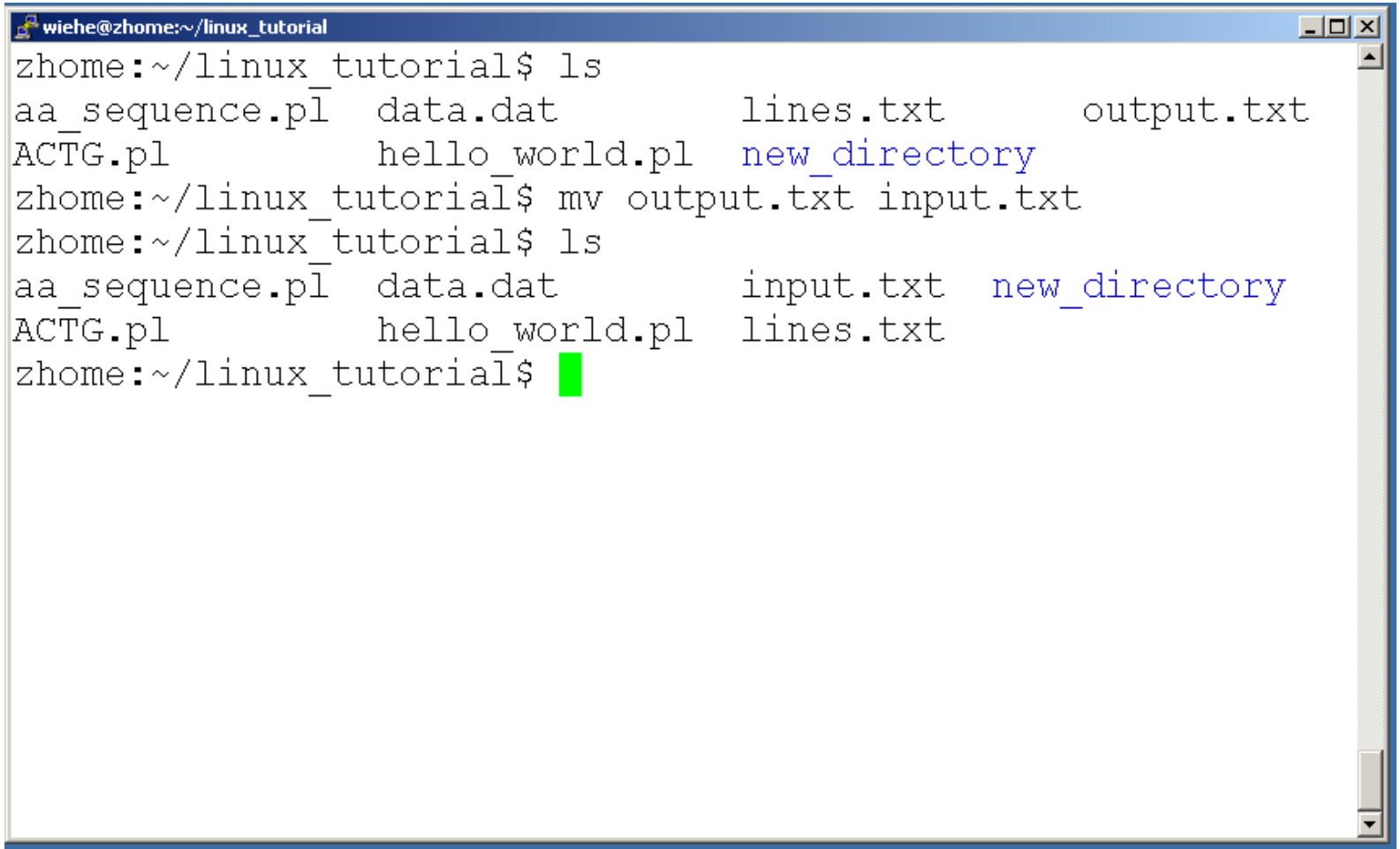
Command: mv

- To move a file to a different location use “mv”



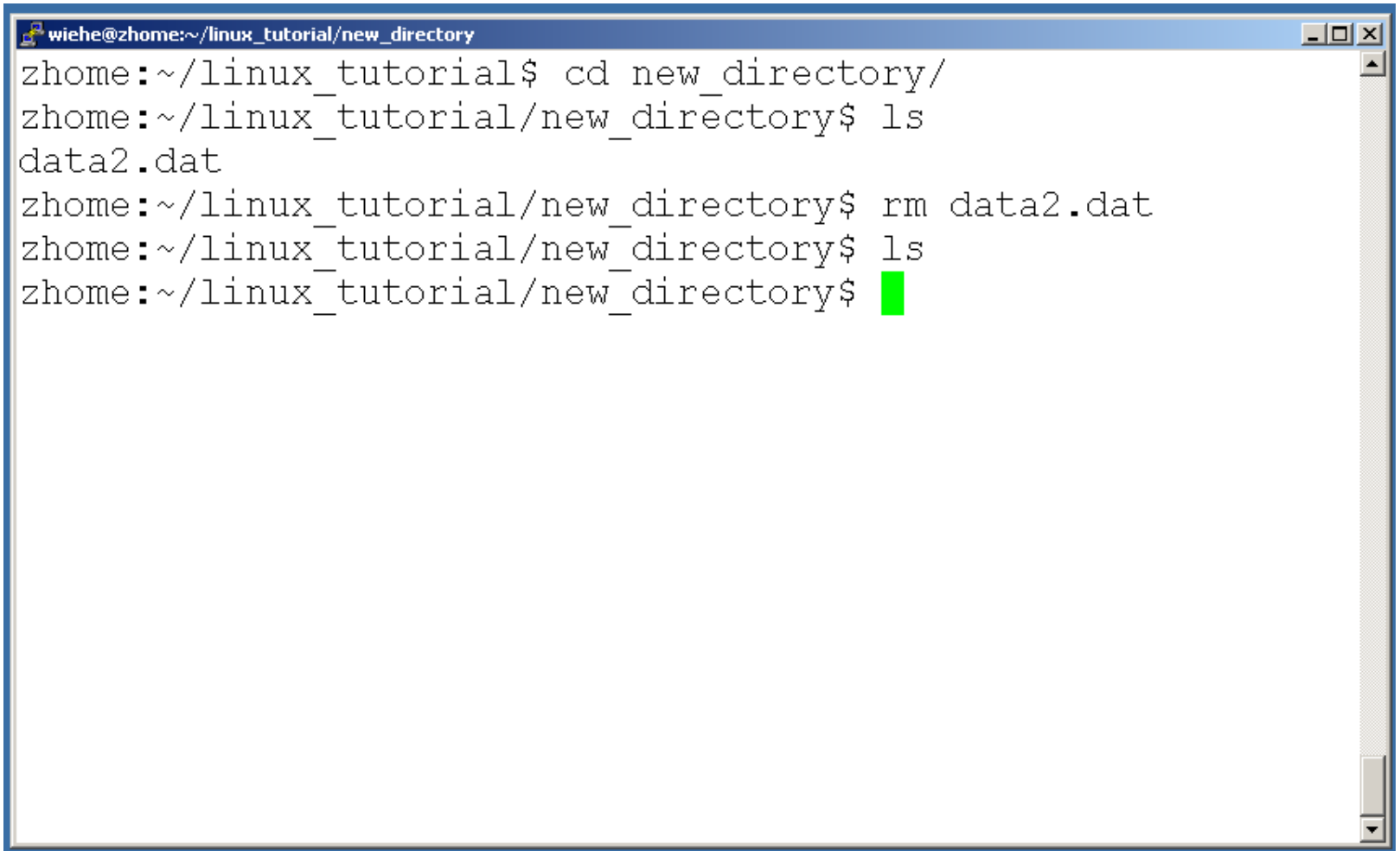
Command: mv

- mv can also be used to rename a file



Command: rm

- To remove a file use “rm”



Command: rm

- To remove a file “recursively”: rm –r
- Used to remove all files and directories
- Be very careful, deletions are permanent in Unix/Linux

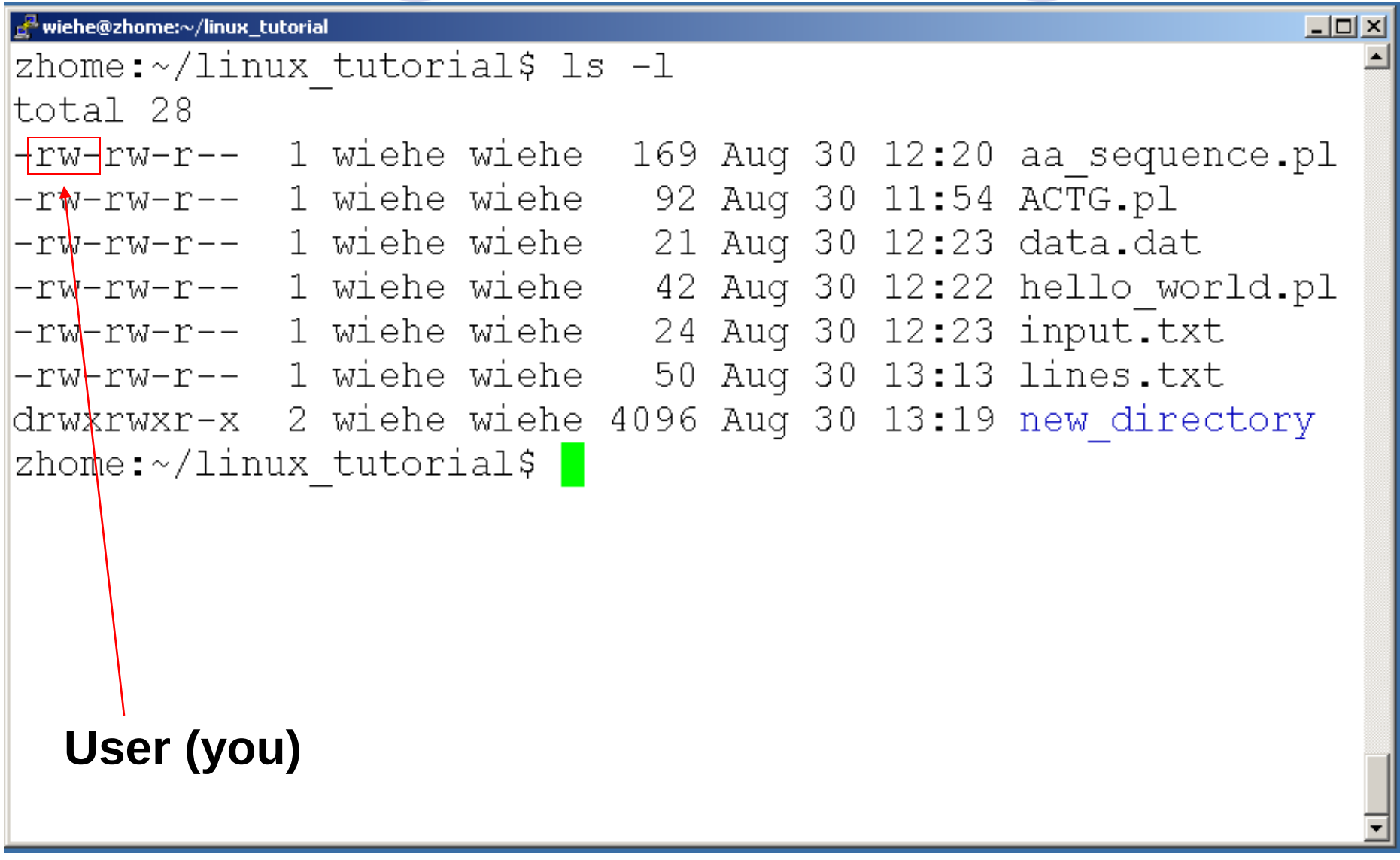
File permissions

- Each file in Unix/Linux has an associated permission level
- This allows the user to prevent others from reading/writing/executing their files or directories
- Use “ls -l *filename*” to find the permission level of that file

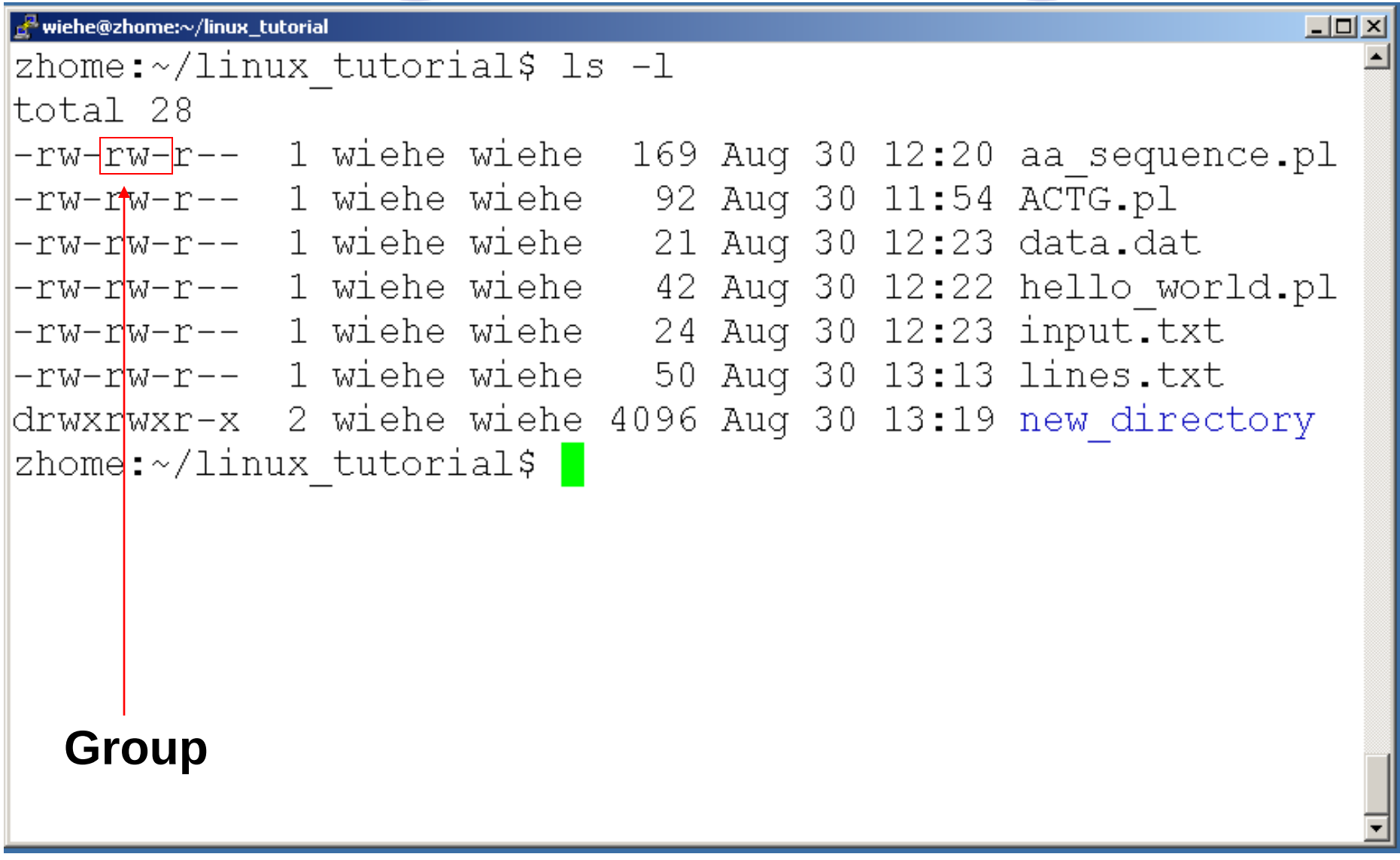
Permission levels

- “r” means “read only” permission
- “w” means “write” permission
- “x” means “execute” permission
  - In case of directory, “**x**” grants permission to list directory contents

File Permissions



File Permissions



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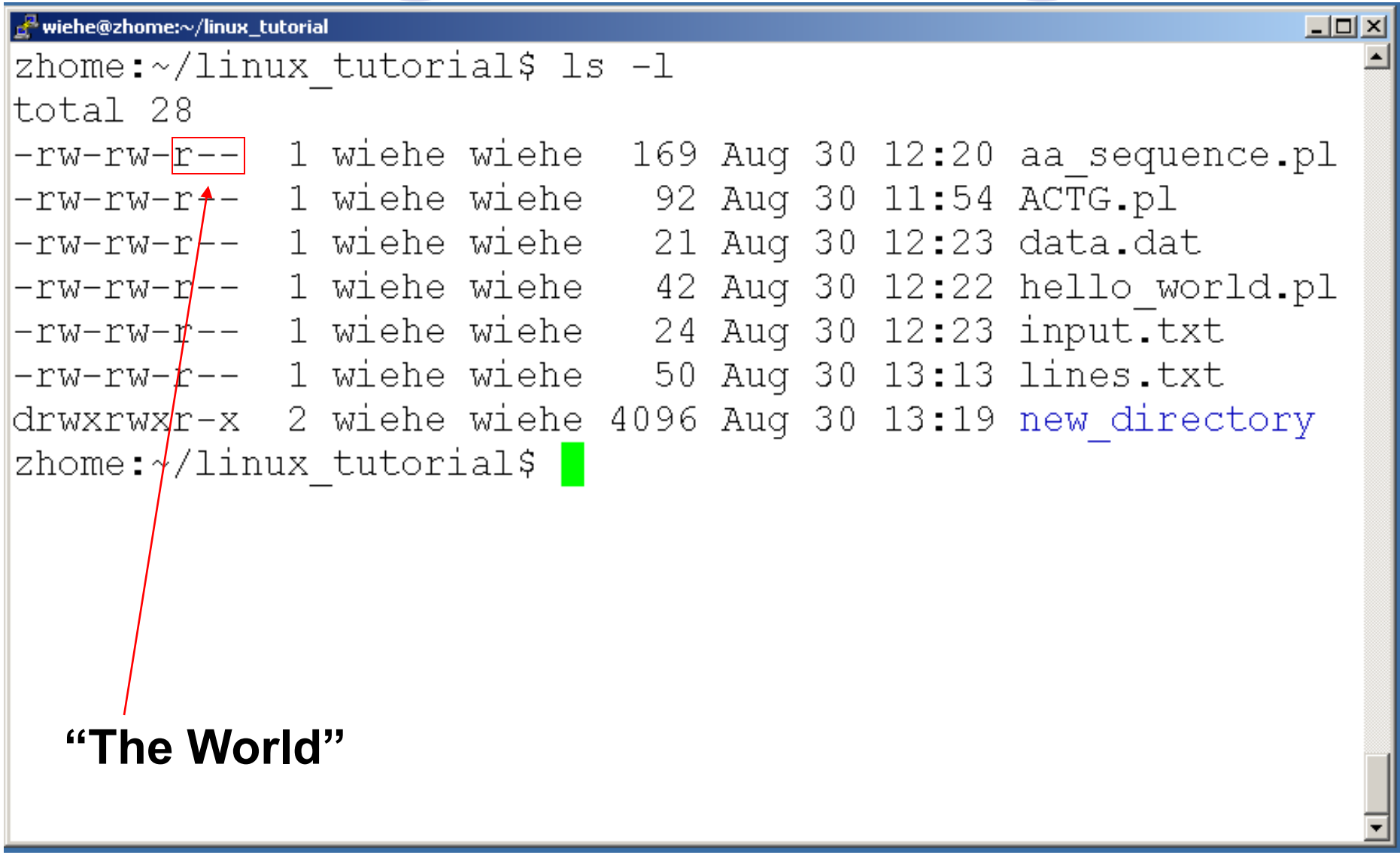
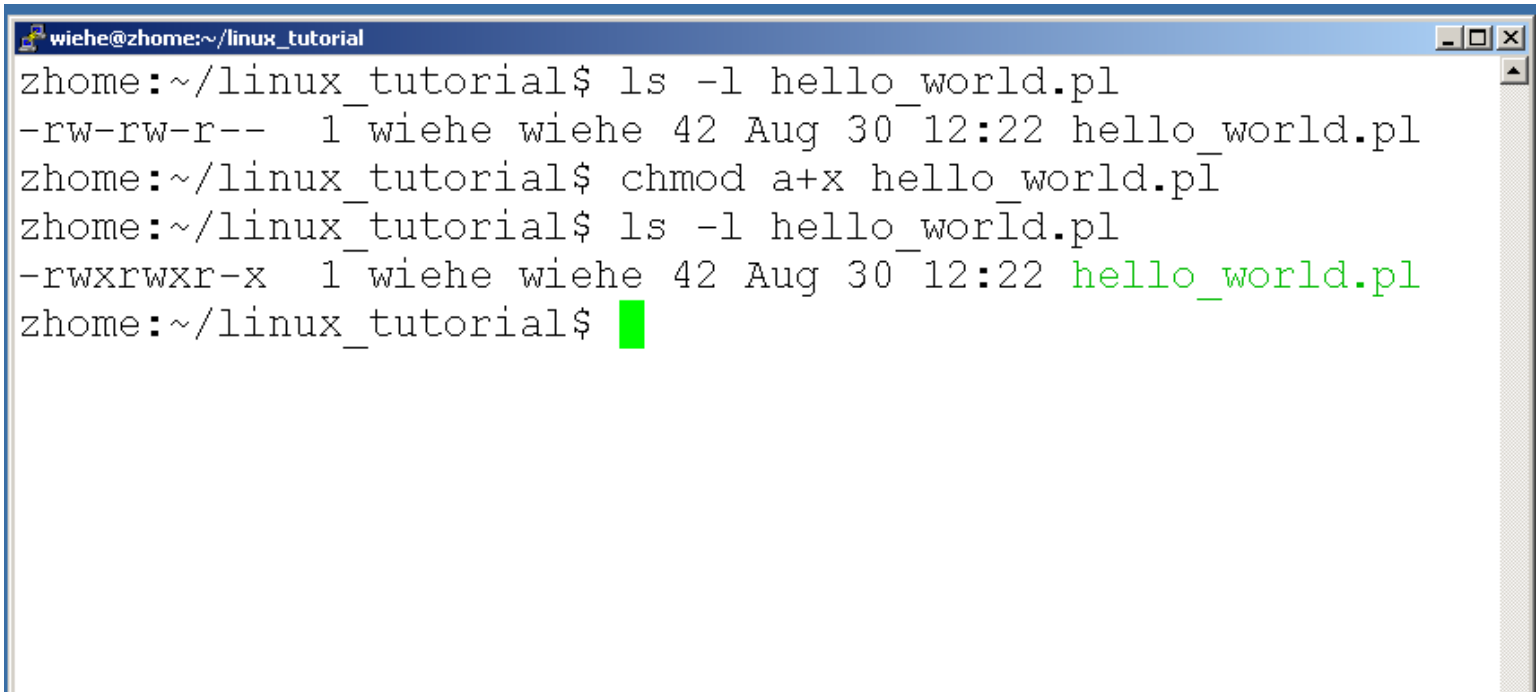


Command: chmod

- If you own the file, you can change it's permissions with "chmod"
  - Syntax: chmod [**u**ser/**g**roup/**o**thers/**a**ll]+[permission] [file(s)]
  - Below we grant execute permission to all:

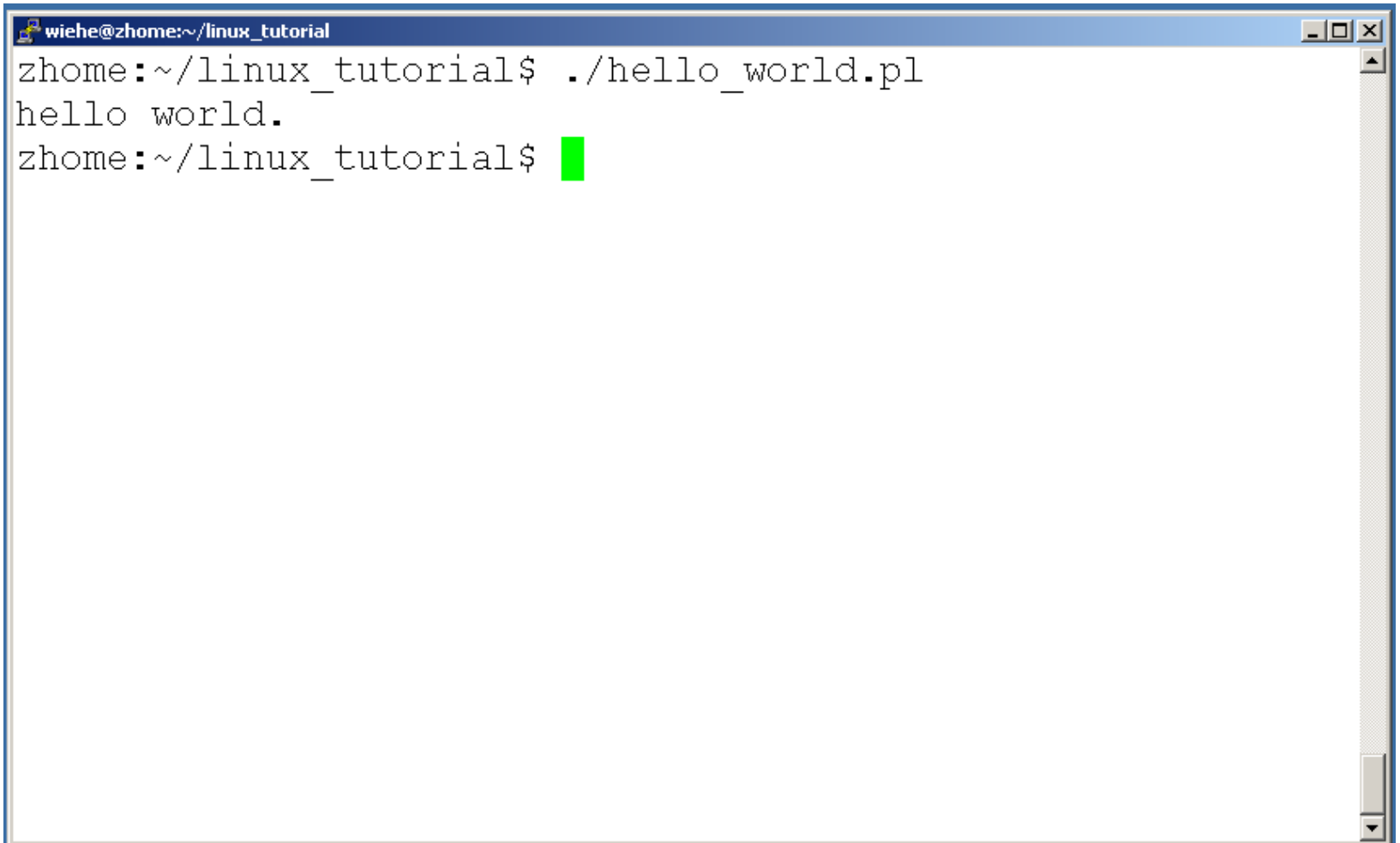


Running a program (a.k.a. a job)

- Make sure the program has executable permissions
- Use “./” to run the program

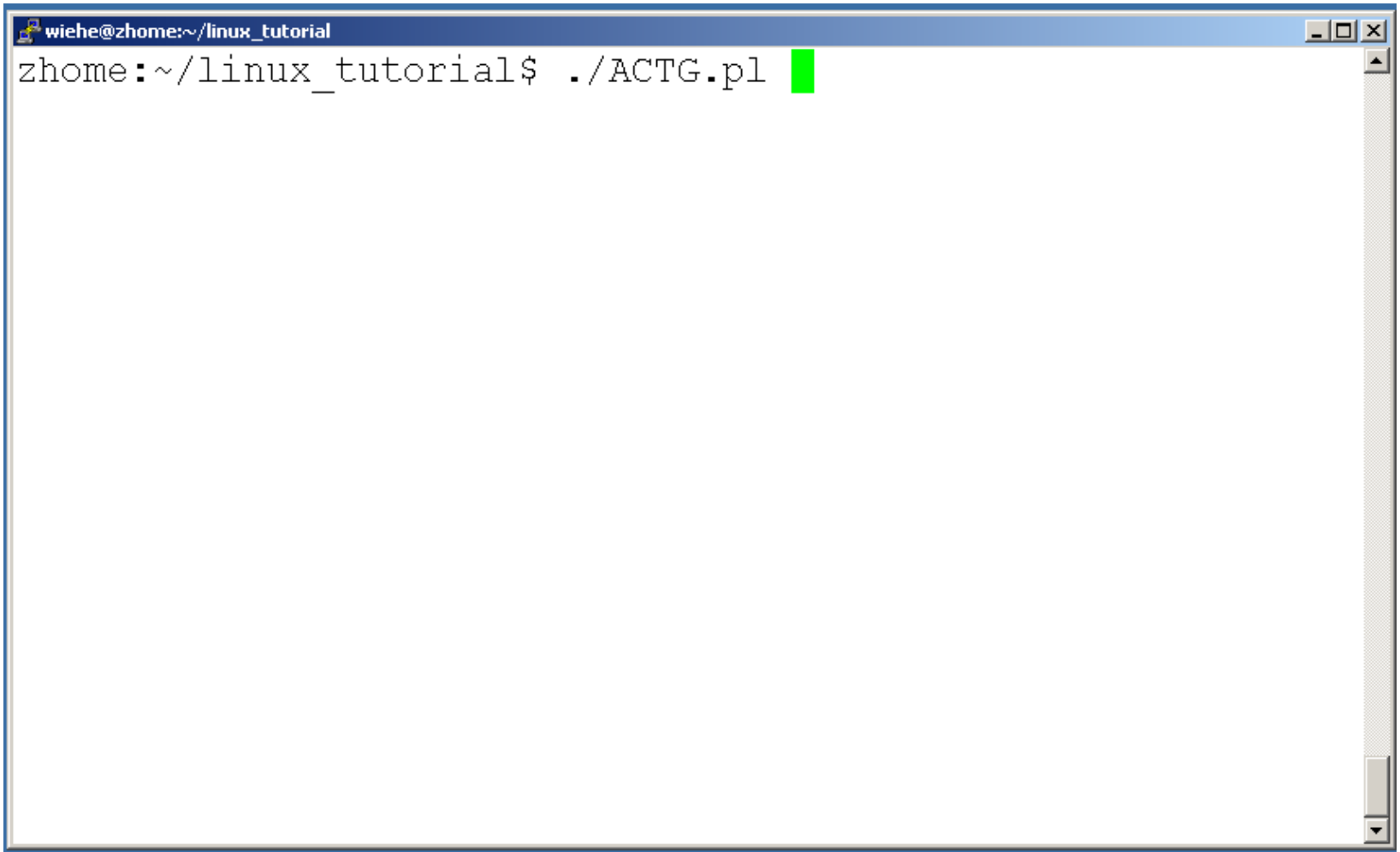
Running a program: an example

- Running the sample perl script “hello_world.pl”



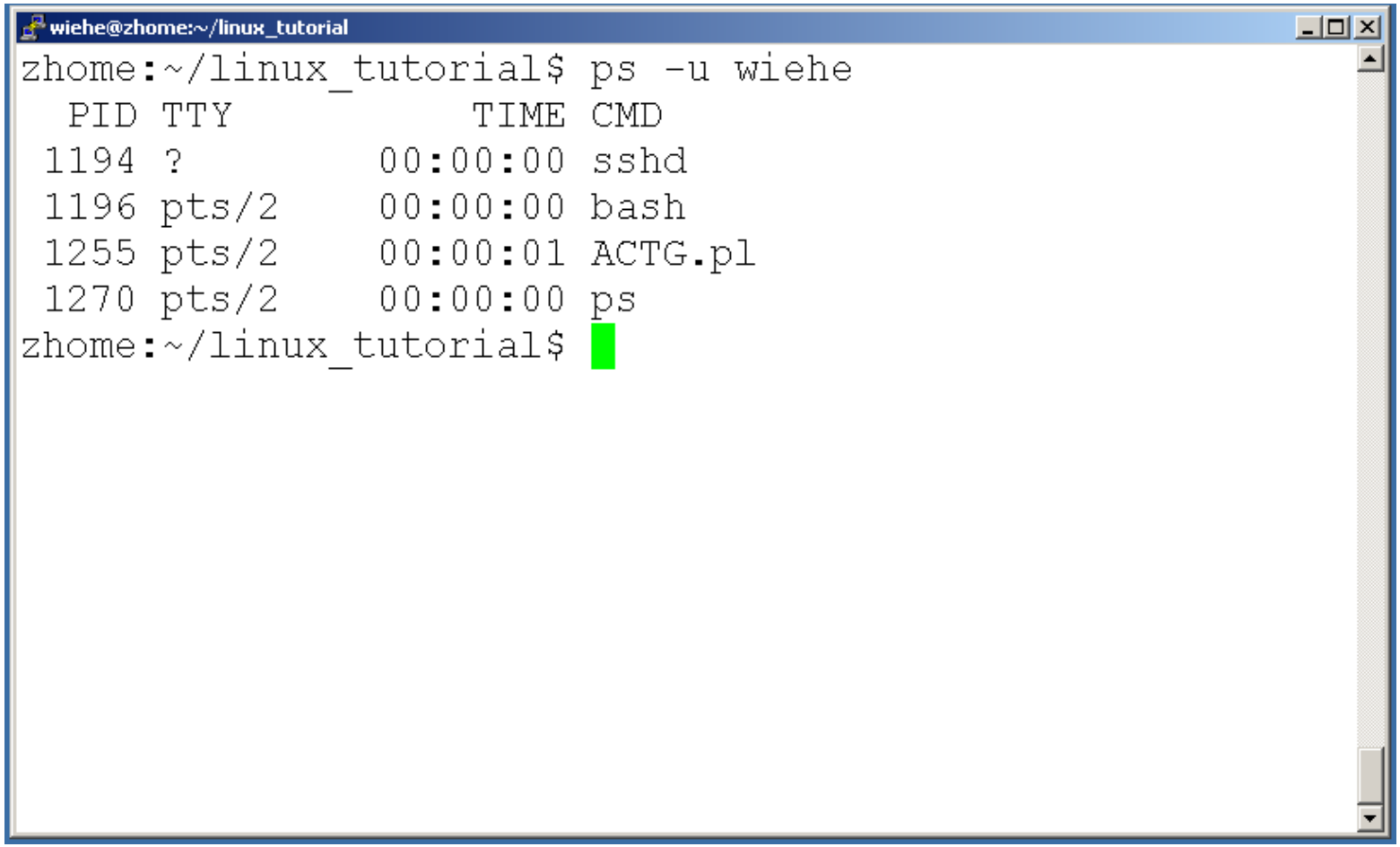
Ending a program

- To end a program use “ctrl-c”. To try it:



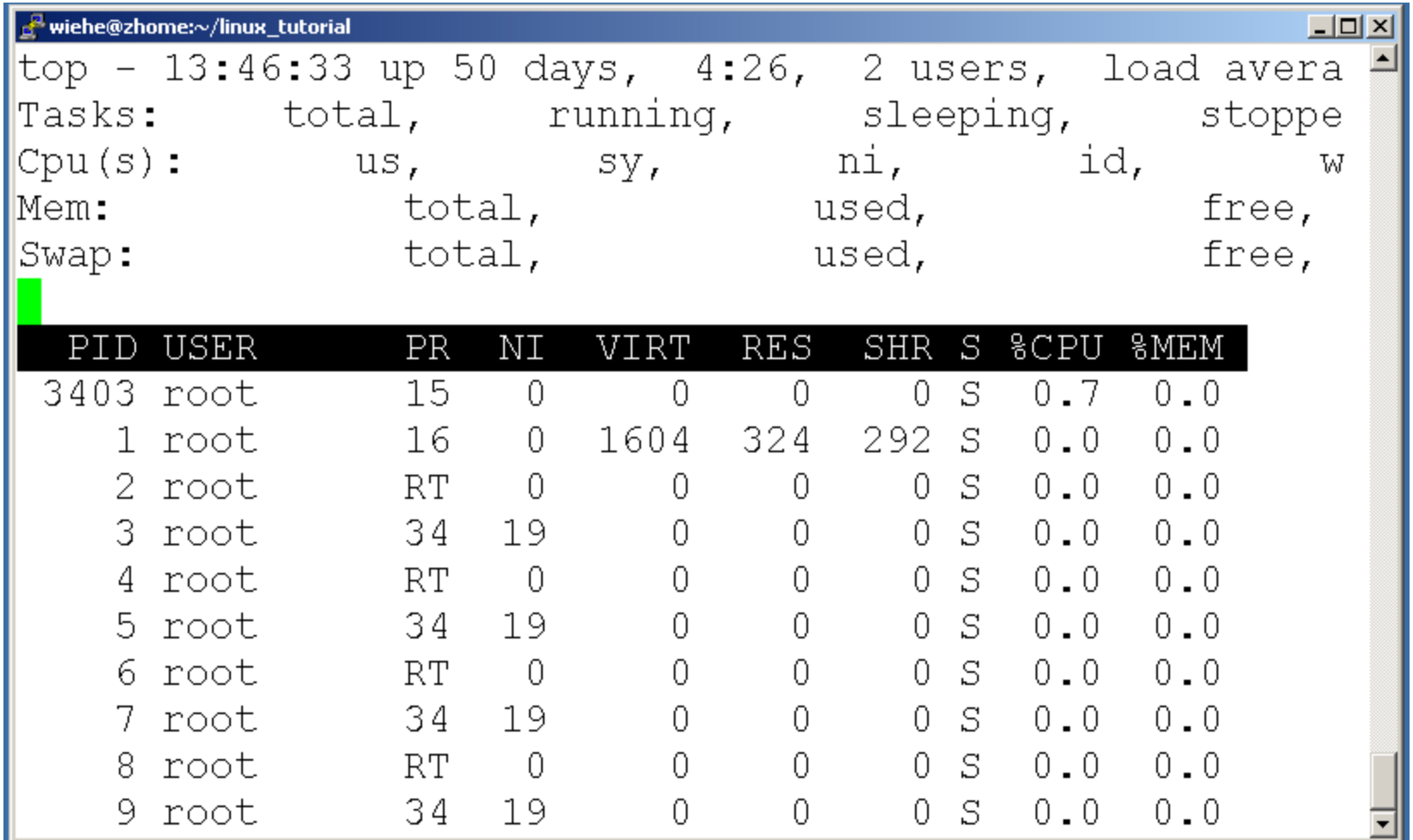
Command: ps

- To view the processes that you're running:



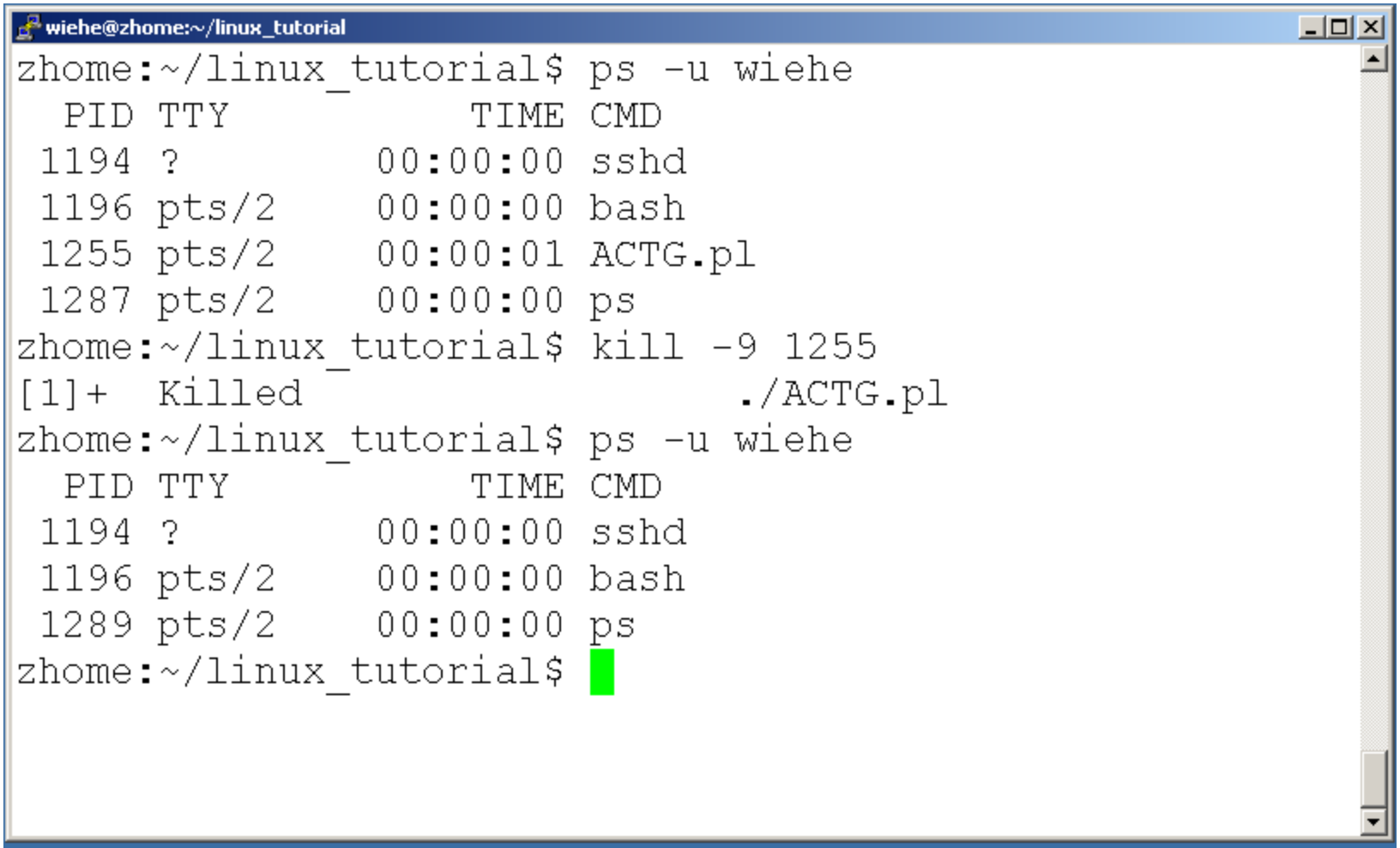
Command: top

- To view the CPU usage of all processes:



Command: kill

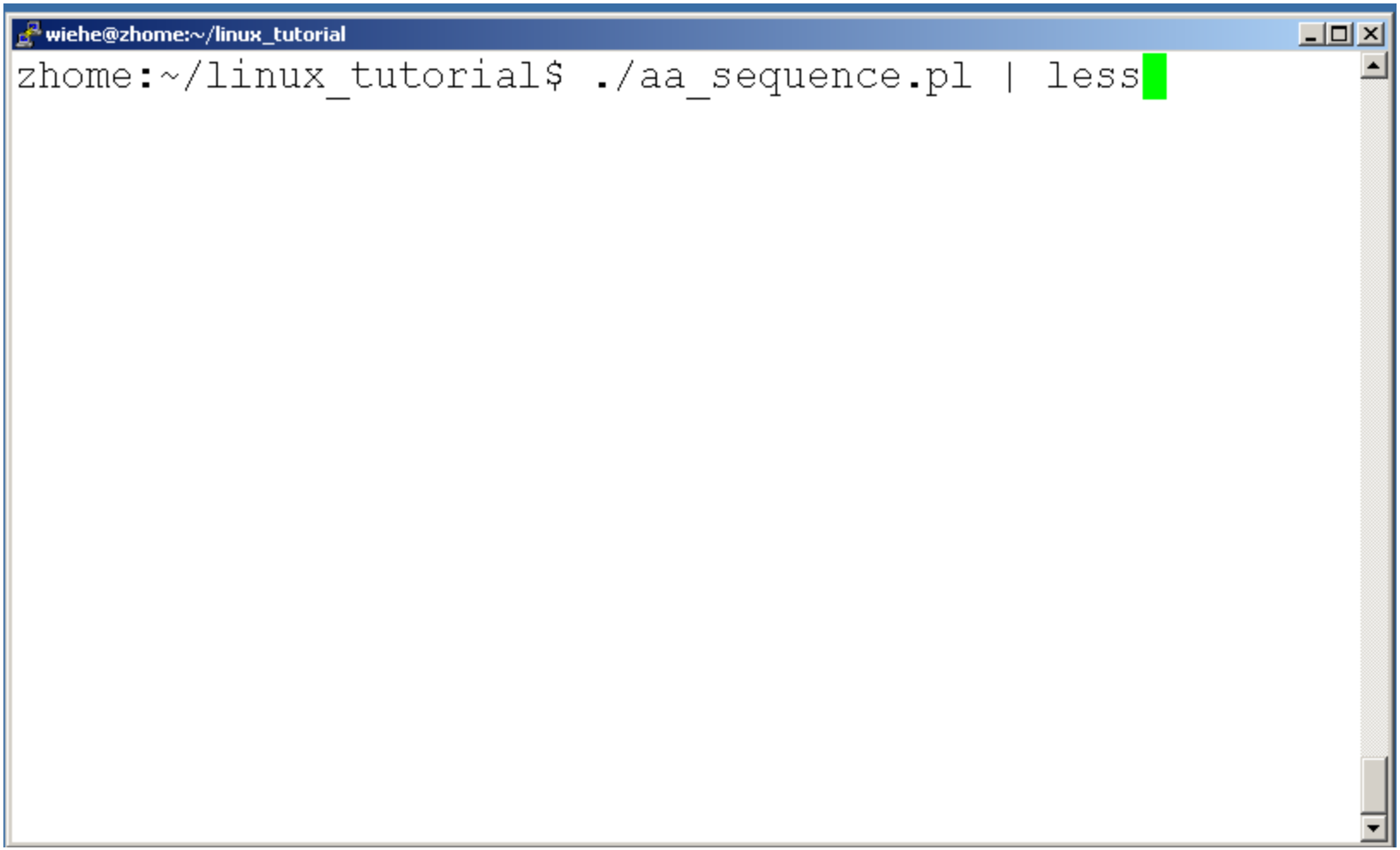
- To terminate a process use “kill”



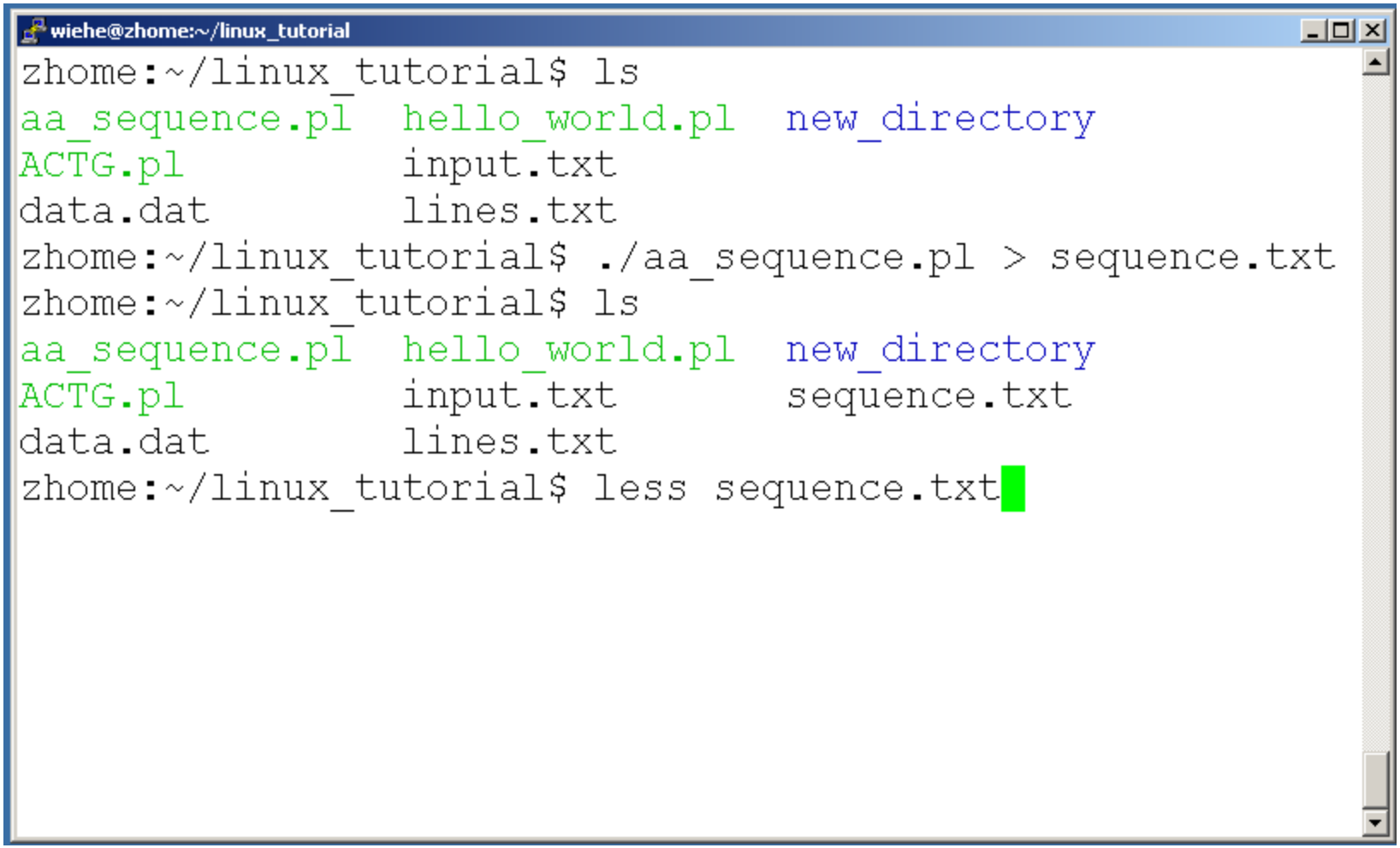
Input/Output Redirection (“piping”)

- Programs can output to other programs
- Called “piping”
- “program_a | program_b”
  - program_a’s output becomes program_b’s input
- “program_a > file.txt”
  - program_a’s output is written to a file called “file.txt”
- “program_a < input.txt”
  - program_a gets its input from a file called “input.txt”

A few examples of piping



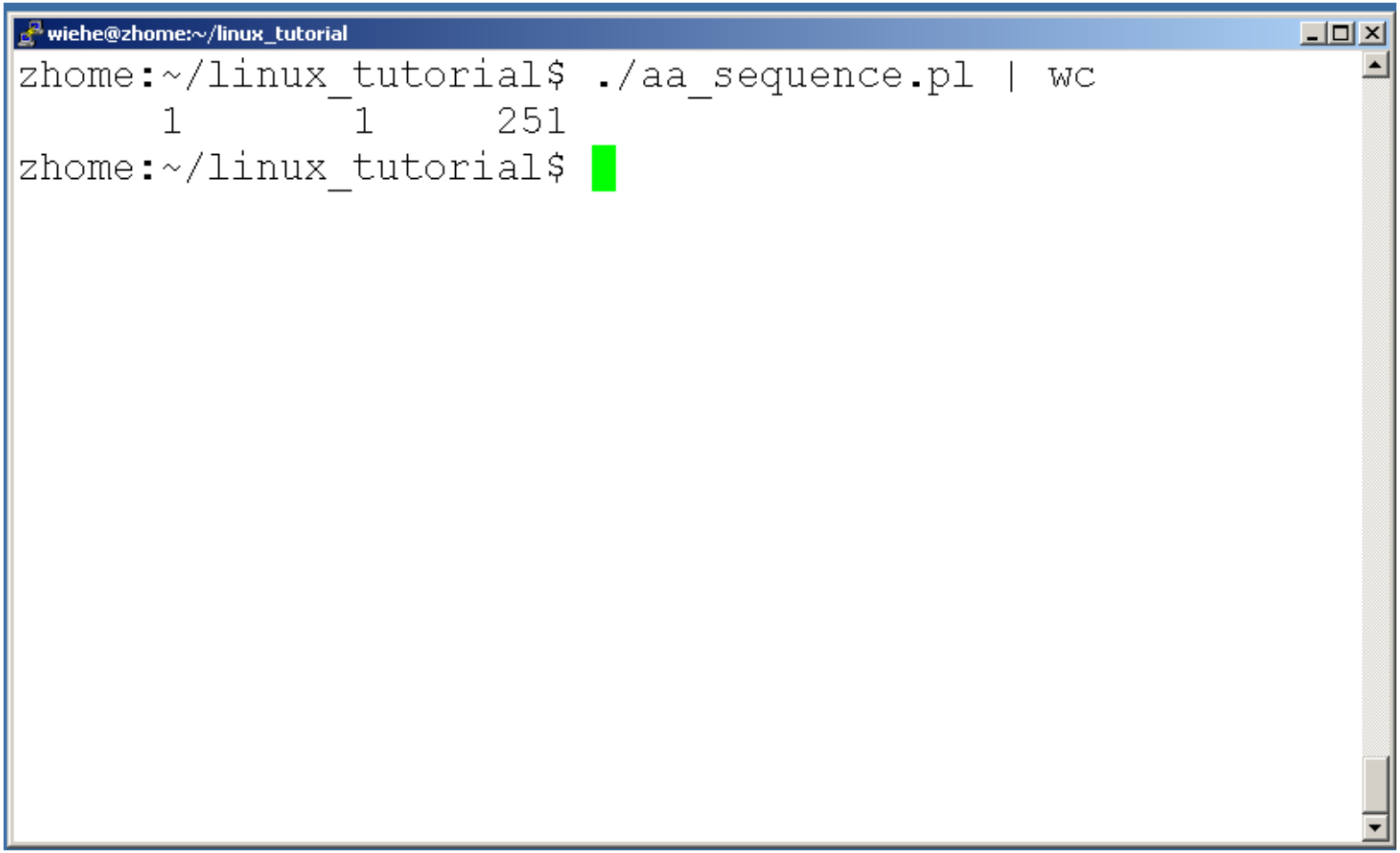
A few examples of piping



Command: wc

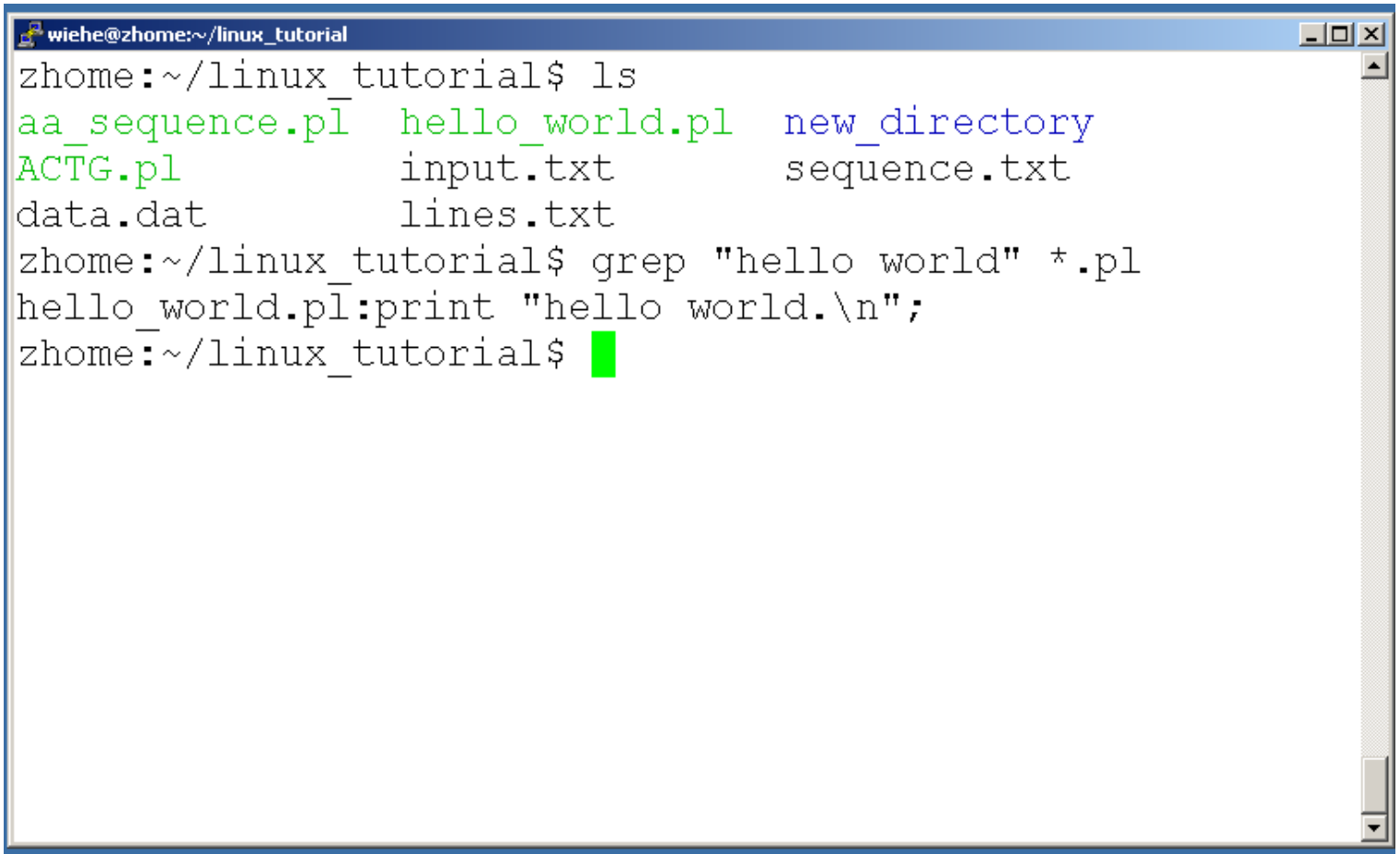
- To count the characters, words, and lines in a file use “wc”
- The first column in the output is lines, the second is words, and the last is characters

A few examples of piping



Command: grep

- To search files in a directory for a specific string use “grep”



Command: diff

- To compare to files for differences use “diff”
  - Try: diff /dev/null hello.txt
  - /dev/null is a special address -- it is always empty, and anything moved there is deleted

Unix Web Resources

- http://www.ee.surrey.ac.uk/Teaching/Unix/
- http://www.ugu.com/sui/ugu/show?help.beginners
- http://en.wikipedia.org/wiki/Unix

Emacs reference card

- http://www.gnu.org/software/emacs/refcards/pdf/refcard.pdf