

WELCOME – THE WORKSHOP WILL BEGIN SOON

Head over to
<https://github.com/carducci/linux-wizard> for
setup instructions, slides, references, and all
lab exercises.



WELCOME

Michael Carducci
Hands-on Software Architect
Speaker, Magician

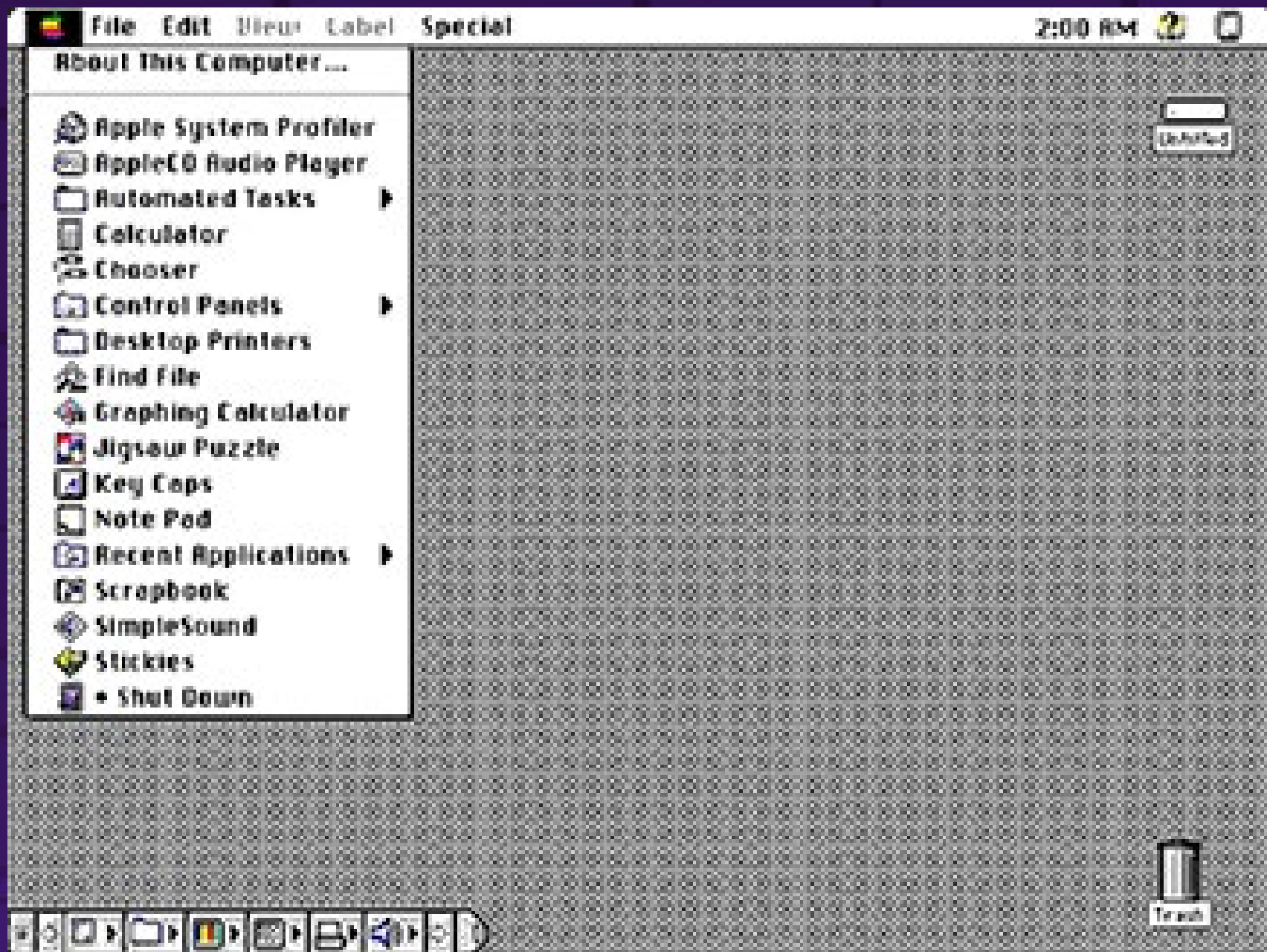
Michael@magician.codes
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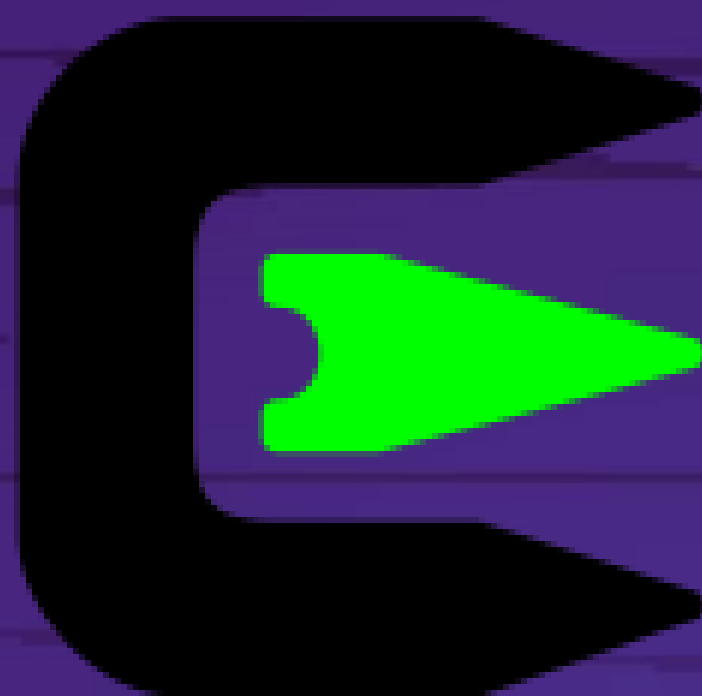


APPLE DOS COMMANDS

- CATALOG
- EXEC
- RENAME
- DELETE
- LOAD
- RUN
- SAVE
- VERIFY

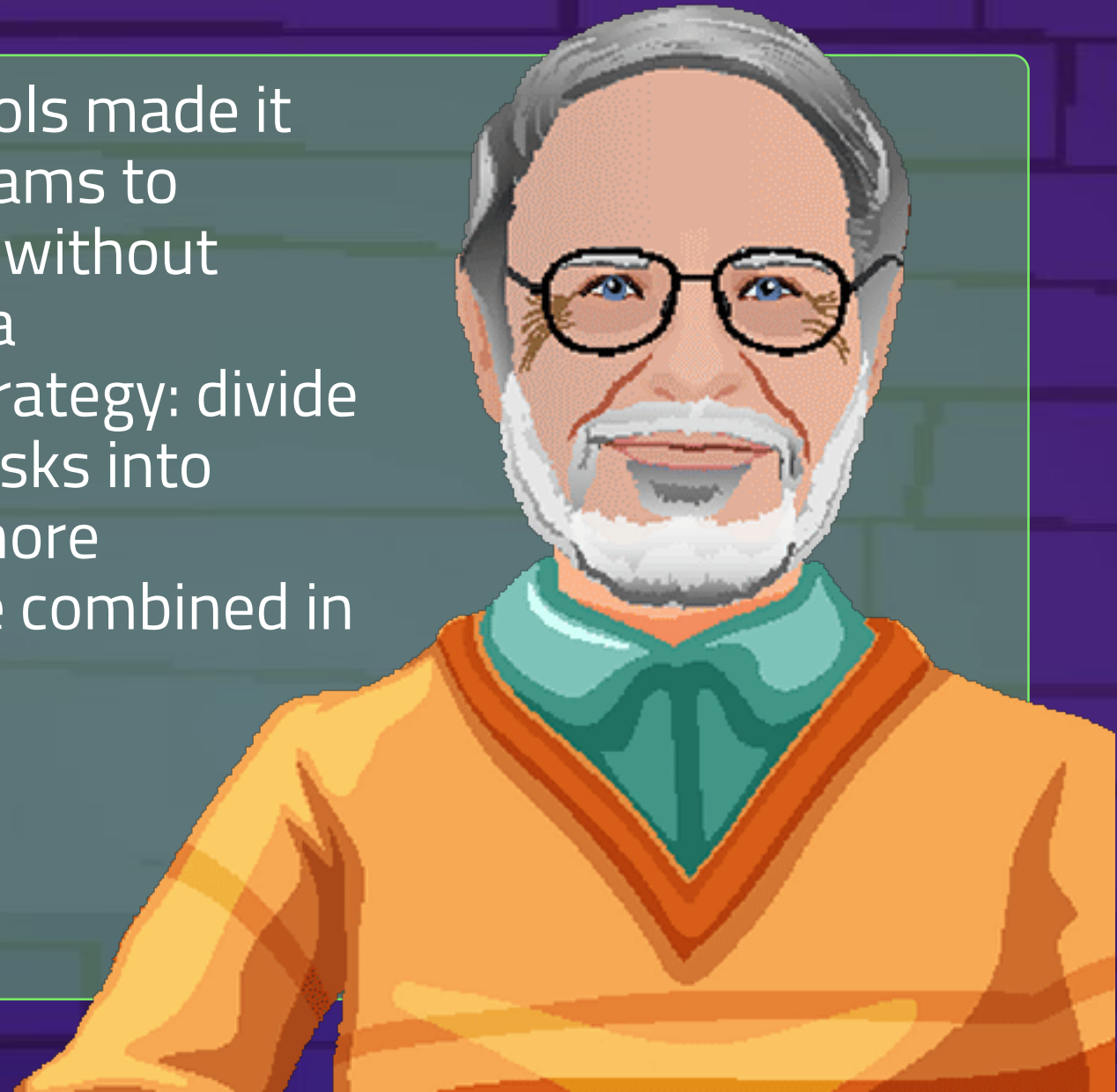






I WAS WRONG...

"The Unix philosophy of software tools made it possible to combine existing programs to accomplish a wide variety of tasks without having to write new software. It's a programming instance of an old strategy: divide and conquer. By breaking bigger tasks into smaller ones, each one becomes more manageable, and the pieces can be combined in unexpected ways."



Brian Kernighan

a

- alias Create an alias •
- apropos Search Help manual pages (man -k)
- apt-get Search, install software packages (Debian, Ubuntu)
- aptitude, emerge, pacman, yum, zypper (D&U, G, A, F, OS)
- aspell Spell Checker
- awk Find and Replace text, database sort/validate/index

b

- basename Strip directory and suffix from filenames
- bash GNU Bourne-Again SHell
- bc Arbitrary precision calculator language
- bg Send to background
- break Exit from a loop •
- builtin Run a shell builtin
- bzip2 Compress or decompress named file(s)

c

- cal Display a calendar
- case Conditionally perform a command
- cat Concatenate and print (display) the content of files
- cd Change Directory
- cfdisk Partition table manipulator for Linux
- chgrp Change group ownership
- chmod Change access permissions
- chown Change file owner and group
- chroot Run a command with a different root directory
- chkconfig System services (runlevel)
- cksum Print CRC checksum and byte counts
- clear Clear terminal screen
- cmp Compare two files
- comm Compare two sorted files line by line
- command Run a command - ignoring shell functions •
- continue Resume the next iteration of a loop •
- cp Copy one or more files to another location
- cron Daemon to execute scheduled commands
- crontab Schedule a command to run at a later time
- csplit Split a file into context-determined pieces
- cut Divide a file into several parts

d

- date Display or change the date & time
- dc Desk Calculator
- dd Convert and copy a file, write disk headers, boot records
- ddrescue Data recovery tool
- declare Declare variables and give them attributes •
- df Display free disk space
- diff Display the differences between two files
- diff3 Show differences among three files
- dig DNS lookup
- dir Briefly list directory contents
- dircolors Colour setup for `ls'
- dirname Convert a full pathname to just a path
- dirs Display list of remembered directories
- dmesg Print kernel & driver messages
- du Estimate file space usage

e

- echo Display message on screen •
- egrep Search file(s) for lines matching an extended expression
- eject Eject removable media
- enable Enable and disable builtin shell commands •
- env Environment variables
- ethtool Ethernet card settings
- eval Evaluate several commands/arguments
- exec Execute a command
- exit Exit the shell
- expect Automate arbitrary apps accessed over a terminal
- expand Convert tabs to spaces
- export Set an environment variable
- expr Evaluate expressions

f

- false Do nothing, unsuccessfully
- fdformat Low-level format a floppy disk
- fdisk Partition table manipulator for Linux
- fg Send job to foreground
- fgrep Search file(s) for lines that match a fixed string
- file Determine file type
- find Search for files that meet a desired criteria
- fmt Reformat paragraph text
- fold Wrap text to fit a specified width.
- for Expand words, and execute commands
- format Format disks or tapes
- free Display memory usage
- fscck File system consistency check and repair
- ftp File Transfer Protocol
- function Define Function Macros
- fuser Identify/kill the process that is accessing a file

g

- gawk Find and Replace text within file(s)
- getopts Parse positional parameters
- grep Search file(s) for lines matching a given pattern
- groupadd Add a user security group
- groupdel Delete a group
- groupmod Modify a group
- groups Print group names a user is in
- gzip Compress or decompress named file(s)

h

- hash Remember full pathname of a name argument
- head Output the first part of file(s)
- help Display help for a built-in command •
- history Command History
- hostname Print or set system name

i

- iconv Convert the character set of a file
- id Print user and group id's
- if Conditionally perform a command
- ifconfig Configure a network interface
- ifdown Stop a network interface
- ifup Start a network interface up
- import Capture X server screen and save to file
- install Copy files and set attributes

j

- jobs List active jobs •
- join Join lines on a common field

k

- kill Stop a process from running
- killall Kill processes by name

l

- less Display output one screen at a time
- let Perform arithmetic on shell variables •
- link Create a link to a file
- ln Create a symbolic link to a file
- local Create variables •
- locate Find files
- logname Print current login name
- logout Exit a login shell •
- look Display lines beginning with a given string
- lpc Line printer control program
- lpr Off line print
- lprint Print a file
- lprintd Abort a print job
- lprintq List the print queue
- lprm Remove jobs from the print queue
- ls List information about file(s)
- lsdf List open files

m

- make Recompile a group of programs
- man Help manual
- mkdir Create new folder(s)
- mkfifo Make FIFOs (named pipes)
- mkisofs Create an hybrid ISO9660//OLIET/HFS filesystem
- mknod Make block or character special files
- more Display output one screen at a time
- mount Mount a file system
- mtools Manipulate MS-DOS files
- mtr Network diagnostics (traceroute/ping)
- mv Move or rename files or directories
- mmv Mass Move and rename (files)

n

- netstat Networking information
- nice Set the priority of a command or job
- nl Number lines and write files
- nohup Run a command immune to hangups
- notify-send Send desktop notifications
- nslookup Query Internet name servers interactively

o

- open Open a file in its default application
- op Operator access

p

- passwd Modify a user password
- paste Merge lines of files
- pathchk Check file name portability
- ping Test a network connection
- kill Stop processes from running
- popd Restore previous value of the current directory
- pr Prepare files for printing
- printcap Printer capability database
- printenv Print environment variables
- printf Format and print data •
- ps Process status
- pushd Save and then change the current directory
- pv Monitor the progress of data through a pipe
- pwd Print Working Directory

q

- quota Display disk usage and limits
- quotacheck Scan a file system for disk usage
- quotactl Set disk quotas

r

- ram ram disk device
- rcp Copy files between two machines
- read Read a line from standard input •
- readarray Read from stdin into an array variable •
- readonly Mark variables/functions as readonly
- reboot Reboot the system
- rename Rename files
- renice Alter priority of running processes
- remsync Synchronize remote files via email
- return Exit a shell function
- rev Reverse lines of a file
- rm Remove files
- rmdir Remove folder(s)
- rsync Remote file copy (Synchronize file trees)

s

- screen Multiplex terminal, run remote shells via ssh
- scp Secure copy (remote file copy)
- sdiff Merge two files interactively
- sed Stream Editor
- select Accept keyboard input
- seq Print numeric sequences
- set Manipulate shell variables and functions
- sftp Secure File Transfer Program
- shift Shift positional parameters
- shopt Shell Options

s

- shutdown Shutdown or restart linux
- sleep Delay for a specified time
- slocate Find files
- sort Sort text files
- source Run commands from a file `.'
- split Split a file into fixed-size pieces
- ssh Secure Shell client (remote login program)
- strace Trace system calls and signals
- su Substitute user identity
- sudo Execute a command as another user
- sum Print a checksum for a file
- suspend Suspend execution of this shell •
- sync Synchronize data on disk with memory

t

- tail Output the last part of file
- tar Store, list or extract files in an archive
- tee Redirect output to multiple files
- test Evaluate a conditional expression
- time Measure Program running time
- timeout Run a command with a time limit
- times User and system times
- touch Change file timestamps
- top List processes running on the system
- traceroute Trace Route to Host
- trap Run a command when a signal is set(bourne)
- tr Translate, squeeze, and/or delete characters
- true Do nothing, successfully
- tsort Topological sort
- tty Print filename of terminal on stdin
- type Describe a command •

u

- ulimit Limit user resources •
- umask Users file creation mask
- umount Unmount a device
- unalias Remove an alias •
- uname Print system information
- unexpand Convert spaces to tabs
- uniq Uniquify files
- units Convert units from one scale to another
- unset Remove variable or function names
- unshar Unpack shell archive scripts
- until Execute commands (until error)
- uptime Show uptime
- useradd Create new user account
- userdel Delete a user account
- usermod Modify user account
- users List users currently logged in
- uencode Encode a binary file
- uudecode Decode a file created by uencode

v

- v Verbose list directory contents ('ls -l -b')
- vdir Verbose list directory contents ('ls -l -b')
- vi Text Editor
- vmstat Report virtual memory statistics

w

- wait Wait for a process to complete •
- watch Execute/display a program periodically
- wc Print byte, word, and line counts
- whereis Search a user path, man pages, source files for a program
- which Search a user path for a program file
- while Execute commands
- who Print all usernames currently logged in
- whoami Print the current user id and name ('id -un')
- wget Retrieve web pages or files via HTTP, HTTPS or FTP
- write Send a message to another user

x

- xargs Execute utility, passing construct(s)
- xdg-open Open a file or URL in default app
- yes Print a string until interrupted
- zip Package and compress (archive) files.
- . Run command script in current shell
- !! Run the last command again
- ### Comment / Remark





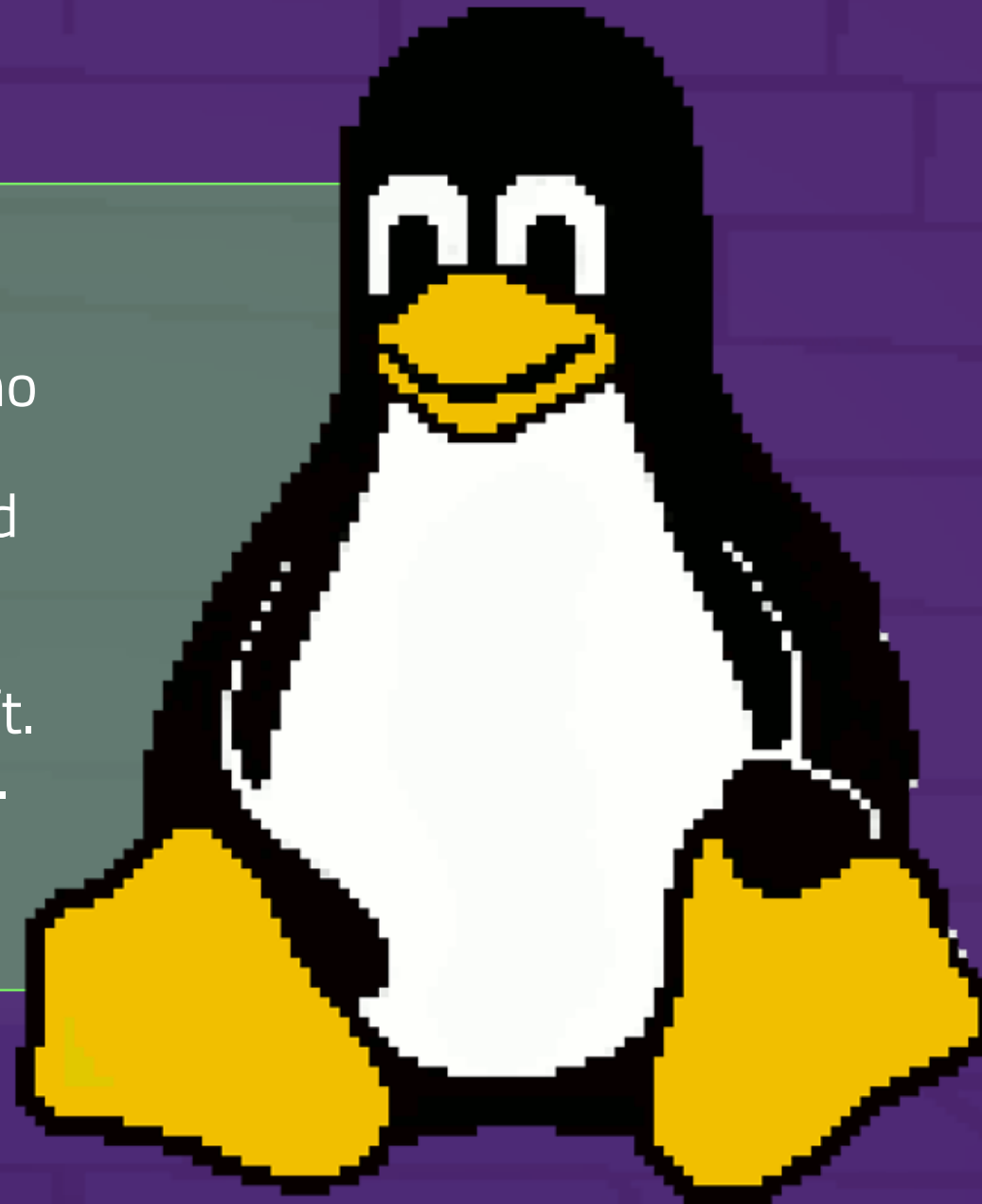


Mentor TUX

Welcome player!

On your journey, you will meet many mentors who will impart knowledge, spells, and wisdom. At each stage in your journey, you will level-up and become a more powerful wizard.

First, you must learn the foundations of your craft. Complete this stage to become a novice wizard.



WIZARD'S SKILL TREE

01

Shell Basics

- Pwd
- Ls
- Cd
- Mkdir
- touch
- Rm
- Mv
- Cp
- History

02

Advanced Shell

- Alias
- Package Managers
- Other Shells
- Shell Frameworks

03

File Basics

- Cat
- Head
- Tail
- Less
- Split
- Echo
- Diff
- Pipes
- STDIO
- xargs

04

Data Basics

- Find
- vi
- Grep
- Regular Expressions
- Sed
- Awk
- Jq

05

Networking

- Ping
- Curl
- Wget
- Ifconfig

06

Shell Scripts

- The Shebang
- Parameters
- Conditionals
- Functions
- Errors

A RE-INTRODUCTION TO THE SHELL

- Basic concepts
 - ❑ Navigation
 - ❑ Basics of working with files
 - ❑ Man Pages
 - ❑ Understanding \$PATH and the modularity of UNIX
 - ❑ Package Managers
 - ❑ Sudo
- History
- Multitasking

LAB [10 MINS]

1. Navigate to the lab1 directory
2. Open lab1notes.txt with less
3. Read the first set of instructions
4. (if not using docker) cmd-z to move that to the background and go through the exercise
5. (if not using docker) type fg to bring the background job back to the foreground
6. Continue through all the exercises
7. Raise your hand when complete or ask questions in chat

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LEVEL UP

You are now a Level 1 Novice Wizard!

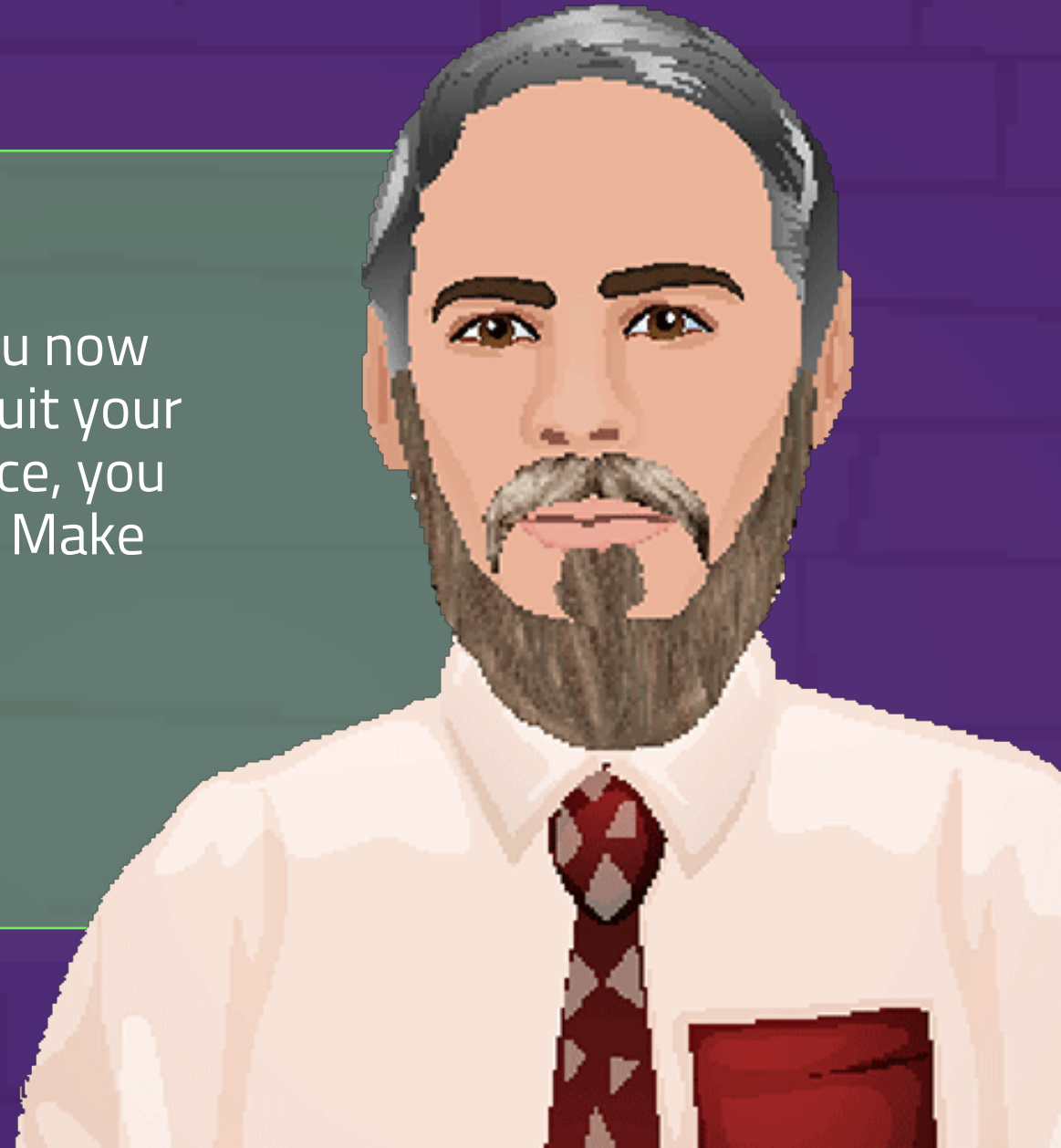




Mentor Dennis Ritchie

Greetings Novice Wizard!

We created Unix to be very customizable. You now have the power to reshape your world to suit your needs. To graduate to the level of apprentice, you must demonstrate mastery of these skills. Make your environment useful and *yours*.



CUSTOMIZING YOUR SHELL

- Adding commands
- Aliases
- Enhanced Shells

LAB [10 MINS]

1. Add the "tf" command (instructions: <https://github.com/nvbn/thefuck>)
2. Add the alias to your .bashrc file
3. Source ~/.bashrc
4. Try it out
5. Add additional aliases for common commands to your .bashrc
 1. E.g. alias restartbash="source ~/.bashrc"
 2. E.g. alias gpo="git push origin"

CUSTOMIZING YOUR SHELL

- Adding commands
- Aliases
- Enhanced Shells

LAB [20 MINS]

1. Install oh my zsh
 1. `wget https://raw.githubusercontent.com/ohmyzsh/ohmyzsh/master/tools/install.sh`
 2. `sh install.sh`
2. Install the powerlevel10k theme
 1. Optional – install the recommended fonts
 2. <https://github.com/romkatv/powerlevel10k#oh-my-zsh>
 3. Update `.zshrc` then source `.zshrc` then configure your theme
3. Install autojump using the package manager
4. `git clone https://github.com/zsh-users/zsh-syntax-highlighting.git ${ZSH_CUSTOM:-~/.oh-my-zsh/custom}/plugins/zsh-syntax-highlighting`
5. `git clone https://github.com/zsh-users/zsh-autosuggestions ${ZSH_CUSTOM:-~/.oh-my-zsh/custom}/plugins/zsh-autosuggestions`
6. `git clone https://github.com/wting/autojump.git ${ZSH_CUSTOM:-~/.oh-my-zsh/custom}/plugins/autojump`
7. `git clone https://github.com/agkozak/zsh-z ${ZSH_CUSTOM:-~/.oh-my-zsh/custom}/plugins/zsh-z`
8. Add Plugins to `.zshrc` and source `.zshrc`
9. Experiment with Autojump

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LEVEL UP

Congratulations! You are now a
Level 5 Apprentice Wizard!



The Linux Shell

FROM NOVICE TO WIZARD

TO BE CONTINUED

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Mentor Linus Torvalds

Welcome, Apprentice!

I see you are beginning to bend and reshape the universe to your will, and you have learned some individual spells.

To become a journeyman wizard, you must learn the art of composing multiple spells to conjure new realities at will. As your knowledge of spells increases, so shall your powers.
Let me show you the way



COMPOSING COMMANDS

- Unix Pipes
- Redirection
- StdIn/StdOut/StdErr
- Xargs

LAB [5 MINS]

1. Create a directory called `composition_playground` and `cd` to this new dir in one command
2. Redirect the output of `seq` to a file called `sequential_numbers.txt`
3. Cat `sequential_numbers.txt` and pipe the output to the `shuff` command then redirect to `shuffled_numbers.txt`
4. Cat `sequential_numbers.txt` and pipe the output into `sort` and redirect with append to `sequential_numbers.txt`
5. Using only `echo` and `xargs` in a single command, create files called `foo`, `bar`, `baz` (hint: omit the `-L` flag in `xargs` and delimit the output of `echo` with spaces.)

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LEVEL UP

Congratulations! You are now a level
15 Journeyman Wizard

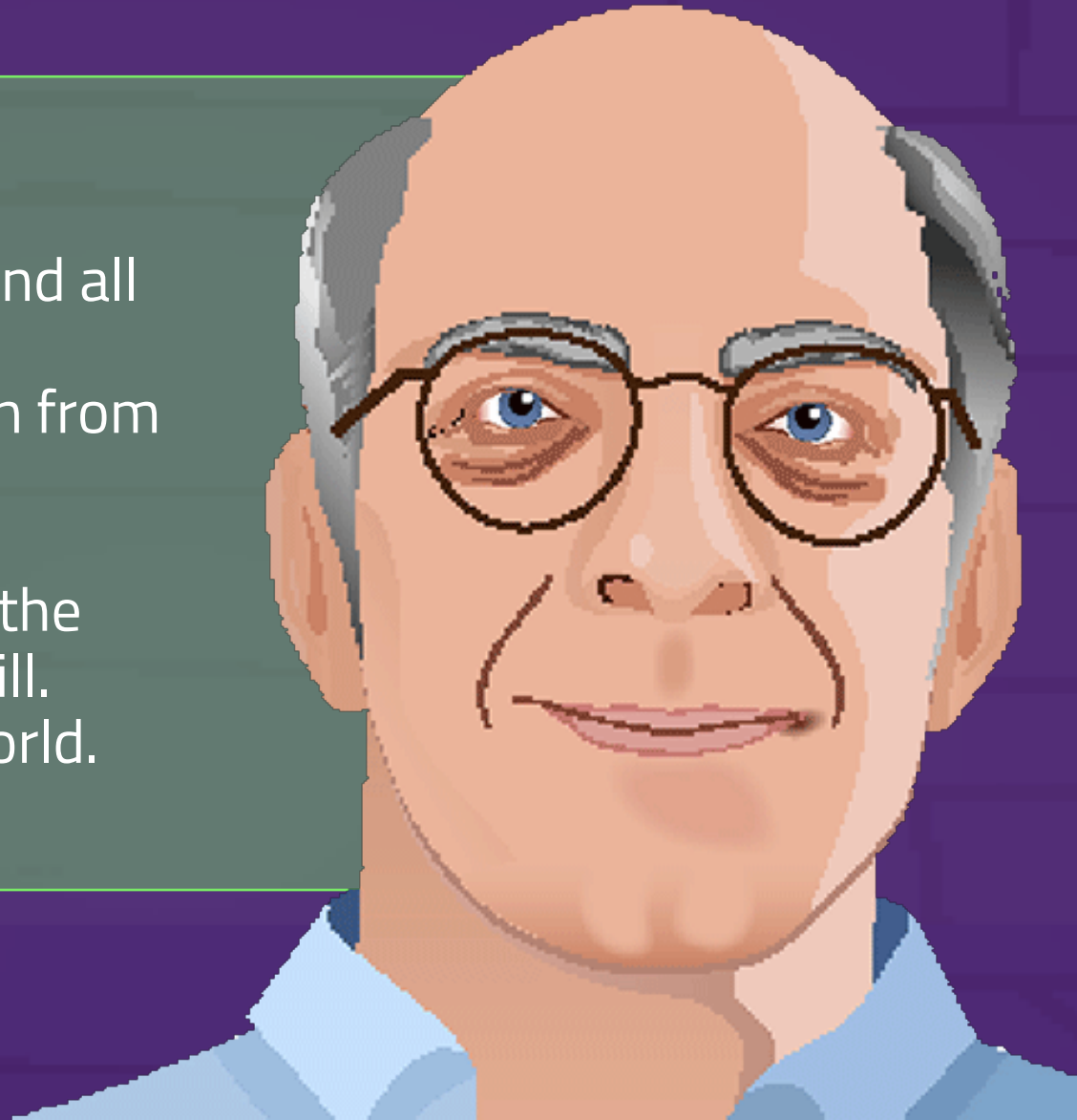


Mentor Andrew S. Tanenbaum

So, you wish to become an adept?

I will illuminate your path. All things are files and all files are mere bytes. And, as all things were derived from the bytes, so all things are born from the bytes by adaptation.

Text is the elemental earth. You will separate the earth from the fire, gently and with great skill. Thus you will have the glory of the whole world. As the text evolves, so therefore shall you.



MANIPULATING FILES AND BYTES

- find
- grep
- Sed
- vim

LAB (5 MINS)



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LEVEL UP

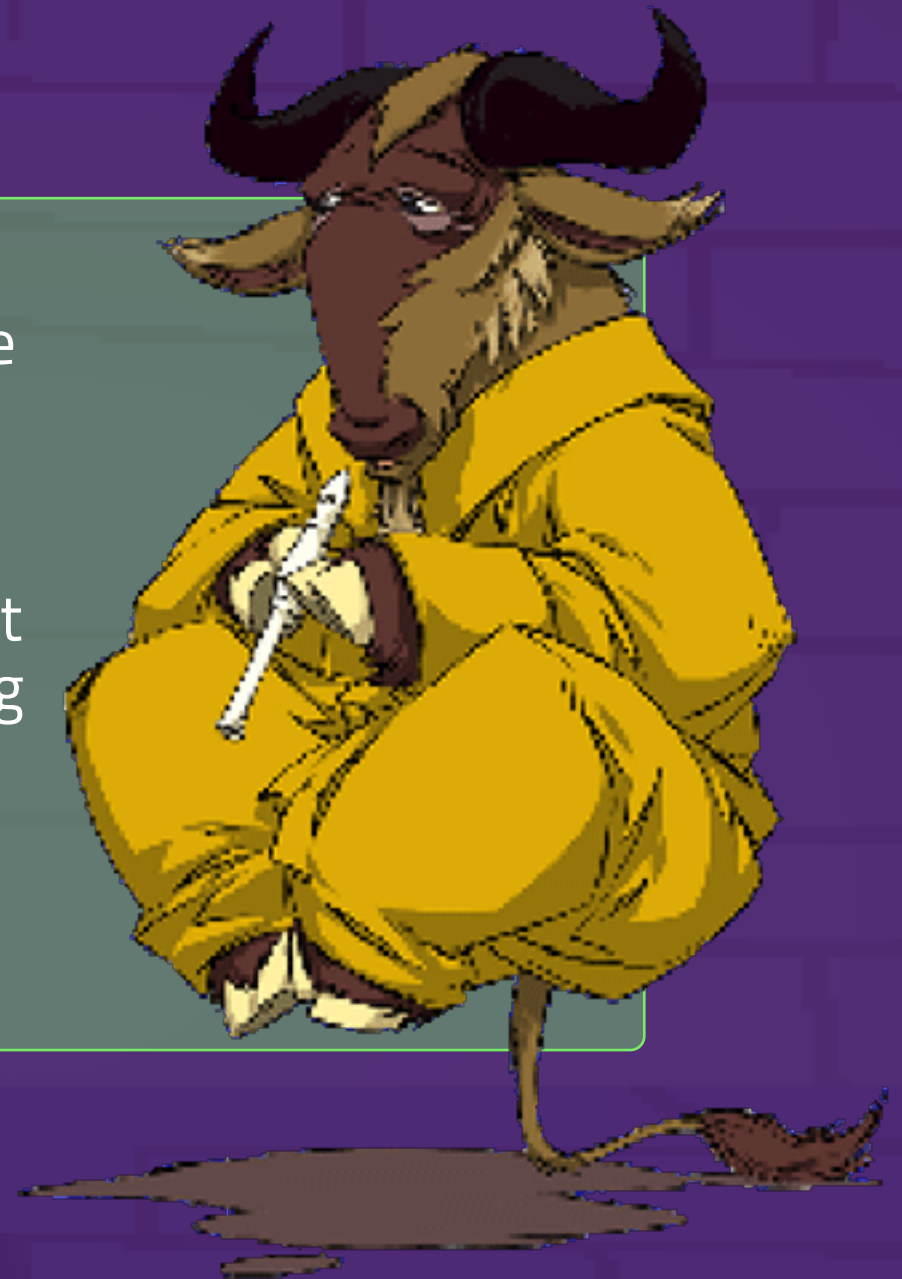
You have earned the rank of Level
20 Adept



Mentor GNU

Lo, traveler! I am the gatekeeper of the legendary wizard Stallman. To meet him you must attain the rank of Master Wizard. The next stage of your journey, however, is Magus.

To evolve: Connect ye to the universe and reshape it at your command. Data is water. This is the strong force of all forces, overcoming every subtle thing and penetrating every solid thing.



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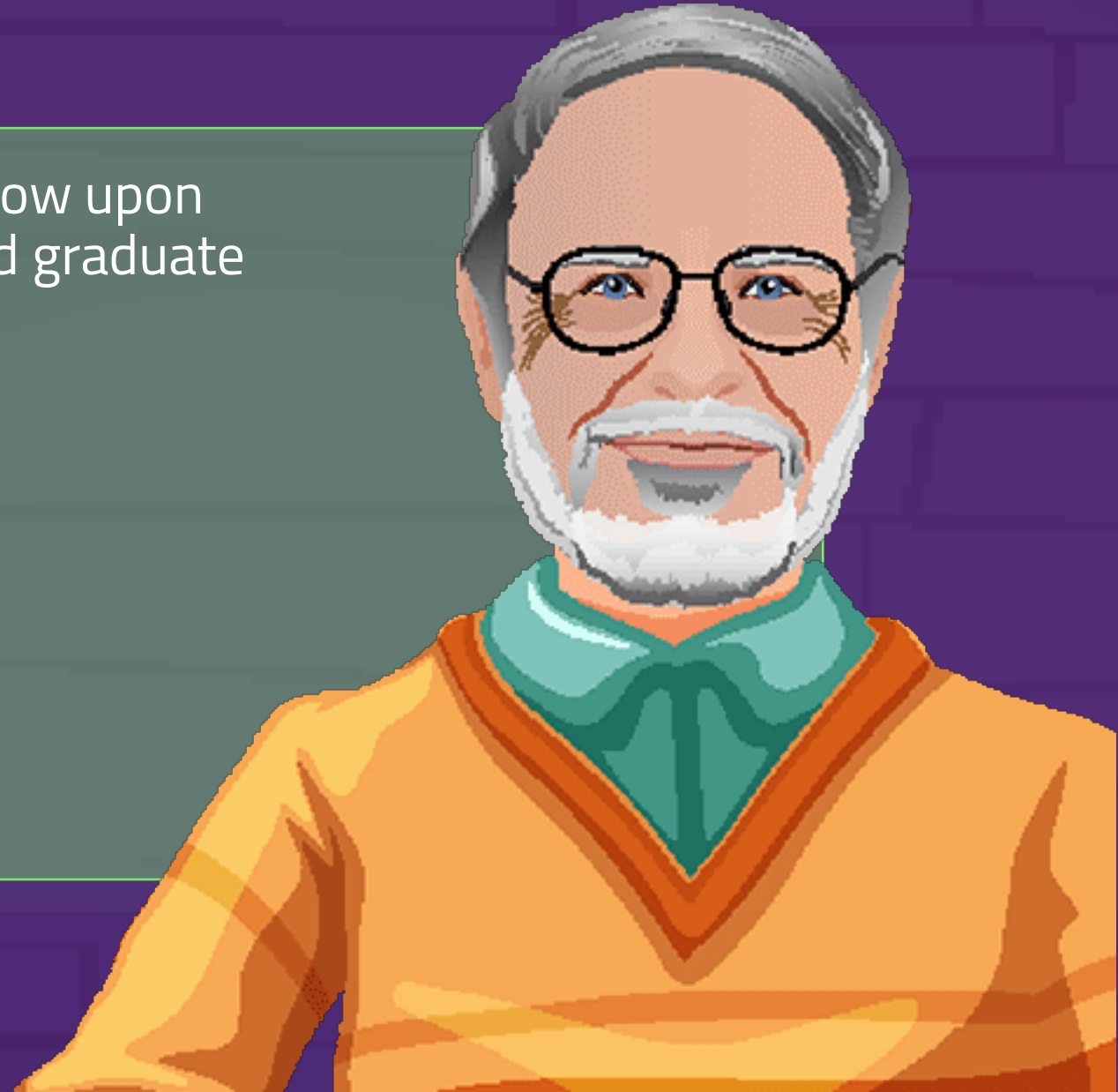
LEVEL UP

Congratulations! You have
earned the rank of level 30
Magus



Mentor Brian Kernighan

Behold, magus! I am the K in AWK. I bestow upon you this new power. Wield it wisely and graduate to the rank of Master Wizard.



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LEVEL UP

You have earned the rank of
Level 40 Master Wizard



Mentor Richard Stallman

Greetings, master wizard. The grandmaster
wields great power and is the parent of all
works of wonder throughout the whole world.
The power thereof is perfect.

Again it doth descend to earth, and uniteth in
itself the force from things superior and things
inferior.

Darkness shall flee from thee.



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- xargs

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Data Basics

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LEVEL UP

You have been promoted to the rank of level 50 Grandmaster Wizard

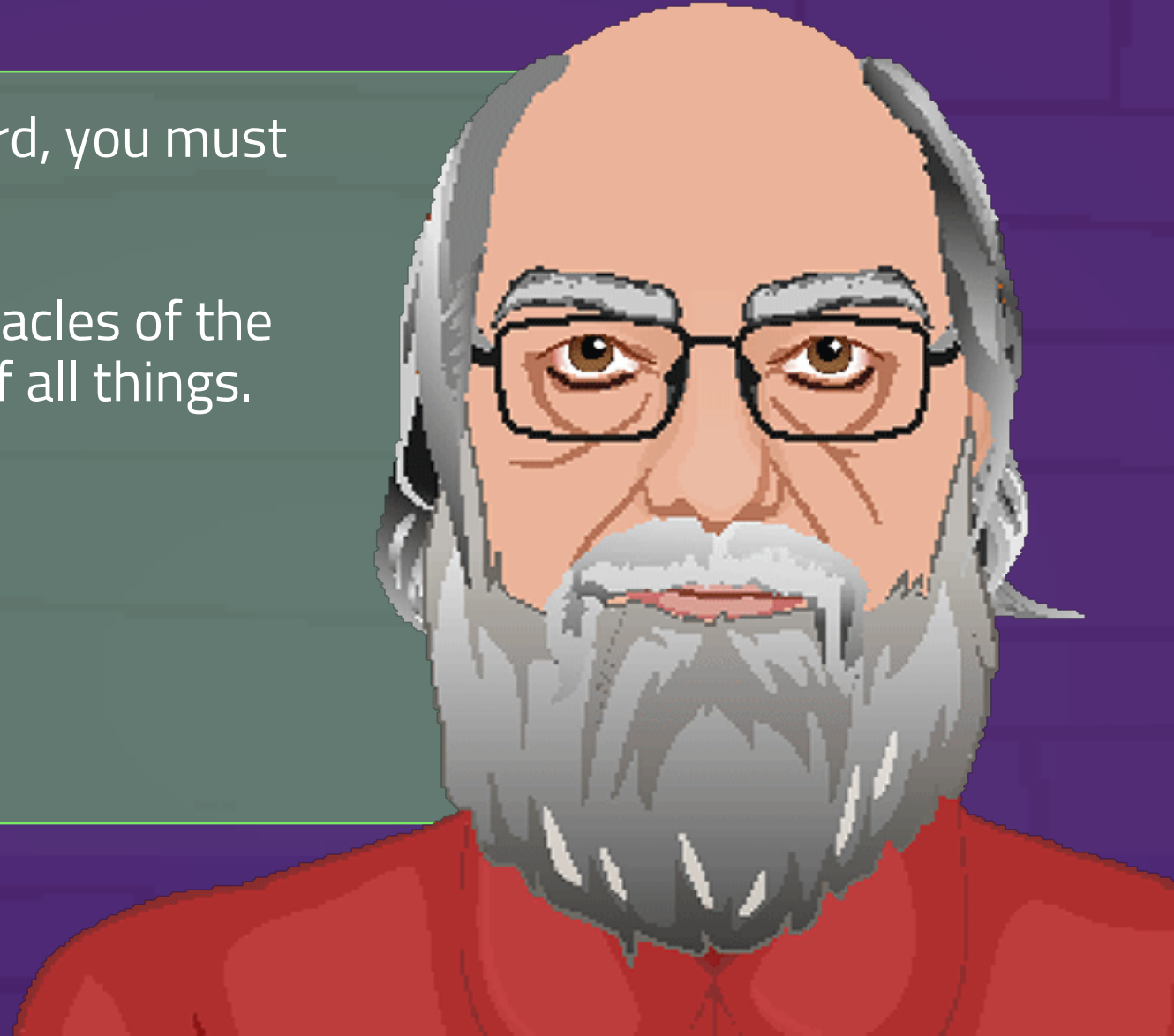


Mentor Ken Thompson

To achieve the rank of legendary wizard, you must pass the final test.

Show that you can accomplish the miracles of the one thing through the adaptations of all things.

Your power will be enormous.





LEVEL UP

Your rank is level 60 Legendary Wizard!

WIZARD'S SKILL TREE

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- Ifconfig

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Basic Navigation, History,
Multitasking, Package Managers



Novice Wizard

Adding Commands, Aliases,
Customized Shells



Apprentice Wizard

Unix Pipes, Redirection,
StdIn/StdOut/StdErr, Xargs



Journeyman Wizard

Find, Grep, Sed, Vi



Adept Wizard

Curl, JQ, Ping



Journeyman Wizard

Awk



Master Wizard

Bash Scripting (if/else, case,
error handling, parameters,
functions)



Grandmaster Wizard

Demonstrate proficiency
using all you have learned.



Legendary Wizard

