

Being Productive With Emacs

Part 1



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“**Emacs** is the extensible, customizable, self-documenting real-time display editor.”

The many faces of emacs

```
emacs@localhost
87654321 0011 2233 4455 6677 8899 aabb ccdd eeff 0123456789abcdef
00000000: 2320 4641 534c 0a20 2063 6f6d 7069 6c65 # FASL. compile
00000010: 6420 6672 6f6d 2022 2f68 6f6d 652f 7068 d from "/home/ph
00000020: 696c 2f70 726f 6a65 6374 732f 736c 7032 il/projects/slp2
00000030: 2f73 6c70 2e6c 6973 7022 0a20 2061 7420 /slp.lisp". at
00000040: 5475 6573 6461 792c 2044 6563 656d 6265 Tuesday, Decembe
00000050: 7220 3236 2c20 3230 3036 2030 323a 3438 r 26, 2006 02:48
00000060: 3a30 3420 504d 2045 5354 0a20 206f 6e20 :04 PM EST. on
00000070: 7068 696c 0a20 2075 7369 6e67 2053 4243 phil. using SBC
00000080: 4c20 7665 7273 696f 6e20 312e 300a ff03 L version 1.0...
00000090: 0000 0058 3836 4700 0000 2700 0000 283a ...X86G...'...(:
000000a0: 4745 4e43 4743 203a 5342 2d50 4143 4b41 GENCGC :SB-PACKA
000000b0: 4745 2d4c 4f43 4b53 203a 5342 2d55 4e49 GE-LOCKS :SB-UNI
000000c0: 434f 4445 2951 a207 5300 0000 4200 0000 CODE)Q..S...B...
000000d0: 2d00 0000 4900 0000 4d00 0000 5000 0000 -...I...M...P...
000000e0: 4c00 0000 0e52 010b 000d 2500 0000 4400 L...R...%...D.
000000f0: 0000 4500 0000 4600 0000 5000 0000 4100 ..E...F...P...A.
00000100: 0000 5200 0000 4100 0000 4d00 0000 4500 ..R...A...M...E.
00000110: 0000 5400 0000 4500 0000 5200 0000 51a2 ..T...E...R...Q.
00000120: 1043 0000 004f 0000 004d 0000 004d 0000 .C...O...M...M..
00000130: 004f 0000 004e 0000 002d 0000 004c 0000 .O...N...-...L..
00000140: 0049 0000 0053 0000 0050 0000 002d 0000 .I...S...P...-...
00000150: 0055 0000 0053 0000 0045 0000 0052 0000 .U...S...E...R..
00000160: 000e 5201 0b02 102a 0000 0053 0000 004c ..R...*...S...L
00000170: 0000 0045 0000 0045 0000 0050 0000 002d ...E...E...P...-
00000180: 0000 004c 0000 004f 0000 0047 0000 002d ...L...O...G...-
00000190: 0000 0050 0000 0041 0000 0054 0000 0048 ...P...A...T...H
000001a0: 0000 002a 0000 00a2 102f 0000 0068 0000 ...*.../...h..
000001b0: 006f 0000 006d 0000 0065 0000 002f 0000 .o...m...e.../..
000001c0: 0070 0000 0068 0000 0069 0000 006c 0000 .p...h...i...l..
-:-- slp.fasl Top of 419k (5,20) (Hexl)
```

emacs is a hex editor
M-x hexl-find-file

The many faces of emacs

```
ADPAgentC.java
public class ADPAgentC extends ADPAgentC {
  Random r;

  int[] fixedpolicy;
  double[] utilities;
  double[] reward;

  int numStates;
  int numActions;
  double discount;

  double[][][] TransModel;
  double[][] Nsa;
  double[][][] Nsasp;

  int[] statevisited;
  int prevState;
  int prevAction;

  PolicyEvaluation policyEval;

  public ADPAgentC(Mdp mdp) {
    super(mdp);

    this.r = new Random();

    this.numStates = mdp.numStates;
    this.numActions = mdp.numActions;
  }
}

public class ADPAgentC extends ADPAgentC {
  Random r;

  int[] policy;
  double[] utilities;
  double[] reward;

  int numStates;
  int numActions;
  double discount;

  double[][][] TransModel;
  int[][] Nsa;
  int[][][] Nsasp;

  int[] statevisited;
  int prevState;
  int prevAction;

  PolicyEvaluation policyEval;

  ExplorationFunction explorationFunction;

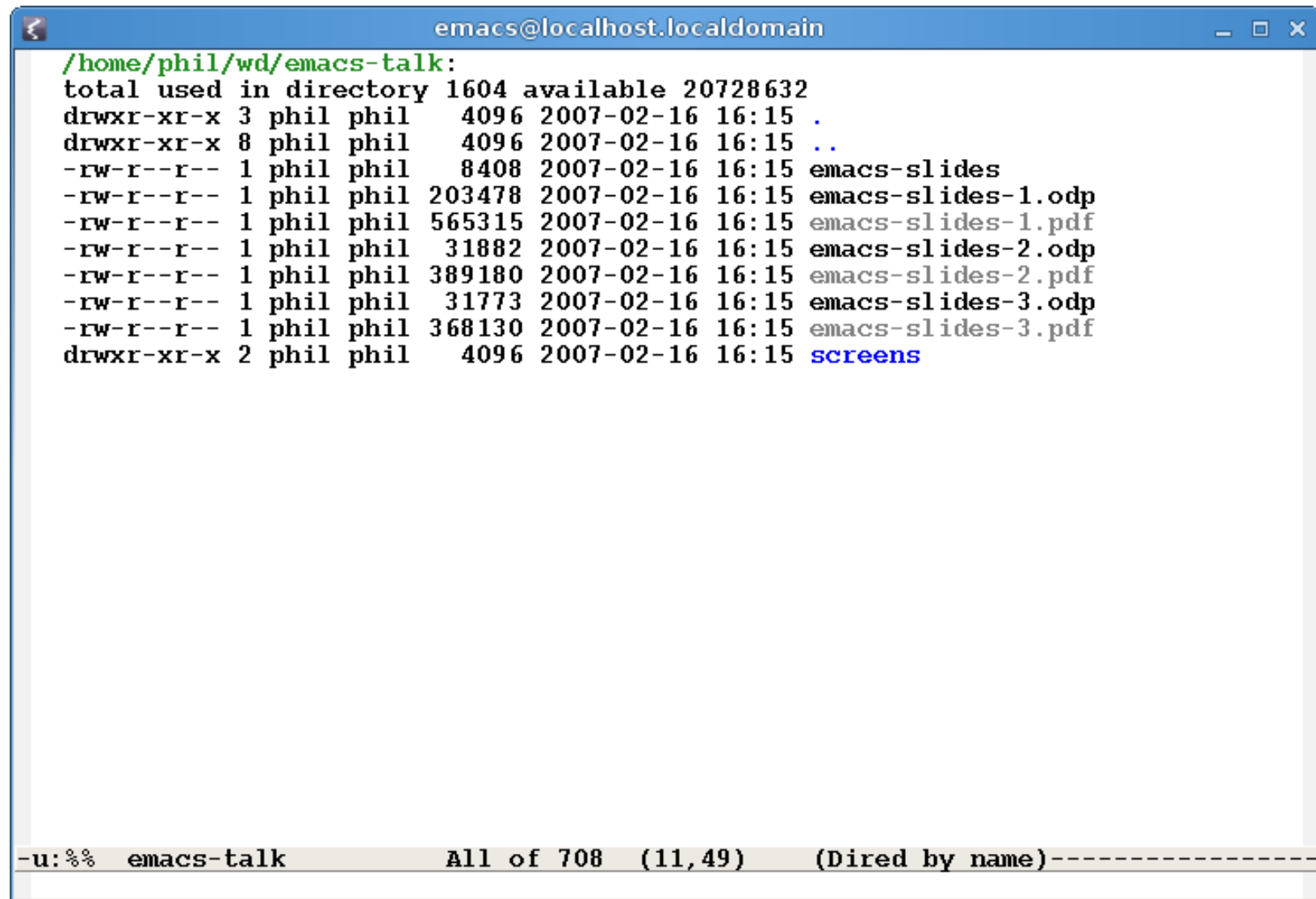
  final int threshold = 5;
  final double unexploredValue = 1000.0;
}

Ediff
Type ? for help
2/17

A: --:%% !home!phil!school!6.825!proj3! B: --:-- ADPAgentC.java 4% of 3.4k (
```

emacs does diffs
M-x ediff-buffers

The many faces of emacs



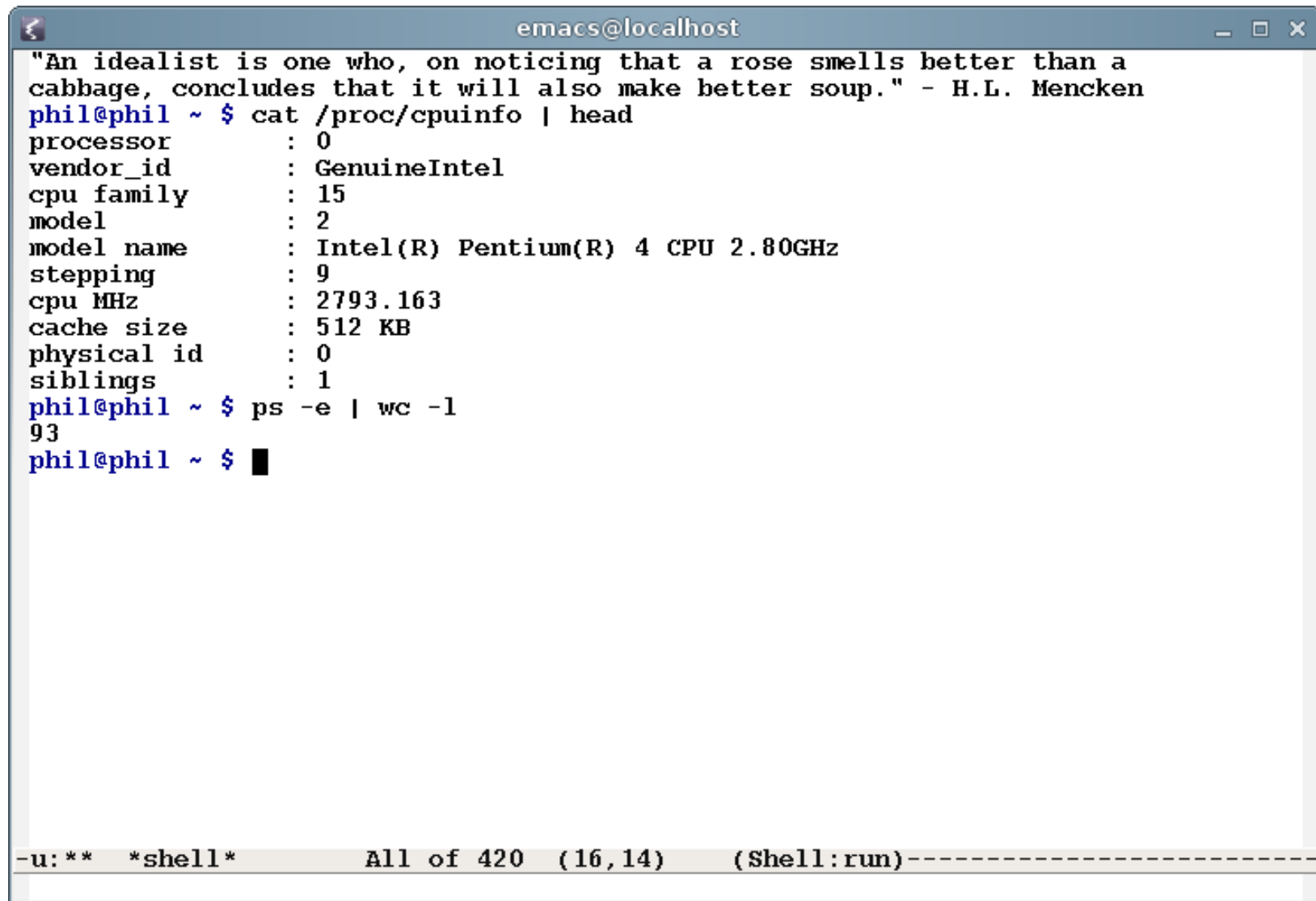
The screenshot shows an Emacs window titled "emacs@localhost.localdomain" with a blue title bar. The main content area displays a directory listing for "/home/phil/wd/emacs-talk:". The listing shows file permissions, owner, group, size, date, time, and filename. The files listed are: ".", "..", "emacs-slides", "emacs-slides-1.odp", "emacs-slides-1.pdf", "emacs-slides-2.odp", "emacs-slides-2.pdf", "emacs-slides-3.odp", "emacs-slides-3.pdf", and "screens". The "screens" file is highlighted in blue. At the bottom of the window, a status bar shows "-u:%% emacs-talk All of 708 (11,49) (Dired by name)-----".

```
emacs@localhost.localdomain
/home/phil/wd/emacs-talk:
total used in directory 1604 available 20728632
drwxr-xr-x 3 phil phil 4096 2007-02-16 16:15 .
drwxr-xr-x 8 phil phil 4096 2007-02-16 16:15 ..
-rw-r--r-- 1 phil phil 8408 2007-02-16 16:15 emacs-slides
-rw-r--r-- 1 phil phil 203478 2007-02-16 16:15 emacs-slides-1.odp
-rw-r--r-- 1 phil phil 565315 2007-02-16 16:15 emacs-slides-1.pdf
-rw-r--r-- 1 phil phil 31882 2007-02-16 16:15 emacs-slides-2.odp
-rw-r--r-- 1 phil phil 389180 2007-02-16 16:15 emacs-slides-2.pdf
-rw-r--r-- 1 phil phil 31773 2007-02-16 16:15 emacs-slides-3.odp
-rw-r--r-- 1 phil phil 368130 2007-02-16 16:15 emacs-slides-3.pdf
drwxr-xr-x 2 phil phil 4096 2007-02-16 16:15 screens

-u:%% emacs-talk All of 708 (11,49) (Dired by name)-----
```

emacs is a file manager
M-x dired

The many faces of emacs

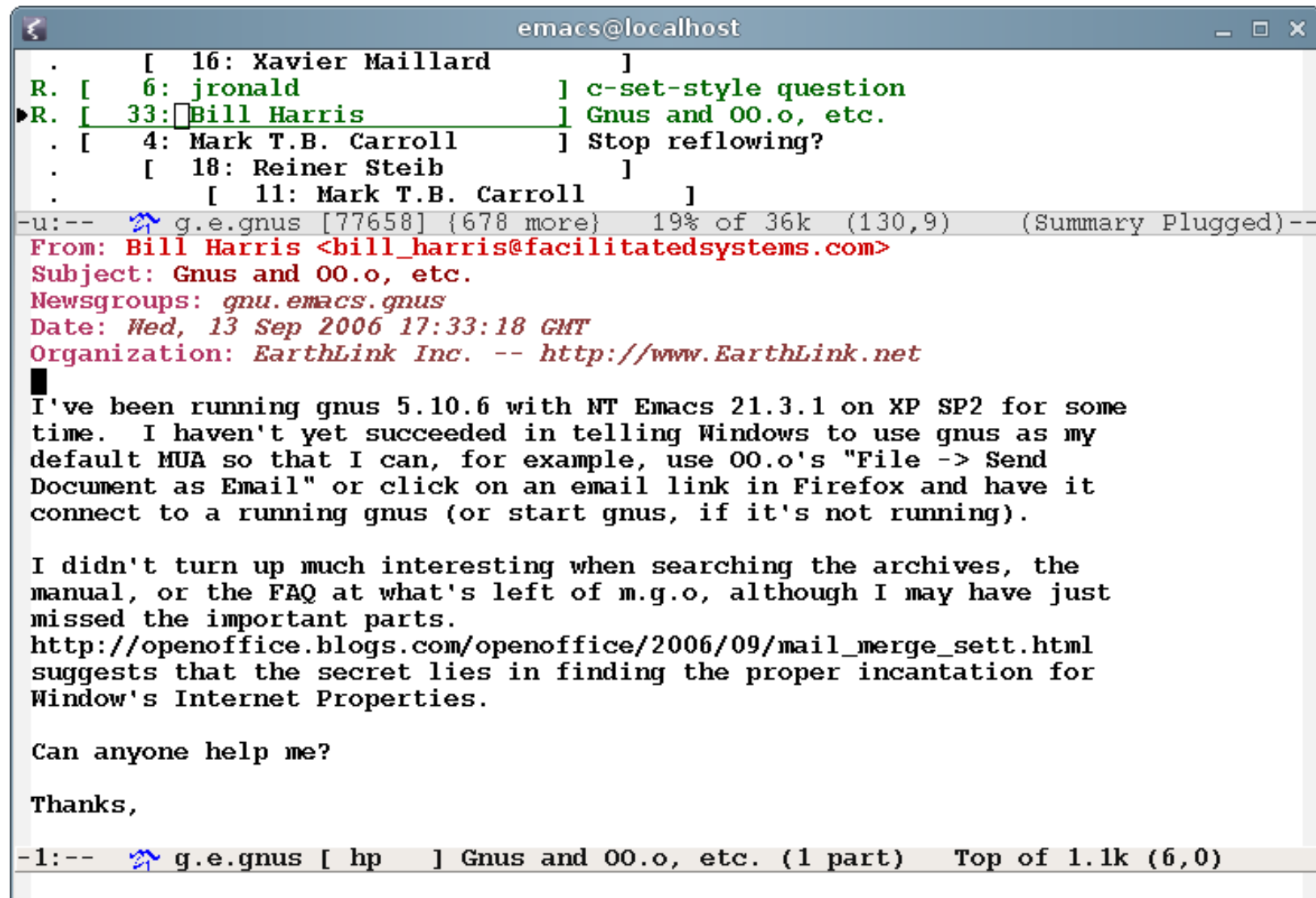


```
emacs@localhost
"An idealist is one who, on noticing that a rose smells better than a
cabbage, concludes that it will also make better soup." - H.L. Mencken
phil@phil ~ $ cat /proc/cpuinfo | head
processor       : 0
vendor_id     : GenuineIntel
cpu family    : 15
model        : 2
model name    : Intel(R) Pentium(R) 4 CPU 2.80GHz
stepping     : 9
cpu MHz      : 2793.163
cache size   : 512 KB
physical id  : 0
siblings     : 1
phil@phil ~ $ ps -e | wc -l
93
phil@phil ~ $ █

-u:** *shell* All of 420 (16,14) (Shell:run)-----
```

emacs is a shell
M-x shell

The many faces of emacs



```
emacs@localhost
. [ 16: Xavier Maillard ]
R. [ 6: jronald ] c-set-style question
▶R. [ 33: Bill Harris ] Gnus and OO.o, etc.
. [ 4: Mark T.B. Carroll ] Stop reflowing?
. [ 18: Reiner Steib ]
. [ 11: Mark T.B. Carroll ]
-u:-- g.e.gnus [77658] {678 more} 19% of 36k (130,9) (Summary Plugged)--
From: Bill Harris <bill_harris@facilitatedsystems.com>
Subject: Gnus and OO.o, etc.
Newsgroups: gnu.emacs.gnus
Date: Wed, 13 Sep 2006 17:33:18 GMT
Organization: EarthLink Inc. -- http://www.EarthLink.net
█
I've been running gnus 5.10.6 with NT Emacs 21.3.1 on XP SP2 for some
time. I haven't yet succeeded in telling Windows to use gnus as my
default MUA so that I can, for example, use OO.o's "File -> Send
Document as Email" or click on an email link in Firefox and have it
connect to a running gnus (or start gnus, if it's not running).

I didn't turn up much interesting when searching the archives, the
manual, or the FAQ at what's left of m.g.o, although I may have just
missed the important parts.
http://openoffice.blogs.com/openoffice/2006/09/mail_merge_sett.html
suggests that the secret lies in finding the proper incantation for
Window's Internet Properties.

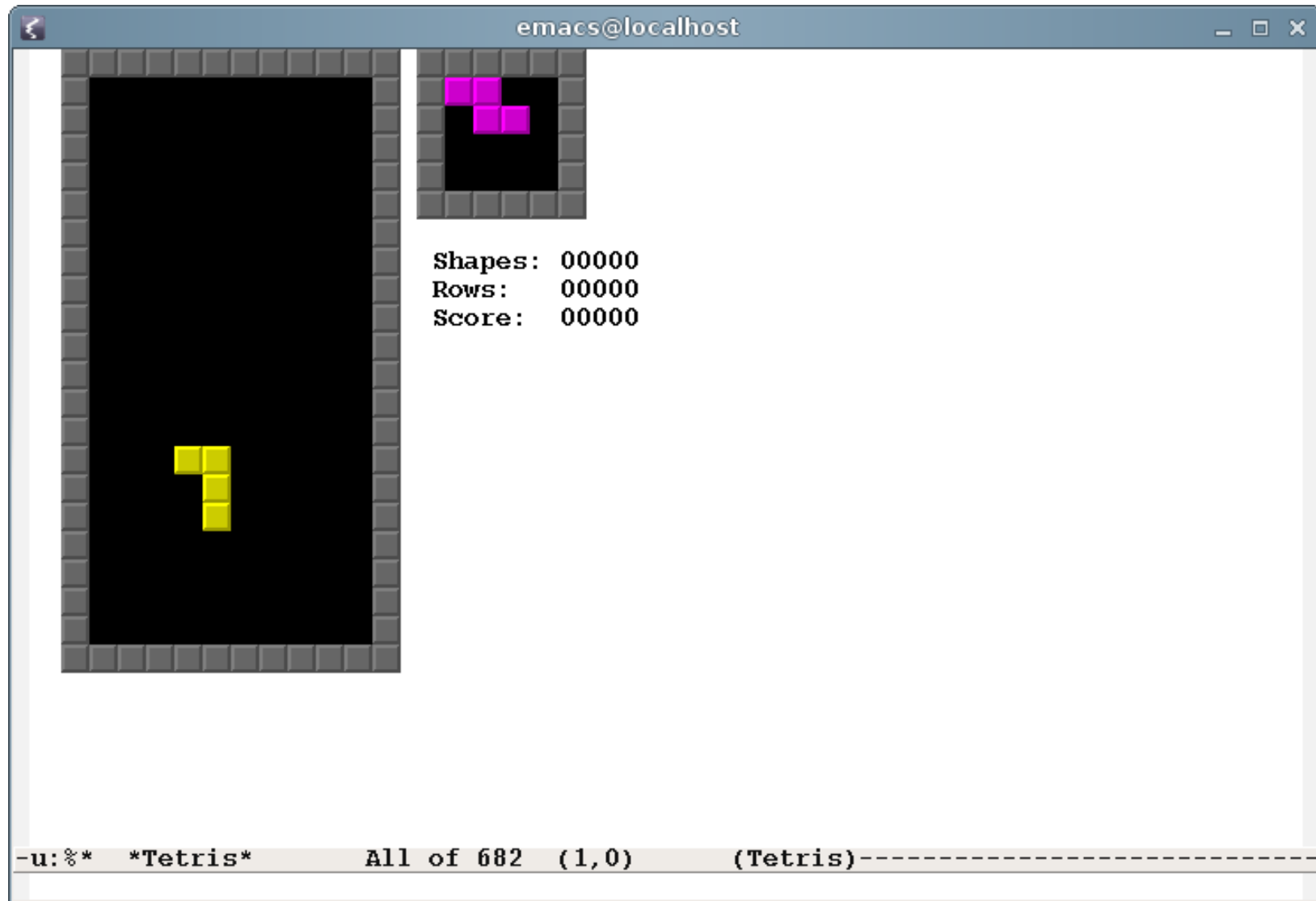
Can anyone help me?

Thanks,

-1:-- g.e.gnus [ hp ] Gnus and OO.o, etc. (1 part) Top of 1.1k (6,0)
```

emacs is a mail/news client
M-x gnus

The many faces of emacs



emacs plays tetris
M-x tetris

Why emacs?

- Provides an integrated environment
 - Same tools, commands, etc. for all tasks
 - Move text between tasks
- Easy to extend
 - Elisp for customizing or adding new features
 - Extension code has the full power of emacs
 - Dynamic environment: no restarting or recompiling
- Portable

■ Today's goal: get the flavor of emacs

- Getting started with emacs
- Editing tips
- Useful features
- Basic customizations
- Common motifs in emacs

Examples based on
GNU Emacs 22

■ Later...

- Advanced customization
- Programming and extending emacs with elisp

Prerequisites (sort of)

- Emacs basic concepts
 - files, buffers, windows, frames
- Keyboard commands
 - key commands, prefix keys, M-x, the minibuffer
- Basic tasks
 - opening and saving files, exiting emacs

Take the tutorial:

C-h t

It's all about text manipulation

■ Text in files

- grocery lists, HTML, code, ...

■ Text outside of files

- shell, debugger, ...

■ Text as a metaphor

- dired, gnus, ...

Text as a metaphor: dired

M-x wdired-change-to-wdired-mode
after opening any directory

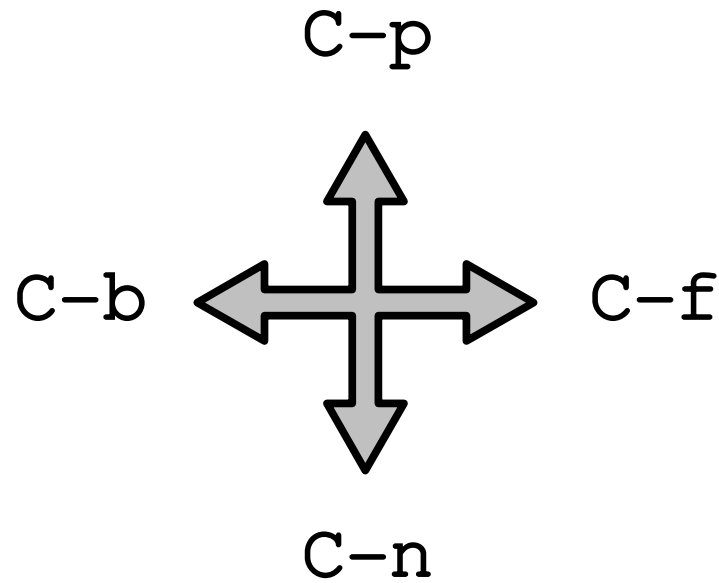
```
emacs@localhost.localdo
/home/phil/wd/emacs-talk:
total used in directory 1604 available 20728
drwxr-xr-x 3 phil phil 4096 2007-02-16 16:15 .
drwxr-xr-x 8 phil phil 4096 2007-02-16 16:15 ..
-rw-r--r-- 1 phil phil 8408 2007-02-16 16:15 emacs-slides
-rw-r--r-- 1 phil phil 203478 2007-02-16 16:15 emacs-slides-1.odp
-rw-r--r-- 1 phil phil 565315 2007-02-16 16:15 emacs-slides-1.pdf
-rw-r--r-- 1 phil phil 31882 2007-02-16 16:15 emacs-slides-2.odp
-rw-r--r-- 1 phil phil 389180 2007-02-16 16:15 emacs-slides-2.pdf
-rw-r--r-- 1 phil phil 31773 2007-02-16 16:15 emacs-slides-3.odp
-rw-r--r-- 1 phil phil 368130 2007-02-16 16:15 emacs-slides-3.pdf
drwxr-xr-x 2 phil phil 4096 2007-02-16 16:15 screens

-u:%% emacs-talk All of 708 (11,49) (Dired by name)
```

After editing names
in this buffer, C-c
C-c renames the
modified files

Moving around in buffers

- By character or line



Moving around in buffers

- Beginning, end of line
 - C-a, C-e
- By word
 - M-f, M-b
- By sentence
 - M-a, M-e
- By screen
 - C-v, M-v
- Beginning, end of buffer
 - M-<, M->
- Go to line #
 - M-g g

Moving around in buffers

- Move some number of lines forward, backward
 - example: C-u 10 C-p
 - C-u prefix generalizes to other commands
- Search for text
 - C-s, C-r
- Exchange point (cursor) and mark
 - C-x C-x

Killing ("cutting") text

- Kill line
 - C-k
- Kill many lines
 - C-u 10 C-k (10 lines)
 - C-u C-k (4 lines)
 - C-u C-u C-k (16 lines)

Killing ("cutting") text

- Kill region
 - C-w
- Save without killing
 - M-w
- Kill sentence
 - M-k
- Zap to character
 - M-z CHAR

Yanking ("pasting") text

- Yank
 - C-y
- Yank previous text
 - M-y (after C-y)
- The kill ring
 - Almost all commands which delete text put it here for possible later retrieval

The mark

- Remembers a previous cursor position
 - C-x C-x to swap point (cursor) and mark
- When you...
 - C-spc
 - M-< or M->
 - Search for text
 - Yank text
 - Insert a buffer
- the mark is set to...
 - where you are
 - where you were
 - where you started
 - start of inserted text
 - start of inserted text

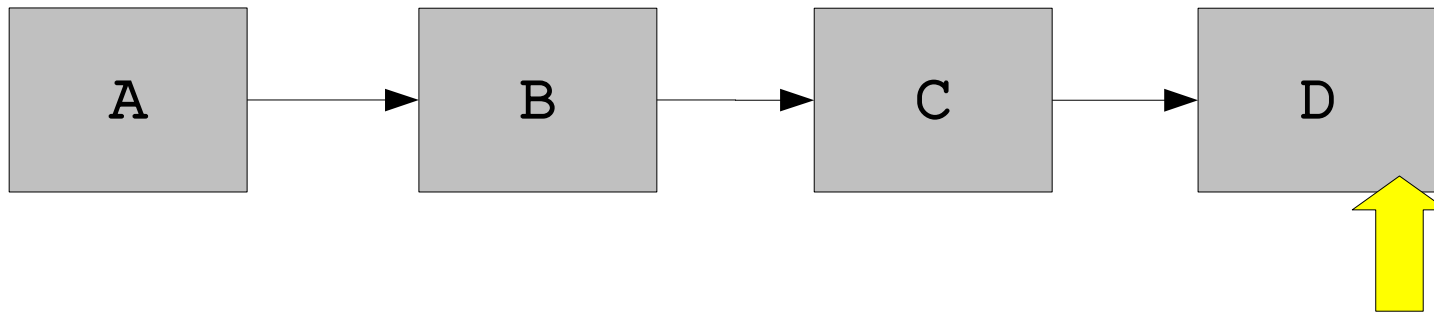
The mark

- The mark ring
 - Move to a previous mark: C-u C-spc
- Mark and point are used to delineate 'the region'

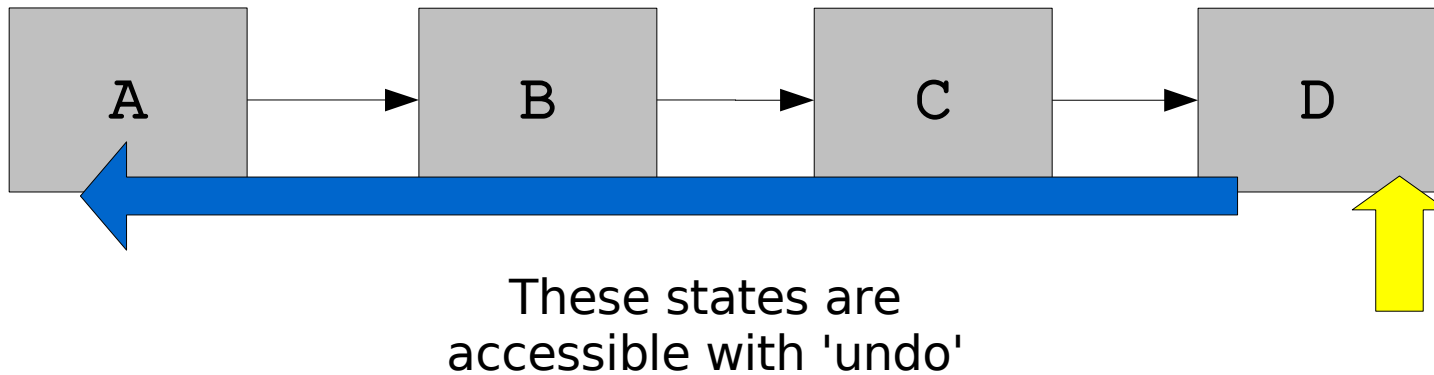
Undo

- Undo previous actions
 - C- / or C- _ or C-x u
- Undo within current region
 - C-u C- /

The undo model, illustrated



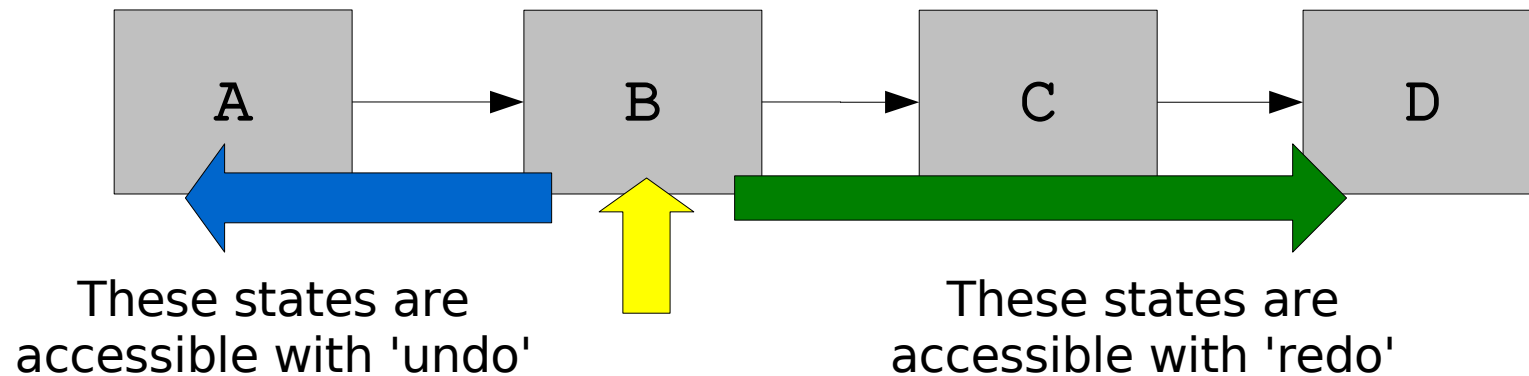
The undo model, illustrated



The undo model, illustrated

Undo some of your actions...

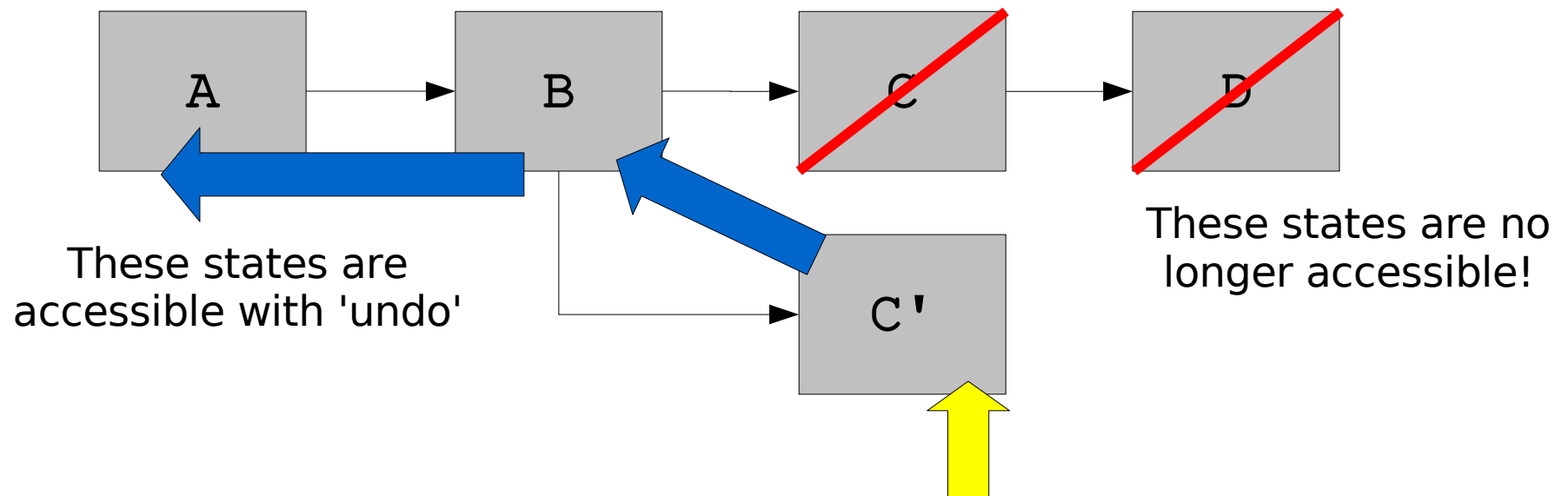
This is how most editors other than emacs work:



The undo model, illustrated

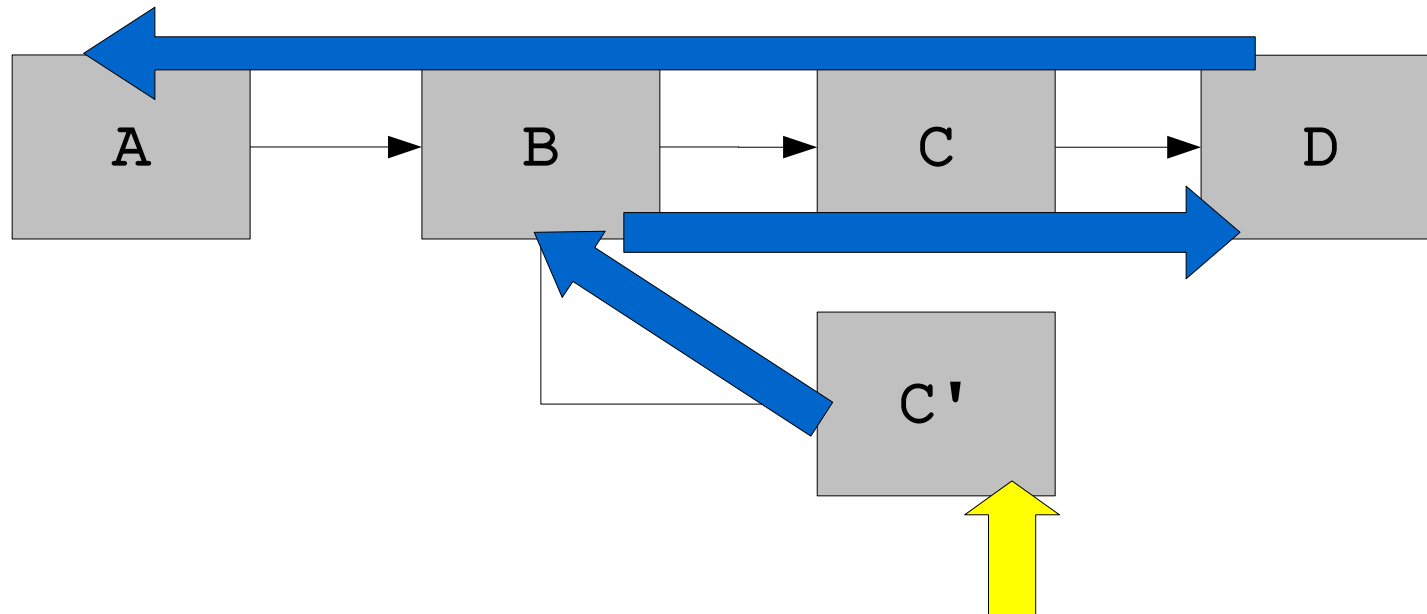
Now do something else...

This is how most editors other than emacs work:



The undo model, illustrated

How emacs handles this situation



The list of states is 'unfolded' so that all previous actions, including undos, are undoable

Prefix arguments

- Sometimes used to indicate repetition
 - `C-u 10 C-f` (forward 10 characters)
 - `C-u C-o` (make 4 new lines)
- Sometimes modify following command
 - `C-/` (undo) vs. `C-u C-/` (undo within region)
 - `M-x shell` vs. `C-u M-x shell`
- A command's documentation (`C-h f` or `C-h k`) describes the effect of the prefix argument, if any

Incremental search

- Search for text
 - `C-s text`
 - `C-s` again to find next occurrence
 - `RET` to stop at found occurrence
 - `C-g` to cancel and go back to start of search
 - Many options available inside search;
`C-h k C-s` to learn more

Incremental search

- Search for regular expression
 - C-M-s *regex*
 - Syntax may be slightly different from other REs you may have used
 - Emacs REs are a superset of Perl REs

Search history

- Search for previously searched string
 - C-s C-s
- Browse and edit previous queries
 - C-s then M-p, M-n

Searching and replacing

- Search and replace, asking for confirmation
 - `M-%` or `M-x query-replace`
- Display all lines matching RE
 - `M-x occur`

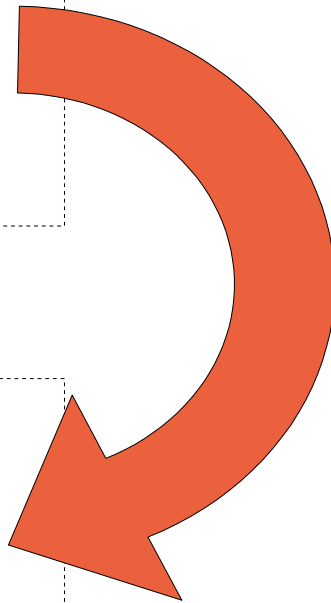
RE search and replacement

- `M-x replace-regexp`
- Substitutions can contain the following:
 - `\&` (the matched string)
 - `\1`, `\2`, etc. (references to parts of matched string)
 - `\#` (number of matched lines so far)
 - `\?` (prompt user for what to enter)
 - `\, (lisp-expression ...)`
 - Arbitrary expression which can include `\1`, `\&`, `\#`, etc.

RE replacement example

```
Bill Gates  
Steve Jobs  
Eric Schmidt  
Larry Ellison
```

```
GATES, Bill  
JOBS, Steve  
SCHMIDT, Eric  
ELLISON, Larry
```



```
M-x replace-regexp  
  \(\w+\) \(\w+\)  
  with  
  \, (upcase \2), \1
```

Everything you need...

- Shell
 - `M-x shell`
- Compile (invoke make)
 - `M-x compile`
- Debug
 - `M-x gdb`

...and then some

- Calculator
 - M-x calc
- Calendar
 - M-x calendar
- Moon calendar
 - M-x phases-of-moon

Major modes

- Alters behavior, key bindings, and text display
- Switch mode in existing buffer:
 - `M-x java-mode`
 - `M-x python-mode`
 - `M-x fundamental-mode`
- Or, use another command to create buffer:
 - `M-x shell`
 - `M-x dired`

Language major mode features

- Language-specific indentation, syntax coloring
- Language-specific features:
 - Lisp: commands for manipulating s-expressions
 - Python: commands for (un)indenting blocks
 - Modes can define or redefine keys

Minor modes

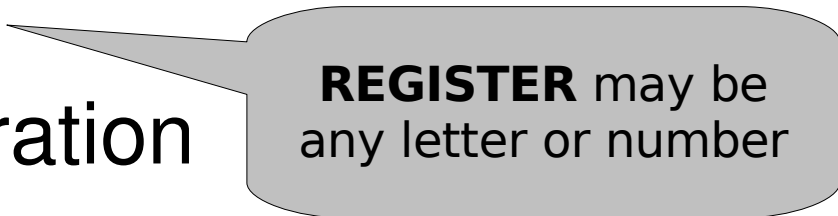
- `M-x follow-mode`
- `M-x auto-fill-mode`
- Narrowing
 - `C-x n n` or `M-x narrow-to-region` to narrow to region
 - `C-x n w` or `M-x widen` to restore ('widen')
- Offer completions for buffers, commands, etc.
 - `M-x icomplete-mode`

Helpful addons

- tramp: open remote files over SSH
- etags: name search/completion for source code

Registers

- Store current window configuration
 - C-x r w *REGISTER*
- Restore window configuration
 - C-x r j *REGISTER*
- Registers can also store positions, text, numbers, file names...



REGISTER may be any letter or number

Macros

- Remembers a fixed sequence of keys for later repetition
- Start recording macro: C-x (
- Stop recording macro: C-x)
- Replay macro: C-x e

Macro example

Define macro:

```
M-d C-d M-u , [SPC]  
C-y C-n C-a
```

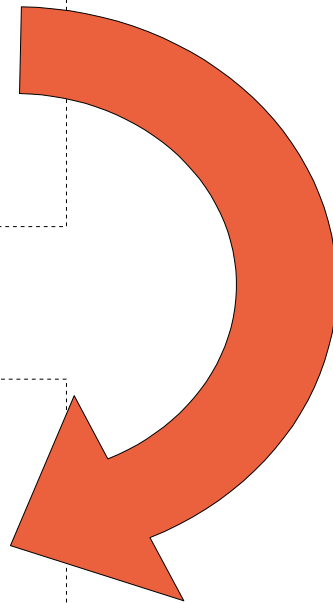
"Remove first word and space, uppercase next word, insert comma and space afterward, reinsert first word, move to beginning of next line"

```
Bill Gates  
Steve Jobs  
Eric Schmidt  
Larry Ellison
```

```
GATES, Bill  
JOBS, Steve  
SCHMIDT, Eric  
ELLISON, Larry
```

Run macro repeatedly:

```
C-x e e ...
```



Everything is a command

- We've seen two ways to invoke commands
 - `C-x n w` (key invocation)
 - `M-x widen` (M-x invocation)

Key bindings

- Emacs maps every key to a command
 - Bindings may be different across buffers, changeable at any time
 - C-h k tells you what any key (sequence) does
 - C-h f tells you what any command does

Running elisp code

- Evaluate elisp with `M-x eval-expression`
 - Example function call: `(+ 2 4 6)`
- Get or set variables:
 - `sentence-end-double-space`
 - `(setq inhibit-startup-message t)`
- Sometimes these correspond to commands:
 - `(forward-char)` is same as `C-f` or `M-x forward-char`

Minibuffer input

- Common features whenever emacs prompts you to enter something
 - Most buffer editing, movement commands work
 - Browse previous inputs with `M-n`, `M-p`
 - Tab-completion is often available
- `M-x eval-expression`, `M-x find-file`, `M-x switch-to-buffer`, ...

Customizing display

- Show trailing whitespace on lines
 - `(setq show-trailing-whitespace t)`
- Hide lines which are deeply indented
 - `C-x $`
- Show column numbers in mode line
 - `(column-number-mode t)`

Customizing key bindings

- `(global-set-key [f7] 'compile)`
- `(global-set-key "\C-o" 'find-file)`

Your .emacs file

- Elisp code here is loaded when emacs starts
 - Set variables to your liking
 - Define your own commands
- Use the `*scratch*` buffer for playing with elisp
 - C-x C-e to evaluate
 - Move to `~/ .emacs` for permanent changes

Custom

- Customization buffer: `M-x customize`
 - Browse, point and click for customization options
 - Custom generates code that goes in your `.emacs`

Emacs server

- Use a single emacs session for **all** editing
- Do this once: `M-x server-start`
 - or put `(server-start)` in your `.emacs` file
- To edit a file:
 - `prompt% emacsclient file`
 - File opens in existing emacs frame
 - `C-x #` when done editing

Invoking or installing emacs

- **emacs21 on Athena:** `athena% emacs`
- **emacs22 on Ubuntu/Debian:**
`apt-get install emacs-snapshot-gtk`
- **emacs22 on Gentoo:** `emerge emacs-cvs`
- **emacs on Windows:**
 - Emacs under cygwin
 - Emacs-Win32 installer

Common problems

- Delete not deleting?
 - `M-x normal-erase-is-backspace-mode`
- Keys with `M-` not working?
 - Use `ESC` instead
 - `ESC x` instead of `M-x`
 - `ESC C-t` instead of `C-M-t`

“In the event of an emergency”

- Cancel command
 - C-g
- Undo!
 - C-/ or C-_
- What did I just do?
 - M-x view-lossage

Getting help with emacs

- Help about help
 - C-h C-h
- Help with key
 - C-h k
- Help with function
 - C-h f
- Help with variable
 - C-h v
- Help with mode
 - C-h m
- Show key bindings
 - C-h b

Getting help with emacs

- Apropos (search for command)
 - C-h a
- Help with prefix key
 - C-h (after prefix key)
- Manuals
 - M-x info, then select emacs, elisp, or elisp-intro

■ **Bonus: Being unproductive with emacs**

- `M-x tetris`, `M-x hanoi`, `M-x doctor`, ...

■ **Next time: emacs lisp**

- Writing new functions, commands, and modes
- Manipulating text programmatically
- Altering behavior of existing commands