

Hacking Emacs

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1 Preface

Emacs is a nice operating system, but what it lacks, in order to compete with Linux, is a good text editor. – Thomer M. Gil

Today, you begin your journey with Emacs, *the extensible, customizable, self-documenting real-time display editor*.

Because of its complexity, Emacs will seem difficult to grok. Rest assured that learning a select few features and packages more than suffices. This material is titled "Hacking Emacs", not only because a great deal of customization will be made, but also because you'll be learning packages that have been handpicked, to greatly boost your productivity with the least amount of learning time.

The tinkerer will marvel at the masterpiece which is Emacs. We hack on Emacs because we can; every facet of Emacs is extensible and customizable. Emacs is not for the faint of heart. Embrace the challenge, but most importantly enjoy the ride. I encourage you to be curious and playful throughout this course.

Atom users, go grab yourselves another cup of coffee while you wait for it to load up :P.

– Jethro Kuan

2 Introduction

2.1 Installing Emacs

If on a Linux distribution, Emacs should be available through your respective package managers.

For OSX users, I recommend [Emacs for OSX](#).

Refer [here](#) if you have further doubts.

This course assumes a recent Emacs version (of version >24.0) has been installed. You can check your Emacs version from the command line with `emacs --version`.

2.2 Terminology

2.2.1 Windows, Frames and Buffers

The text you are editing in Emacs resides in an object called the **buffer**.

A **window** is a container for a buffer. A window can contain one and only one buffer.

A **frame** is a container for windows. While inaccurate, one can think of it as the window configuration for Emacs.

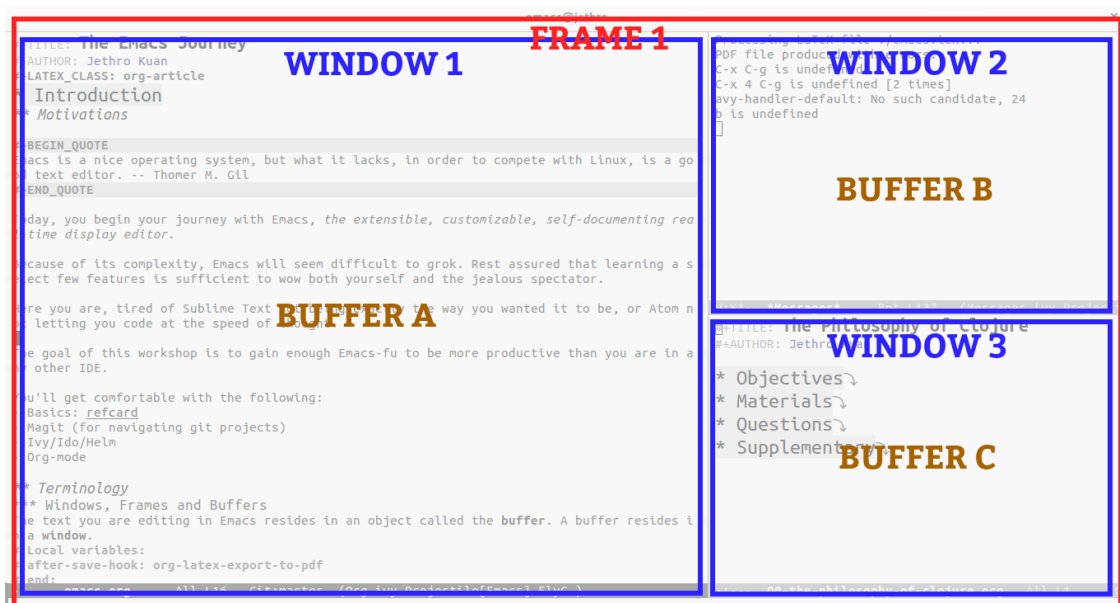


Figure 1: A pictorial representation of windows, frames and buffers. In this picture, there are 1 frame, 3 windows and 3 buffers.

2.2.2 Killing, Yanking and the CUA

The table below shows analogous terminologies between Emacs clipboard system and modern standards:

Modern	Emacs
Cut	Kill
Paste	Yank
Copy	Save To Kill Ring

The Emacs terminology had been set in stone decades ago, long before the terms 'cut', 'copy' and 'paste' (derived from the CUA, or Common User Access) were formed.

I will demonstrate in a later chapter why the Emacs way is better for text-editing.

2.2.3 Modes, Major Modes and Minor Modes

Major modes control how buffers behave. Each buffer will have *one and only one* major mode. Most major modes tend to be language-specific. For example, when opening a Python file `foo.py`, the central Emacs register will figure out that this file is a Python file and load the Python major mode.

Major modes often offer the following functionality:

1. Font locking (aka syntax highlighting)
2. Indentation engines
3. Language-specific keybindings (for refactoring etc.)

In the scenario where the Emacs central registry for file extensions should fail to associate the file with a major mode, Emacs will scan the first portion of the file and infer one.

Minor modes can be thought of as extensions, adding functionality to a buffer. These are optional, and can be added locally on a per buffer basis, or globally affecting all buffers.

An example of a popular minor mode is the *aggressive-indent mode*, which keeps text in a buffer properly indented at all times.

2.2.4 Modeline

The bottom bar in Emacs is called the **modeline**. Each window has a modeline, which presents useful information about the buffer it displays. The first item in brackets is the major mode, and the others are all minor modes.

Note that some minor modes can be configured to not appear on the modeline (a.k.a diminished). To see the full list of modes activated, run `M-x describe-mode`, or `C-h m`.

buffer name	line num	major mode	minor modes
~:***- introduction.org	All L50	Git-master	(Org ivy Projectile[Emacs] FlyC-)

Figure 2: A typical modeline for Emacs

2.2.5 Keybindings and Elisp Functions

Keybindings are combinations of keys that invoke functions when pressed. The origins of these functions can be one of three: it could come out-of-the-box, be provided by an installed package, or be self-written.

These functions are defined in a language called **Emacs Lisp**, also referred to in short as **Elisp**. Emacs Lisp files have the file extension `.el`.

The full list of functions are browsable and invocable with `M-x`.

3 Taming the Beast

Vanilla Emacs works in a variety of unfortunate ways. These defaults have grown a resistance to change over the decades.

We perform tweaking on Emacs minutiae, and simultaneously learn how Emacs is customized.

3.1 Customizing Emacs

During initialization, Emacs attempts to load an *init* file. This *init* file is an Emacs Lisp file, and is processed top-down.

PROTIP: To load vanilla Emacs, run `emacs` with the command-line switch `-q`. This will come in useful when your configuration file breaks.

Emacs searches for *init* files in several locations:

1. `~/.emacs`
2. `~/.emacs.el`
3. `~/.emacs.d/init.el`

The 3rd option `~/.emacs.d/init.el` is recommended. Having a dedicated folder for Emacs-related configuration simplifies versioning.

If you haven't done so, create a blank file `init.el` in `~/.emacs.d`.

The tweaks are listed in order of importance. To enable them, copy them into the `init.el` file.

3.1.1 Enabling Package Archives

MELPA is the de-facto package archive for Emacs. Because it is not enabled by default, we add it to the list of `package-archives`.

Similarly, we enable the Org-mode repository, which contains the most up-to-date version of `org-with-contrib`.

```
1 (when (>= emacs-major-version 24)
2   (require 'package)
3   (add-to-list 'package-archives '("melpa" . "http://melpa.org/packages/") t)
4   (add-to-list 'package-archives '("org" . "http://orgmode.org/elpa/") t)
5   (package-initialize))
```

The more security conscious will note that packages are fetched using HTTP, instead of HTTPS. HTTPS, however, did not work for me. Refer [here](#) for the reasons why you might want to do so, and how to do it.

3.1.2 Setting User Details

These variables are used in some parts of Emacs, such as email.

```
1 (setq user-full-name "John Appleseed"
2       user-mail-address "john@me.com")
```

3.1.3 UI Cruft

All these UI cruft take up precious screen estate, and should be removed.

```
1 (tooltip-mode -1)
2 (tool-bar-mode -1)
3 (menu-bar-mode -1)
4 (scroll-bar-mode -1)
5 (setq inhibit-splash-screen t)
6 (setq inhibit-startup-message t)
```

3.1.4 Use-package

use-package is a macro which allows you to isolate package configuration in an organized and performant fashion. It was created by John Wiegley, the current Emacs maintainer.

```
1 (unless (package-installed-p 'use-package)
2       (package-refresh-contents)
3       (package-install 'use-package))
4
5 (eval-and-compile
6   (defvar use-package-verbose t)
7   (require 'cl)
8   (require 'use-package)
9   (require 'bind-key)
10  (require 'diminish)
11  (setq use-package-always-ensure t))
```

Here, we set `use-package-always-ensure` to `true`, so if a package is found missing, it will be installed automatically.

3.1.5 y/n

It is easier to type y/n than to type yes/no.

```
1 (defalias 'yes-or-no-p 'y-or-n-p)
```

3.1.6 Custom Files

Emacs comes with a built-in interface to customize all parts of Emacs. To persist the changes you've made, Emacs saves them (by default) into your `init.el` file, which can cause it to grow out of control.

I like to keep such customizations saved in a separate file.

```
1 (setq custom-file "~/.emacs.d/custom.el")
2 (load custom-file)
```

Try to put this at the bottom of your `init.el` file, so it overrides any configuration you might have added in your `init.el` file.

3.1.7 Backup Files

Backup files are important, but they litter your directories with temporary files. I move the temp files to the system temp directory.

```
1 (setq backup-directory-alist
2      '(("*" . ,temporary-file-directory)))
3 (setq auto-save-file-name-transforms
4      '(("*" ,temporary-file-directory t)))
```

When added to your `init.el`, Emacs will scan the temp directory and purge old backup files on startup.

```
1 (let ((week (* 60 60 24 7))
2       (current (float-time (current-time))))
3   (dolist (file (directory-files temporary-file-directory t))
4     (when (and (backup-file-name-p file)
5               (> (- current (float-time (fifth (file-attributes file))))
6                   week))
7       (message "%s" file)
8       (delete-file file))))
```

3.1.8 Overwriting Text (Optional)

I'm used to having text being overwritten when highlighted. These always saves me a few keystrokes.

```
1 (delete-selection-mode +1)
```

3.1.9 Default Font (Optional)

Because I love **Fira Code**.

```
1 (add-to-list 'default-frame-alist
2           '(font . "Fira Code-12"))
```

3.1.10 Tabs vs Spaces (Optional)

I'm a fan of the 2 spaces rule.

```
1 (setq-default tab-width 2)
2 (setq-default indent-tabs-mode nil)
```

3.2 Theming

There are a **myraid** of themes available for your picking. Here I list the better ones:

1. Zenburn
2. Solarized
3. Leuven (has an impressive org-mode theme)
4. Monokai
5. Tomorrow by Sanityinc
6. Darkorai

I'm currently using **tao**, a monochrome theme, with personal customizations for org-mode.

To enable a theme, find the relevant name of the theme on MELPA and add in the following snippet of code:

```
1 (use-package tao-theme
2   :init
3   (load-theme 'tao-yang t))
```

At this point you should have quite a hefty amount of modification done. Remember to save your configuration directory into version control.

4 Managing the Workspace

It's common to want to create new windows in your Emacs frame to maximize screen estate and make editing easier.

Key	Window
C-x 0	Delete current window
C-x 1	Maximize current window
C-x 2	Split current window <i>horizontally</i>
C-x 3	Split current window <i>vertically</i>

4.1 Winner-mode

Winner-mode is a global minor mode. When activated, it allows you to "undo" and "redo" changes in the window configuration.

Key	Action
C-c left	winner-undo
C-c right	winner-redo

The keybinding for switching between windows is C-x o, which I find overly complex for such an essential key.

4.2 WindMove

WindMove is a library included in Emacs starting with version 21. It lets you switch between windows using Shift + arrow keys. To activate it on startup, add the following piece of code in your `init.el`.

```
1 (when (fboundp 'windmove-default-keybindings)
2   (windmove-default-keybindings))
```

4.3 Ace-window

ace-window lets you quickly switch between windows. It's the one I'm currently using, and I'm very happy with it.

```
1 (use-package ace-window
2   :bind (("M-q" . ace-window)))
```

I'd bind it to M-q, or anything else you find convenient.

5 Thought-speed Motion

With a more usable Emacs configuration, we'll begin exploring how to navigate around Emacs, installing helper libraries where relevant.

I recommend printing [this refcard](#), to be referred to when needed.

The first rule to moving around quickly is to **never leave the keyboard**. This concept is prevalent across all pertinent text editors, be it Vim or Emacs. In Emacs, key combinations are the gateway to text-editing nirvana.

5.1 Moving Across Lines

The most common line-movement operations are listed below.

Key	Movement	Emacs Function
C-e	End of line	(end-of-line)
C-a	Start of line	(beginning-of-line)
M-m	first non-whitespace of line	(back-to-indentation)

PROTIP: To check what a key combination is bound to, press C-h k kbd. Alternatively, M-x describe-keybindings lists all defined keys and their definitions in order of precedence.

5.2 Moving Within Visible Text

[avy](#) is a package for jumping to visible text using a char-based decision tree. Within three keystrokes, you're able to get to any visible point in the buffer.

```
1 (use-package avy
2   :bind* (("C-'" . avy-goto-char)
3           ("C-, " . avy-goto-char-2)))
```

PROTIP: To jump back to your previous location, use C-u C-space.

5.3 Moving Within the Buffer

5.3.1 isearch

isearch is short for incremental search. On several occasions you find yourself wanting to move to a different location of the document, knowing the textual content in the area. You can move to the location using the *isearch*, bound to C-s. To move to the next matching search result, press C-s again. The search can also be performed in the reverse direction, and this is bound to C-r.

5.3.2 moccure

moccure is short for multi-occur. Some find this useful, but I personally feel like Swiper (introduced below) is sufficient for my day to day operations. The key benefit of *moccure* is that a buffer for search result matches is created, and this can be used to move to the matched locations again.

5.3.3 imenu

imenu is short for interactive menu. Imenu offers a way to find the major definitions in a file by name. For example, in an Emacs Lisp (`.el`) file, you can navigate around with imenu to variables, and function definitions. In org-mode, you can navigate to title headers with imenu. Because of its utility, I bind it to `M-i`.

```
1 (bind-key* "M-i" imenu)
```

To use `bind-key`, you need `use-package` installed. Skip this step if you intend to install counsel, described below.

5.4 Registers

NOTE: Before I begin, note that while I introduce registers here, registers are not just for moving around the buffer.

Registers are compartments where text, rectangles, positions, window configurations and many more can be stored. Think of it as a temporal bookmarking system; these registers get wiped at the end of the Emacs process. Each register is denoted by a single character (eg. `?r` or `?1`). The register `?a` is different from the register `?A`.

Whatever you store inside a register persists until it is overwritten by something else, or until the Emacs process is killed.

Store a file in a register is simple:

```
1 (set-register r '(file . name))
```

Do this for all your bookmarks, and you can quickly jump to them with `C-x r reg`.

To make things simpler, bind `jump-to-register` to a more accessible key:

```
1 (bind-key* "C-o" 'jump-to-register)
```

Putting these in your `init.el` file ensures that they will always be available. I encourage you to play around with the other forms of registers.

5.5 Bookmarks

Bookmarks are similar to registers, but they are persisted in a file.

To create a bookmark, type `C-x r m bookmark-name`. Similarly, bind `bookmark-jump` to a more accessible key:

```
1 (bind-key* "C-o" 'bookmark-jump)
```

To change the file in which you store your bookmarks, invoke `M-x customize-variable bookmark-default-file`.

5.6 Ivy, Counsel and Swiper

Ivy is a generic completion mechanism for Emacs. It aims to be smaller, simpler and more highly customizable.

Counsel provides a collection of Ivy-enhanced versions of command Emacs commands, including `find-file`, `describe-function` and `M-x`.

Swiper, the ivy-enhanced version of `isearch`.

```
1 (use-package counsel)
2 (use-package swiper
3   :bind*
4   (("C-s" . swiper)
5    ("C-c C-r" . ivy-resume)
6    ("M-a" . counsel-M-x)
7    ("C-x C-f" . counsel-find-file)
8    ("C-c h f" . counsel-describe-function)
9    ("C-c h v" . counsel-describe-variable)
10   ("C-c i u" . counsel-unicode-char)
11   ("M-i" . counsel-imenu)
12   ("C-c g" . counsel-git)
13   ("C-c j" . counsel-git-grep)
14   ("C-c k" . counsel-ag)
15   ("C-c l" . scounsel-locate))
16 :config
17 (progn
18   (ivy-mode 1)
19   (setq ivy-use-virtual-buffers t)
20   (define-key read-expression-map (kbd "C-r") #'counsel-expression-history)
21   (ivy-set-actions
22     'counsel-find-file
23     '(("d" (lambda (x) (delete-file (expand-file-name x)))
24       "delete"
25     )))
26   (ivy-set-actions
27     'ivy-switch-buffer
```

```
28      '(("k"
29        (lambda (x)
30          (kill-buffer x)
31          (ivy--reset-state ivy-last))
32        "kill")
33      ("j"
34        ivy--switch-buffer-other-window-action
35        "other window")))))
```

For a powerful preconfigured alternative, consider [helm](#) and its companion tutorial [here](#). For something like Swiper, look at [helm-swoop](#).

For a simpler in-built alternative, look at `ido-mode`, Mickey Petersen has a great write-up about it [here](#).

6 Thought-speed Editing

6.1 Moving Text Around

Earlier, I introduced the terminology Emacs uses for its clipboard system. I missed one vital piece, because I felt it was more appropriate to introduce here to keep things fresh.

Text that gets killed is erased, and then stored inside the **kill ring**. This stored text is then retrievable by **yanking**. There is only one kill ring, global to Emacs.

A clear distinction has to be made between killing and deleting. Deleting text removes it from the buffer, but does not store it in the kill ring. Therefore extra caution has to be made when performing deletions.

6.1.1 Deleting Text

Here are the more useful text deletion commands:

Key	Action	Function
M-\	Delete spaces and tabs around point	(delete-horizontal-space)
M-SPC	Delete spaces and tabs around point, leaving one space	(just-one-space)
C-x C-o	Delete blank lines around current line	(delete-blank-lines)
M-^	Join two lines by deleting intervening newline, along with indentation	(delete-indentation)

6.1.2 Killing Text

Here are the more useful text killing commands:

Key	Action	Function
C-k	Kill line	(kill-line)
C-w	Kill region	(kill-region)
C-x DEL	Kill back to beginning of sentence	(backward-kill-sentence)
M-k	Kill to end of sentence	(kill-sentence)

NOTE: By default, a sentence is delimited by a period, followed by **two** spaces. This is so that Emacs can differentiate between abbreviations (M. J. for example), and actual sentences. It is recommended that you follow the two space convention, but if you insist, (setq sentence-end-double-space nil) should do the trick.

6.1.3 Yanking Text

Here are the more useful text killing commands:

Key	Action	Function
C-y	Yank last killed text	(yank)
M-y	Replace last killed text with an earlier batch of killed text	(yank-pop)
M-w	Save region as last killed text without performing the kill	(kill-ring-save)
C-M-w	Append next kill to last batch of killed text	(append-next-kill)

You can think of the kill ring as a stack, so you could continuously pop the kill ring to obtain earlier batches of killed text.

6.1.4 browse-kill-ring

I often defer to **browse-kill-ring** to access my kill-ring history. I bind it to M-y, replacing (yank-pop). Try it out, and see if it suits your workflow.

```
1 (use-package browse-kill-ring
2   :bind ("M-y" . browse-kill-ring))
```

6.2 Selecting Regions

6.2.1 The Mark, the Point and the Region

Many Emacs commands operate on an arbitrary, contiguous part of the buffer, also known as the *region*. A region is delimited by two objects: the *mark* and the *point*.

The point is where your cursor (keyboard) is currently placed. C-SPC creates a mark at the current position of point, activating it, as well as activating the region. The region is the text between the point and the mark, regardless of which direction. To deactivate the mark, simply quit with C-g.

Some common region commands include `kill-region`.

6.2.2 Rectangular Region

Rectangle commands operate on rectangular areas of text. This may seem rather esoteric, but it occasionally presents itself as the correct tool.

C-x SPC creates a rectangular mark. The following presents commonly used rectangular commands, all prefixed with C-x r, operate on rectangular regions:

(Region-rectangle is short-formed as RR)

Key	Action	Function
<code>C-x r k</code>	Kill text in RR, saving its contents into last-killed rectangle	<code>(kill-rectangle)</code>
<code>C-x r M-w</code>	Save text in RR into kill-ring	<code>(copy-rectangle-as-kill)</code>
<code>C-x r d</code>	Delete text in RR	<code>(delete-rectangle)</code>
<code>C-x r y</code>	Yank last killed rectangle	<code>(yank-rectangle)</code>
<code>C-x r c</code>	Clear RR, replacing all text with spaces	<code>(clear-rectangle)</code>
<code>C-x r t string RET</code>	Replace rectangle contents with string on each line	<code>(string-rectangle)</code>

6.2.3 Expand Region

`expand-region` is one of those packages that you can live without, but as you use it more often, you find yourself repeatedly going back to it. [Here's](#) a great overview of `expand-region`.

```

1 (use-package expand-region
2   :bind (("C-=" . er/expand-region)))

```

6.3 Zap-to-char

As an ex-vim user, I miss the `ct` and `dt` key dearly. Fret not, for what vim can do, emacs can do better.

`zap-up-to-char` does exactly what it says it does: it kills up to, but not including the ARGth occurrence of CHAR.

```

1 (autoload 'zap-up-to-char "misc"
2   "Kill up to, but not including ARGth occurrence of CHAR."
3   'interactive)
4
5 (bind-key* "M-z" 'zap-up-to-char)

```

Let's play with some examples:

I think I love to eat pancakes and bananas.

We begin from the start of the sentence. Now let's say we want to kill up to "think", I'd do `M-z t RET`. If I wanted to kill up to "to", then I provide an argument value of 2 to `zap-up-to-char` by pressing `M-2 M-z t RET`.

Remember that the text is *killed*, which means it gets saved into the kill ring and can be retrieved at a later point in time through yanking.

If you use `avy`, perhaps you'll find `zzz-to-char` to your liking. It uses the `avy` interface to select which letter to zap up till.

```
1 (use-package zzz-to-char
2   :bind (("M-z" . zzz-up-to-char)))
```

6.4 Multiple-cursors

Multiple cursors would be familiar functionality to Sublime Text users. It's the perfect tool for many things, including editing variable names with visual feedback.

```
1 (use-package multiple-cursors
2   :bind (("C-M-c" . mc/edit-lines)
3         ("C->" . mc/mark-next-like-this)
4         ("C-<" . mc/mark-previous-like-this)
5         ("C-c C-<" . mc/mark-all-like-this)
6         ("C-n" . mc/mark-next-lines)))
```

NOTE: I rebound "C-n", which is not recommended!

Most often, I use it in conjunction with `expand-region`: `expand-region` to select the keyword (variable names, for example), and use `C-c C-<` to select all instances of the variable, and simply type over it.

6.5 Templating

yasnippet is a templating system for Emacs, allowing you to type an abbreviation and automatically expand it into function templates. This feature is similar to the one offered by Textmate; in fact, the templating language is inherited from Textmate.

```
1 (use-package yasnippet
2   :diminish yas-global-mode yas-minor-mode
3   :defer 5
4   :init (add-hook 'after-init-hook 'yas-global-mode)
5   :config (setq yas-snippet-dirs '("~/emacs.d/snippets/")))
```

Andrea Crotti maintains an **official repo** for yasnippet templates, which supports various languages and major-modes. I recommend forking the repository – as I did – and cloning it into a sub-directory under `~/emacs.d`. This way, you can add your own templates and version control them. Above, I had set the `yas-snippet-dirs` to `~/emacs.d/snippets`, so following that configuration:

```
1 git submodule add git@github.com:foobar/snippets.git ~/emacs.d/snippets
```

6.6 Autocompletion

Text completion in Emacs has Emacs users split between two major factions: autocomplete and company-mode. Both have similar feature sets, but it is generally argued that company-mode is more feature-rich.

The following snippet installs **company-mode**.

```
1 (use-package company
2   :defer 5
3   :diminish company-mode
4   :init (progn
5         (add-hook 'after-init-hook 'global-company-mode)
6         (setq company-dabbrev-ignore-case nil
7               company-dabbrev-code-ignore-case nil
8               company-dabbrev-downcase nil
9               company-idle-delay 0
10              company-begin-commands '(self-insert-command)
11              company-transformers '(company-sort-by-occurrence))
12         (use-package company-quickhelp
13           :config (company-quickhelp-mode 1))))
```

One thing that people miss from autocomplete is documentation popups. We add that functionality with **company-quickhelp**. Another notable setting made was to set the delay for autocomplete to 0. Play around with the numbers and see what you're comfortable with.

Note that company-mode is merely a framework for autocompletion. To enable autocompletion for various languages, you'd need to install various company backends.

7 Project Management

In most cases, your work is not limited to a single file. Instead, it's comprised of multiple files residing in a parent directory, or perhaps even version-controlled with Git or the likes.

While Emacs does not ship with project management tooling, there are a few quality libraries that help you with that.

7.1 FFIP

find-file-in-project, or *ffip* in short, provides quick access to files in a directory managed by version-control (git/svn/mercurial). It's intentionally kept simple. It uses GNU find under the hood, which makes it suitable even for large codebases. The default interface has been recently changed to *ivy* (introduced **earlier**). Look no further than *ffip* for a simple project-management tool.

```
1 (use-package find-file-in-project
2   :bind (("s-f" . find-file-in-project)
3         ("s-F" . find-file-in-current-directory)
4         ("M-s-f" . find-file-in-project-by-selected)))
```

The functions are so useful they deserve a short keybinding: `s-f` is what I'd go with.

7.2 Projectile

Projectile is a different beast, leveraging a variety of tools to be a performant project interaction library. While *ffip* aims to be a minimalistic and fast file-switcher for projects, *projectile* aims to be the all-encompassing project-management tool. It has certainly proved to be the only one you'll need.

Here are some handpicked features *Projectile* has to offer, as seen on the Github page:

- jump to a file in project
- jump to files at point in project
- jump to a project buffer
- jump to a test in project
- toggle between files with same names but different extensions (e.g. `.h` <-> `.c/.cpp`, `Gemfile` <-> `Gemfile.lock`)
- toggle between code and its test (e.g. `main.service.js` <-> `main.service.spec.js`)
- switch between projects you have worked on
- replace in project
- regenerate project etags or gtags (requires `ggtags`).
- run `make` in a project with a single key chord

I bind the *projectile* keymap to `C-x p`. If you use *ivy*, set the `projectile-completion-system` to *ivy*, and install **counsel-projectile**, which adds more *ivy*-friendly functions for *projectile*.

```

1 (use-package projectile
2   :demand t
3   :init (projectile-global-mode 1)
4   :bind-keymap* ("C-x p" . projectile-command-map)
5   :config
6   (require 'projectile)
7   (use-package counsel-projectile
8     :bind (("s-p" . counsel-projectile)
9           ("s-f" . counsel-projectile-find-file)
10          ("s-b" . counsel-projectile-switch-to-buffer)))
11   (setq projectile-use-git-grep t)
12   (setq projectile-completion-system 'ivy))

```

Projectile also has a little known feature: `projectile-commander`. The default action upon switching projects is `find-file`, and that might not be desirable. Give yourself a choice between doing a `find-file`, a `git-fetch`, or even language specific things like starting a REPL.

First, set the projectile to utilize `projectile-commander`:

```

1 (setq projectile-switch-project-action #'projectile-commander)

```

Next, define the methods you want:

```

1 (def-projectile-commander-method ?s
2   "Open a *eshell* buffer for the project."
3   (projectile-run-eshell))
4 (def-projectile-commander-method ?c
5   "Run 'compile' in the project."
6   (projectile-compile-project nil))
7 (def-projectile-commander-method ?\C-?
8   "Go back to project selection."
9   (projectile-switch-project))
10 (def-projectile-commander-method ?d
11   "Open project root in dired."
12   (projectile-dired))
13 (def-projectile-commander-method ?F
14   "Git fetch."
15   (magit-status)
16   (call-interactively #'magit-fetch-current))
17 (def-projectile-commander-method ?j
18   "Jack-in."
19   (let* ((opts (projectile-current-project-files))
20          (file (ido-completing-read
21                "Find file: "
22                opts
23                nil nil nil nil
24                (car (cl-member-if
25                    (lambda (f)
26                      (string-match "core\\.clj\\'" f))
27                    opts)))))

```

```
28 (find-file (expand-file-name
29             file (projectile-project-root)))
30 (run-hooks 'projectile-find-file-hook)
31 (cider-jack-in)))
```

Append all these code into `:config` for the `projectile` package.

7.3 Using Ag or Grep

Projectile ships with functions that make use of `grep` and `ag`. `Grep` and `Ag` are both command-line tools used for searching code. You use `projectile-ag` (`C-x p s s`) or `projectile-grep` (`C-x p s g`) to perform a project-scoped search, and use the search results to navigate to the relevant locations. `Ag` is more performant, but does not come installed with most systems. In most cases, `grep` is sufficiently fast.

Alternatively, if you had installed `counsel` by following the instructions [here](#), you'd have access to the function, `counsel-ag`, `counsel-git`, and `counsel-git-grep`. `counsel-git-grep` (`C-c j`) is especially great for projects, because it prunes out files captured by `.gitignore`.

7.4 Magit

Magit is an interface for `Git`. It is an absolute joy to use, and is one of the main reasons I stuck with Emacs after a period with `Vim`.

```
1 (use-package magit
2   :bind (("C-x g" . magit-status)
3         ("C-x M-g" . magit-blame))
4   :init (setq magit-auto-revert-mode nil)
5   :config (add-hook 'magit-mode-hook 'hl-line-mode))
```

Surely you can figure out the basics like adding remotes, fetching, and committing with such a simplified interface. [Here's](#) a great tutorial on how to perform rebases, squashes and the like easily with `Magit`.

8 Icing on the Cake

Here I introduce packages I've installed that are not a must, but are definitely nice to have.

8.1 golden-ratio

Give the window you're working in more screen estate.

```
1 (use-package golden-ratio
2   :diminish golden-ratio-mode
3   :config (progn
4             ;;(add-to-list 'golden-ratio-extra-commands 'ace-window)
5             (golden-ratio-mode 1)))
```

If you're using **ace-window**, uncomment the line for golden-ratio to work properly.

8.2 aggressive-indent

Keep your code nicely aligned while you hack away at the more important stuff. Remember to disable this for languages that depend on indentation for syntax, like Python.

```
1 (use-package aggressive-indent
2   :diminish aggressive-indent-mode
3   :config (add-hook 'prog-mode-hook 'aggressive-indent-mode))
```

8.3 which-key

Which-key is a godsend when you're first starting out using Emacs. I still refer to the list of keybindings it shows from time to time.

```
1 (use-package which-key
2   :diminish which-key-mode
3   :config (add-hook 'after-init-hook 'which-key-mode))
```

8.4 volatile-highlights

Volatile-highlights provides visual feedback for operations such as yanking by highlighting the relevant regions.

```
1 (use-package volatile-highlights
2   :defer 5
```



```
3 :diminish volatile-highlights-mode
4 :config (volatile-highlights-mode t))
```

8.5 firestarter

firestarter lets you execute commands (including shell commands) on save. Example use cases include compiling SASS files, and compiling a program.

```
1 (use-package firestarter
2   :bind ("C-c m s" . firestarter-mode)
3   :init (put 'firestarter 'safe-local-variable 'identity))
```

8.6 git-gutter+

I use git-gutter+ primarily for showing on the left side what parts of my files have changed. It also has additional features like staging hunks for commits, but I use **Magit** for that. You can take a look at the Github page for more details.

```
1 (use-package git-gutter+
2   :init (global-git-gutter+-mode)
3   :diminish git-gutter+-mode
4   :defer 5
5   :config (progn
6             (setq git-gutter+-modified-sign "==")
7             (setq git-gutter+-added-sign "++")
8             (setq git-gutter+-deleted-sign "--")))
```

8.7 Honourable Mentions

1. **hydra**
2. **electric-align**

9 Miscellaneous Goodies

9.1 Minimizing Startup Time

9.1.1 Emacs Daemon

One way to avoid all perceived boot time, is to start emacs during the system boot as a daemon. This is the option I have gone with.

All you need to do add the Emacs daemon to auto-start:

```
1 emacs --daemon
```

I use *systemd* instead. For this option, create a user *systemd* service file with the following content:

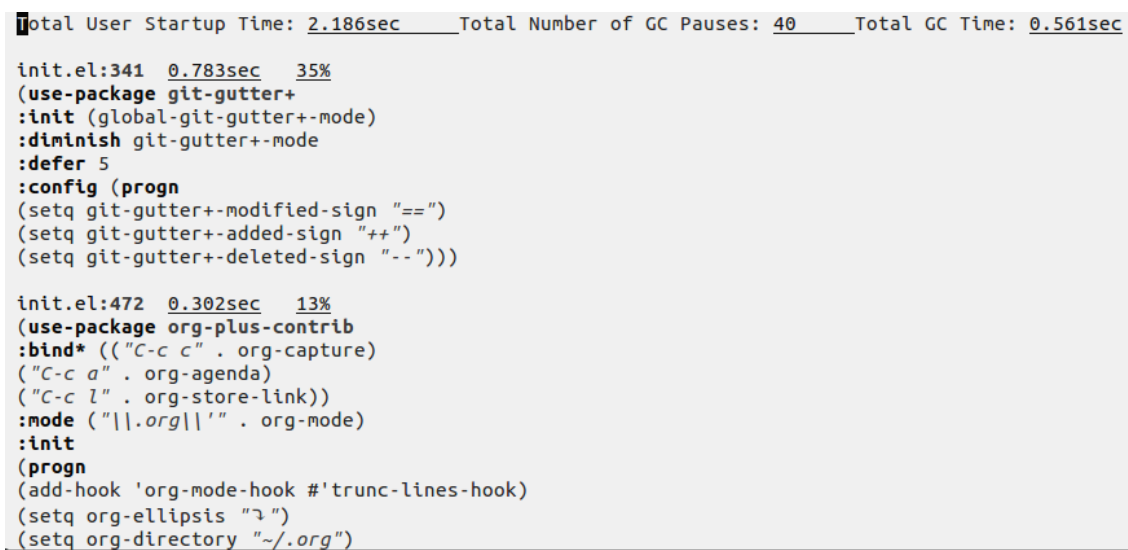
To enable the service on startup, just do `systemd enable --user emacs.service`.

9.1.2 Profiling with esup

Esup can perform a profile of your current configuration. Esup is obtainable over MELPA, so go ahead and use `use-package` like we normally do:

```
1 (use-package esup
2   :defer t)
```

Next, just execute esup with `M-x esup`. A separate emacs process will start, and the profiling results will be returned in a separate window, which would look like this:



```

Total User Startup Time: 2.186sec  Total Number of GC Pauses: 40  Total GC Time: 0.561sec

init.el:341  0.783sec  35%
(use-package git-gutter+
:init (global-git-gutter+-mode)
:diminish git-gutter+-mode
:defer 5
:config (progn
(setq git-gutter+-modified-sign "==")
(setq git-gutter+-added-sign "++")
(setq git-gutter+-deleted-sign "--")))

init.el:472  0.302sec  13%
(use-package org-plus-contrib
:bind* ((("C-c c" . org-capture)
("C-c a" . org-agenda)
("C-c l" . org-store-link))
:mode ("|.org|" . org-mode)
:init
(progn
(add-hook 'org-mode-hook #'trunc-lines-hook)
(setq org-ellipsis "⋮")
(setq org-directory "~/org"))
```

Figure 3: esup profiling results

You can take note of the packages that take the longest amount of time to initialize, and

weigh their alternatives. For example, I might contemplate removing git-gutter+ or replacing it with a more lightweight alternative.

9.2 Micro-optimizations with keyfreq

Once you've determined your Emacs style, you begin to use the same keybindings again and again. Understanding which functions are invoked most often, allows you to optimize your workflow by binding them to shorter, more accessible key combinations.

keyfreq monitors your keypresses during daily Emacs usage.

```
1 (use-package keyfreq
2   :config
3   (keyfreq-mode 1)
4   (keyfreq-autosave-mode 1))
```

After a period of Emacs usage, run `M-x keyfreq-show`. Perform micro-optimizations based on the results. After which, `M-x keyfreq-reset` to rinse and repeat.

9.3 Remapping Capslock

Without doubt, the capslock key is one of the most underused keys (that is if you're normal). Do yourself a favour and remap it to something more useful – I recommend the elusive Ctrl key. On the Mac, you can remap it in the keyboard preferences pane.

9.4 Ergonomic Keybindings

Anyone who spends enough time at the keyboard is at risk of repetitive strain injury, or RSI. Spend some time reflecting on how often you stretch out your pinky or move your thumb into awkward positions to press a key.

9.4.1 M-x

Let's face it. `M-x` is actually pretty damn hard to hit. `x` is highly inaccessible, not even on alternative keyboard layouts like Dvorak.

In **prelude**, `M-x` is bound to `C-x C-m`. I bind `M-x` to `M-a`, which is originally bound to `backward-sentence`, which I don't use much at all. Both are viable options.

9.4.2 ergoemacs

ergoemacs was developed to bring familiar keys to Emacs, as well as to reduce risk of RSI. While you could follow the instructions on the webpage to have it installed, I recommend studying their keybindings and adopting the ones you think you'll like.