Doom Emacs Configuration

The Methods, Management, and Menagerie of Madness — in meticulous detail

TECOSAUR

e1dfc56
2025-06-09
14:56 UTC

CHAPTER

Contents

1 Introduction **8**
1.1 Why Emacs? . . . 8
1.1.1 The enveloping editor . . . 9
1.1.2 Some notably unique features . . . 9
1.1.3 Issues . . . 9
1.1.4 Teach a man to fish... . . . 10
1.2 Editor comparison . . . 11
1.3 Notes for the unwary adventurer . . . 12
1.3.1 Extra Requirements . . . 13
1.4 Current Issues . . . 14
1.4.1 Magit push in daemon . . . 14
1.4.2 Unread emails doesn't work across Emacs instances . . . 14

2 Rudimentary configuration **15**
2.1 Confpkg . . . 15
2.1.1 Motivation . . . 15
2.1.2 Design . . . 15
2.1.3 Preparation . . . 16
2.1.4 Setup . . . 17
2.1.5 Package generation . . . 18
2.1.6 Identify cross-package dependencies . . . 20
2.1.7 Commenting out `package!` statements . . . 22
2.1.8 Creating the config file . . . 23
2.1.9 Quieter output . . . 26
2.1.10 Reporting load time information . . . 26
2.1.11 Finalise . . . 31
2.1.12 Bootstrap . . . 31
2.2 Personal Information . . . 34
2.3 Better defaults . . . 35
2.3.1 Simple settings . . . 35
2.3.2 Frame sizing . . . 36
2.3.3 Auto-customisations . . . 36
2.3.4 Windows . . . 36
2.3.5 Hippie expand . . . 37
2.3.6 Buffer defaults . . . 39

2.4 Doom configuration . . . 40
2.4.1 Modules . . . 40
2.4.2 Profiles . . . 45
2.4.3 Visual Settings . . . 46
2.4.4 Some helper macros . . . 53
2.4.5 Allow babel execution in CLI actions . . . 53
2.4.6 Elisp REPL . . . 54
2.4.7 Htmlize command . . . 56
2.4.8 Org buffer creation . . . 57
2.4.9 Dashboard . . . 57
2.4.10 Config doctor . . . 72
2.5 Other things . . . 74
2.5.1 Editor interaction . . . 74
2.5.2 Window title . . . 74
2.5.3 Systemd daemon . . . 74
2.5.4 Emacs client wrapper . . . 76
2.5.5 Prompt to run setup script . . . 78
2.5.6 Grabbing source block content as a string . . . 79

3 Packages **81**
3.1 Loading instructions . . . 81
3.1.1 Packages in MELPA/ELPA/emacsmirror . . . 81
3.1.2 Packages from git repositories . . . 81
3.1.3 Disabling built-in packages . . . 82
3.2 Convenience . . . 82
3.2.1 Avy . . . 82
3.2.2 Rotate (window management) . . . 83
3.2.3 Emacs Everywhere . . . 83
3.2.4 Which-key . . . 83
3.3 Tools . . . 84
3.3.1 Abbrev . . . 84
3.3.2 Very large files . . . 85
3.3.3 Eros . . . 87
3.3.4 EVIL . . . 87
3.3.5 GPTel . . . 88
3.3.6 Headlice . . . 89
3.3.7 Consult . . . 89
3.3.8 Magit . . . 90
3.3.9 MPRIS . . . 93
3.3.10 Smerge . . . 94

3.3.11 Corfu . . . 95
3.3.12 Projectile . . . 95
3.3.13 Jinx . . . 95
3.3.14 TRAMP . . . 99
3.3.15 Auto activating snippets . . . 99
3.3.16 Screenshot . . . 100
3.3.17 Etrace . . . 100
3.3.18 YASnippet . . . 101
3.3.19 String inflection . . . 101
3.3.20 Smart parentheses . . . 102
3.4 Visuals . . . 102
3.4.1 Info colours . . . 102
3.4.2 Modus themes . . . 103
3.4.3 Spacemacs themes . . . 104
3.4.4 Theme magic . . . 104
3.4.5 Simple comment markup . . . 105
3.4.6 Doom modeline . . . 105
3.4.7 Keycast . . . 108
3.4.8 Screencast . . . 108
3.4.9 Mixed pitch . . . 109
3.4.10 Marginalia . . . 111
3.4.11 Centaur Tabs . . . 112
3.4.12 Nerd Icons . . . 113
3.4.13 Prettier page breaks . . . 113
3.4.14 Writeroom . . . 114
3.4.15 Treemacs . . . 116
3.4.16 Visual fill column . . . 117
3.5 Frivolities . . . 119
3.5.1 xkcd . . . 119
3.5.2 Selectric . . . 126
3.5.3 Wttrin . . . 126
3.5.4 Spray . . . 126
3.5.5 Elcord . . . 127
3.6 File types . . . 127
3.6.1 Systemd . . . 127

4 Applications 128
4.1 Ebooks . . . 128
4.2 Calculator . . . 132
4.2.1 CalcTeX . . . 132

4.2.2 Defaults . . . 133
4.2.3 Embedded calc . . . 133
4.3 Newsfeed . . . 135
4.3.1 Keybindings . . . 135
4.3.2 Usability enhancements . . . 136
4.3.3 Visual enhancements . . . 136
4.3.4 Functionality enhancements . . . 139
4.4 Dictionary . . . 140
4.5 Mail . . . 143
4.5.1 Fetching . . . 143
4.5.2 Indexing/Searching . . . 155
4.5.3 Sending . . . 156
4.5.4 Mu4e . . . 157
4.5.5 Org Msg . . . 169

5 Language configuration 171
5.1 General . . . 171
5.1.1 File Templates . . . 171
5.2 Plaintext . . . 171
5.2.1 Ansi colours . . . 171
5.2.2 Margin without line numbers . . . 171
5.3 Org . . . 172
5.3.1 System config . . . 174
5.3.2 Packages . . . 175
5.3.3 Behaviour . . . 183
5.3.4 Visuals . . . 209
5.3.5 Exporting . . . 217
5.3.6 HTML Export . . . 225
5.3.7 LaTeX Export . . . 242
5.3.8 Beamer Export . . . 284
5.3.9 Reveal export . . . 285
5.3.10 ASCII export . . . 285
5.3.11 Markdown Export . . . 287
5.3.12 Babel . . . 288
5.3.13 ESS . . . 290
5.4 LaTeX . . . 290
5.4.1 To-be-implemented ideas . . . 290
5.4.2 Compilation . . . 291
5.4.3 Snippet helpers . . . 291
5.4.4 Editor visuals . . . 294

5.4.5 Math input . . . 297
5.4.6 SyncTeX . . . 298
5.4.7 Fixes . . . 298
5.5 Python . . . 299
5.6 PDF . . . 299
5.6.1 MuPDF . . . 299
5.6.2 Terminal viewing . . . 299
5.7 R . . . 300
5.7.1 Editor Visuals . . . 300
5.8 Julia . . . 301
5.9 Data.toml files . . . 301
5.10 Graphviz . . . 302
5.11 Markdown . . . 302
5.12 Beancount . . . 303
5.13 GIMP Palette files . . . 303
5.14 Snippets . . . 305
5.14.1 Latex mode . . . 305
5.14.2 Markdown mode . . . 311
5.14.3 Org mode . . . 312

Let us change our traditional attitude to the construction of programs: Instead of imagining that our main task is to instruct a computer what to do, let us concentrate rather on explaining to human beings what we want a computer to do. — Donald Knuth

Chapter 1 Introduction

Customising an editor can be very rewarding ... until you have to leave it. For years I have been looking for ways to avoid this pain. Then I discovered vim-anywhere, and found that it had an Emacs companion, emacs-anywhere. To me, this looked most attractive.

Separately, online I have seen the following statement enough times I think it's a catchphrase

> *Redditor 1: I just discovered this thing, isn't it cool.*
> *Redditor 2: Oh, there's an Emacs mode for that.*

This was enough for me to install Emacs, but I soon learned there are far more compelling reasons to keep using it.

I tried out the `spacemacs` distribution a bit, but it wasn't quite to my liking. Then I heard about `doom emacs` and thought I may as well give that a try. TLDR; it's great.

Now I've discovered the wonders of literate programming, and am becoming more settled by the day. This is both my config, and a cautionary tale (just replace "Linux" with "Emacs" in the comic below).

1.1 Why Emacs?

Emacs is not a text editor, this is a common misnomer. It is far more apt to describe Emacs as *a Lisp machine providing a generic user-centric text manipulation environment*. That's quite a mouthful. In simpler terms one can think of Emacs as a platform for text-related applications. It's a vague and generic definition because Emacs itself is generic.

Good with text. How far does that go? A lot further than one initially thinks:

- Task planning
- File management
- Terminal emulation
- Email client
- Remote server tool
- Git frontend
- Web client/server

- and more...

Ideally, one may use Emacs as *the* interface to perform `input → transform → output` cycles, i.e. form a bridge between the human mind and information manipulation.

1.1.1 The enveloping editor

Emacs allows one to do more in one place than any other application. Why is this good?

- Enables one to complete tasks with a consistent, standard set of keybindings, GUI and editing methods — learn once, use everywhere
- Reduced context-switching
- Compressing the stages of a project — a more centralised workflow can progress with greater ease
- Integration between tasks previously relegated to different applications, but with a common subject — e.g. linking to an email in a to-do list

Emacs can be thought of as a platform within which various elements of your workflow may settle, with the potential for rich integrations between them — a *life* IDE if you will.

Today, many aspects of daily computer usage are split between different applications which act like islands, but this often doesn't mirror how we *actually use* our computers. Emacs, if one goes down the rabbit hole, can give users the power to bridge this gap.

1.1.2 Some notably unique features

- Recursive editing
- Completely introspectable, with pervasive docstrings
- Mutable environment, which can be incrementally modified
- Functionality without applications
- Client-server separation allows for a daemon, giving near-instant perceived startup time.

1.1.3 Issues

- Emacs has irritating quirks

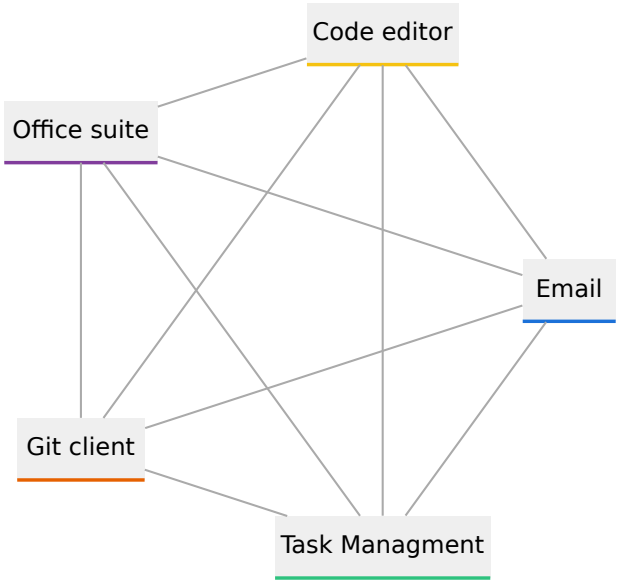


Figure 1.1: Some sample workflow integrations that can be used within Emacs

- Some aspects are showing their age (naming conventions, APIs)
- Emacs is (mostly) single-threaded, meaning that when something holds that thread up the whole application freezes
- A few other nuisances

1.1.4 Teach a man to fish…

> *Give a man a fish, and you feed him for a day. Teach a man to fish, and you feed him for a lifetime. — Anne Isabella*

Most popular editors have a simple and pretty settings interface, filled with check-boxes, selects, and the occasional text-box. This makes it easy for the user to pick between common desirable behaviours. To me this is now like *giving a man a fish*.

What if you want one of those 'check-box' settings to be only on in certain conditions? Some editors have workspace settings, but that requires you to manually set the value for *every single instance*. Urgh, what a pain.

What if you could set the value of that 'check-box' setting to be the result of an arbitrary expression evaluated for each file? This is where an editor like Emacs comes in. Configuration for Emacs isn't a list of settings in JSON etc. it's **an executable program which modifies the behaviour of**

the editor to suit your liking. This is 'teaching a man to fish'.

Emacs is built in the same language you configure it in (Emacs Lisp, or elisp). It comes with a broad array of useful functions for text-editing, and Doom adds a few handy little convenience functions.

Want to add a keybinding to delete the previous line? It's as easy as

```
(map! "C-d"
      (cmd! (previous-line)
            (kill-line)
            (forward-line)))
```

How about another example, say you want to be presented with a list of currently open *buffers* (think files, almost) when you split the window. It's as simple as

```
(defadvice! prompt-for-buffer (&rest _)
  :after 'window-split (switch-to-buffer))
```

Want to test it out? You don't need to save and restart, you can just *evaluate the expression* within your current Emacs instance and try it immediately! This editor is, after all, a Lisp interpreter.

Want to tweak the behaviour? Just re-evaluate your new version — it's a super-tight iteration loop.

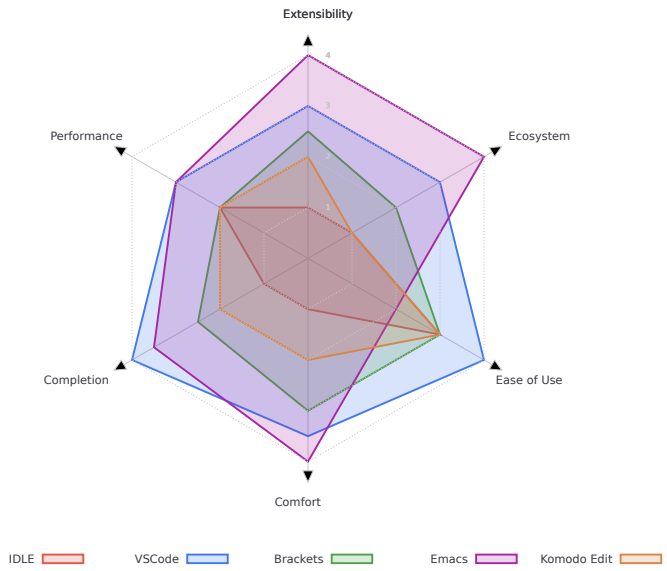
1.2 Editor comparison

Over the years I have tried out (spent at least a year using as my primary editor) the following applications

- Python IDLE
- Komodo Edit
- Brackets
- VSCode
- and now, Emacs

I have attempted to quantify aspects of my impressions of them below.

Editor	Extensibility	Ecosystem	Ease of Use	Comfort	Completion	Performance
IDLE	1	1	3	1	1	2
VSCode	3	3	4	3.5	4	3
Brackets	2.5	2	3	3	2.5	2
Emacs	4	4	2	4	3.5	3
Komodo Edit	2	1	3	2	2	2



1.3 Notes for the unwary adventurer

If you like the look of this, that's marvellous, and I'm really happy that I've made something which you may find interesting, however:

Warning

This config is *insidious*. Copying the whole thing blindly can easily lead to

recommend copying chunks instead.

If you are so bold as to wish to steal bits of my config (or if I upgrade and wonder why things aren't working), here's a list of sections which rely on external setup (i.e. outside of this config).

dictionary I've downloaded a custom SCOWL dictionary, which I use in . If this causes issues, just delete the `(setq ispell-dictionary ...)` bit.

There are also a number of files I may tangle to *other than* `{init,config,package}.el`. The

complete list (excluding confpkg generated files) is as follows:

- `~/.config/doom.orgdev/config.el`
- `~/.config/doom.orgdev/init.el`
- `~/.config/doom.orgdev/packages.el`
- `~/.config/doom/cli.el`
- `~/.config/doom/doctor.el`
- `~/.config/doom/init.el`
- `~/.config/doom/misc/mbsync-imapnotify.py`
- `~/.config/doom/misc/org-export-header.html`
- `~/.config/doom/packages.el`
- `~/.config/doom/setup.sh`
- `~/.config/emacs/profiles.el`
- `~/.config/inkscape/palettes/Emacs Fancy Splash.gpl`
- `~/.config/systemd/user/emacs.service`
- `~/.config/systemd/user/goimapnotify@.service`
- `~/.config/systemd/user/mbsync.service`
- `~/.config/systemd/user/mbsync.timer`
- `~/.local/bin/e`
- `~/.local/bin/emacsmail`
- `~/.local/share/applications/emacs-client.desktop`
- `~/.local/share/applications/emacsmail.desktop`
- `~/.local/share/mime/packages/org.xml`

Oh, did I mention that I started this config when I didn't know any `elisp`, and this whole thing is a hack job? If you can suggest any improvements, please do so, no matter how much criticism you include I'll appreciate it :)

1.3.1 Extra Requirements

The lovely `doom doctor` is good at diagnosing most missing things, but here are a few extras.

- A LaTeX Compiler is required for the mathematics rendering performed in Org, and by CalcTeX.

- I use the Overpass font as a go-to sans serif. It's used as my `doom-variable-pitch-font` and in the graph generated by Roam. I have chosen it because it possesses a few characteristics I consider desirable, namely:
  - A clean, and legible style. Highway-style fonts tend to be designed to be clear at a glance, and work well with a thicker weight, and this is inspired by *Highway Gothic*.
  - It's slightly quirky. Look at the diagonal cut on stems for example. Helvetica is a masterful design, but I like a bit more pizzazz now and then.
- A few LSP servers. Take a look at init.el to see which modules have the `+lsp` flag.

1.4 Current Issues

1.4.1 Magit push in daemon

Quite often trying to push to a remote in the Emacs daemon produces as error like this:

```
128 git ... push -v origin refs/heads/master\:refs/heads/master
Pushing to git@github.com:tecosaur/emacs-config.git

fatal: Could not read from remote repository.

Please make sure you have the correct access rights
and the repository exists.
```

1.4.2 Unread emails doesn't work across Emacs instances

It would be nice if it did, so that I could have the Emacs-daemon hold the active mu4e session, but still get that information. In this case I'd want to change the action to open the Emacs daemon, but it should be possible.

This would probably involve hooking into the daemon's modeline update function to write to a temporary file, and having a file watcher started in other Emacs instances, in a similar manner to Rebuild mail index while using mu4e.

Chapter 2
Rudimentary configuration

2.1 Confpkg

2.1.1 Motivation

Previously, all of my configuration was directly tangled into `config.el`. This *almost* satisfies my use. Occasionally though, I'd want to apply or extract a *specific bit* of my config in an elisp script, such as some of my Org-export customisations. This is a hassle, either loading my entire config (of which 90% simply complicates the state), or manually copying the relevant code in pieces, one source block at a time (just a different kind of hassle). While I'd like to think my config is "greater than the sum of its parts", much of it can be safely clumped into self-contained packets of functionality.

One afternoon I thought "wouldn't it be nice if I could just load a few of those self-contained chunks of my config", then I started thinking about how I could have that *and* `config.el`. This is the result.

2.1.2 Design

It's already natural to organise blocks of config under sections, and we can use `:noweb-ref` with a `header-args:emacs-lisp` property to direct all child source blocks into a single parent. We could have two parents, one tangling to `subconf/config-X.el` and the other to `config.el`, however this will duplicate any evaluations required to generate the content, which isn't great (particularly for things which take a moment, like checking for LaTeX packages). Instead we can *just* write to the `subconf/*` files and then at the end of tangling extract their contents into `config.el`.

```
digraph {
    graph [bgcolor="transparent"];
    node  [shape="underline" penwidth="2" style="rounded,filled" fillcolor="#efefef"
    ↪  color="#c9c9c9" fontcolor="#000000" fontname="Alegreya Sans"];
    edge  [color="#aaaaaa" penwidth="1.2" fontname="Alegreya Sans"]
    rankdir="LR"
    "config.org" [color="#4db5bd"]
    "config.el" [color="#e69055"]
    node[color="#a991f1"]
    "subconf/config-magit.el"
    "subconf/config-org.el"
```

```
    "subconf/config-?.el"
    node[color="#51afef"]
    "config.org" -> "Magit#src1" -> "subconf/config-magit.el" -> "config.el"
    "config.org" -> "Magit#src2" -> "subconf/config-magit.el"
    "config.org" -> "Org#src1" -> "subconf/config-org.el" -> "config.el"
    "config.org" -> "Org#src2" -> "subconf/config-org.el"
    "config.org" -> "Org#..." -> "subconf/config-org.el"
    "config.org" -> "(etc.)#..." -> "subconf/config-?.el" -> "config.el"
}
```

To set this up within each section, instead of manually repeating a common form we can generate the form and supply the relevant section properties via a babel call keyword, like so:

```
* Subject

#+call: confpkg("subject")

#+begin_src emacs-lisp
;; Code that configures the subject...
#+end_src
```

This isn't entirely straightforward, but with some mild abuse of noweb and babel we can make it work!

2.1.3 Preparation

This approach is built around `#+call` invocations that affect the tangling. Unfortunately for this use-case, babel call keywords are not executed on tangle. Tangled noweb blocks *are* however, and so we can fudge the behaviour we want by tangling a noweb block to a temp file, with a noweb block that executes babel calls in the buffer.

```
(condition-case nil
    (progn
      (message "Intitialising confpkg")
      <<bootstrap>>
      (org-fold-core-ignore-fragility-checks
        (org-babel-map-executables nil
          (when (eq (org-element-type (org-element-context)) 'babel-call)
            (org-babel-lob-execute-maybe)))))
  (quit (revert-buffer t t t)))
```

See the Section 2.1.12 section for an explanation of the `<<bootstrap>>` noweb reference.

```
<<confpkg-prepare()>>
```

2.1.4 Setup

Before generating the template with babel, we want to keep track of:

- How many config groups are created
- Information about each config group

To do this we can simply create two variables. Due to temp-buffer shenanigans, we'll have to use global variables here.

Then we need to set up the two final phases of this process:

- Creating `config.el`
- Cleaning up the superfluous generated content

To trigger the final phases we'll add a hook to `org-babel-post-tangle-hook`. Once again, it would be preferred if this was done locally, but it needs to be global. To avoid this causing headaches down the line we'll make sure when implementing the hook function to have it remove itself from the hook when executed.

```
(setq confpkg--num 0
      confpkg--list nil)

<<confpkg-dependency-analysis>>
<<confpkg-strip-package-statements>>
<<confpkg-create-config>>
(defun confpkg-cleanup ()
 <<confpkg-cleanup>>
  )
<<confpkg-finaliser>>

<<confpkg-clear-old-files>>

(add-hook 'org-babel-tangle-finished-hook #'confpkg-tangle-finalise)
```

To avoid generating cruft, it would also be good to get rid of old tangled config files at the start.

```
(make-directory "subconf" t)
(dolist (conf-file (directory-files "subconf" t "config-.*\\.el"))
  (delete-file conf-file))
```

Now to have this take effect, we can just use a babel call keyword. Thanks to the preparation step this will be executed during tangling.

2.1.5 Package generation

Now we actually implement the `confpkg` babel function. We could just direct the output into the `subconf/config-X.el` file without any extra steps, but why not be a bit fancier and make it more like a package.

To do this, we'll have `confpkg` load a template and then fill it in using `format-spec`. To make sure this is actually used, we'll call `org-set-property` to modify the parent heading, and register the config group with the variables we created earlier.

```
;; Babel block for use with #+call
;; Arguments:
;;  - name, the name of the config sub-package
;;  - needs, (when non-empty) required system executable(s)
;;  - after, required features as a string or vector of strings
;;  - pre, a noweb reference to code that should be executed eagerly,
;;    and not deferred via after. The code is not included in the
;;    generated .el file and should only be used in dire situations.
;;  - prefix, the package prefix ("config-" by default)
;;  - via, how this configuration should be included in config.el,
;;    the current options are:
;;    + "copy", copy the configuration lisp
;;    + "require", insert a require statement
;;    + "none", do not do anything to load this configuration.
;;      This only makes sense when configuration is either being
;;      temporarily disabled or loaded indirectly/elsewhere.
;;  - emacs-minimum, the minimum emacs version ("29.1" by default)
(when (or (string-empty-p needs)
          (cl-every #'executable-find (delq nil (split-string needs ","))))
  (let* ((name (if (string-empty-p name)
                   (save-excursion
                     (and (org-back-to-heading-or-point-min t)
                          (substring-no-properties
                           (org-element-interpret-data
                            (org-element-property :title (org-element-at-point))))))
                 name))
         (after
          (cond
           ((and (stringp after) (string-empty-p after)) nil)
           ((and (stringp after) (string-match-p "\\`[^()]+\\'" after))
            (intern after)) ; Single feature.
           ((and (vectorp after) (cl-every #'stringp after))
            (nconc (list :and) (mapcar #'intern after)))
           (t nil)))
         (pre (and (not (string-empty-p pre)) pre))
         (confpkg-name
          (concat prefix (replace-regexp-in-string
```

```
                          "[^a-z-]" "-" (downcase name))))
         (confpkg-file (expand-file-name (concat confpkg-name ".el")
                                         "subconf")))
    (unless (file-exists-p confpkg-file)
      (make-empty-file confpkg-file t))
    (cl-incf confpkg--num)
    (org-set-property
     "header-args:emacs-lisp"
     (format ":tangle no :noweb-ref %s :noweb-sep \"\\n\\n\"" confpkg-name))
    (push (list :name name
                :package confpkg-name
                :file confpkg-file
                :after after
                :pre pre
                :via (intern via)
                :package-statements nil)
          confpkg--list)
    (format-spec
     "#+begin_src emacs-lisp :tangle %f :mkdirp yes :noweb no-export :noweb-ref none
     ↪  :comments no
<<confpkg-template>>
#+end_src"
     `((?n . ,confpkg--num)
       (?p . ,confpkg-name)
       (?f . ,confpkg-file)
       (?e . ,emacs-minimum)
       (?Y . ,(format-time-string "%Y"))
       (?B . ,(format-time-string "%B"))
       (?m . ,(format-time-string "%m"))
       (?d . ,(format-time-string "%d"))
       (?M . ,(format-time-string "%M"))
       (?S . ,(format-time-string "%S"))))))
```

Now all that's needed is a template to be used.

```
;;; %p.el --- Generated package (no.%n) from my config -*- lexical-binding: t; -*-
;;
;; Copyright (C) %Y TEC
;;
;; Author: TEC <https://code.tecosaur.net/tec>
;; Maintainer: TEC <contact@tecosaur.net>
;; Created: %B %d, %Y
;; Modified: %B %d, %Y
;; Version: %Y.%m.%d
;; Homepage: https://code.tecosaur.net/tec/emacs-config
;; Package-Requires: ((emacs \"%e\"))
;;
;; This file is not part of GNU Emacs.
```

```
;;
;;; Commentary:
;;
;;  Generated package (no.%n) from my config.
;;
;;  During generation, dependency on other aspects of my configuration and
;;  packages is inferred via (regexp-based) static analysis.  While this seems
;;  to do a good job, this method is imperfect.  This code likely depends on
;;  utilities provided by Doom, and if you try to run it in isolation you may
;;  discover the code makes more assumptions.
;;
;;  That said, I've found pretty good results so far.
;;
;;; Code:

<<%p>>

(provide '%p)
;;; %p.el ends here
```

This currently makes the included content look much more package-like that in truly is. However, I hope that some static analysis in future will allow for dependency information to be collected and included.

Lastly, should there be an issue or interruption, it's possible that the modifications from `#+call: confpkg` may persist. If I've been good with my committing, resolving this should be as simple as reverting unstaged changes. So... back in reality, it would be nice to have a way to clean up `confpkg` residue.

```
(org-fold-core-ignore-fragility-checks
  (org-babel-map-executables nil
    (when (and (eq (org-element-type (org-element-context)) 'babel-call)
               (equal (org-element-property :call (org-element-context)) "confpkg"))
      (org-babel-remove-result)
      (org-entry-delete nil "header-args:emacs-lisp"))))
```

2.1.6 Identify cross-package dependencies

At a basic level, we can search for regexp expressions indicating the definition of functions or variables and search for their usage.

```
(defun confpkg--rough-extract-definitions (file)
  (with-temp-buffer
    (insert-file-contents file)
    (goto-char (point-min))
```

```
    (let (symbols)
      (while (re-search-forward
              (rx line-start (* (any ?\s ?\t)) "("
                  (or "defun" "defmacro" "defsubst" "defgeneric" "defalias" "defvar"
                  ↪  "defcustom" "defface" "deftheme"
                      "cl-defun" "cl-defmacro" "cl-defsubst" "cl-defmethod"
                      ↪  "cl-defstruct" "cl-defgeneric" "cl-deftype")
                  (+ (any ?\s ?\t))
                  (group (+ (any "A-Z" "a-z" "0-9"
                                 ?+ ?- ?* ?/ ?_ ?~ ?! ?@ ?$ ?% ?^ ?& ?= ?: ?< ?> ?{
                                 ↪  ?})))
                  (or blank ?\n))
              nil t)
        (push (match-string 1) symbols))
      symbols)))
```

Continuing our rough regexp approach, we can construct a similar function to look for uses of symbols.

```
(defun confpkg--rough-uses-p (file symbols)
  (with-temp-buffer
    (insert-file-contents file)
    (let ((symbols (copy-sequence symbols)) uses-p)
      (while symbols
        (goto-char (point-min))
        (if (re-search-forward (rx word-start (literal (car symbols)) word-end) nil t)
            (setq uses-p t symbols nil)
          (setq symbols (cdr symbols))))
      uses-p)))
```

Now we can put these two functions together to annotate `confpkg--list` with their (confpkg) dependencies.

```
(defun confpkg-annotate-list-dependencies ()
  (dolist (confpkg confpkg--list)
    (plist-put confpkg :defines
               (confpkg--rough-extract-definitions
                (plist-get confpkg :file))))
  (dolist (confpkg confpkg--list)
    (let ((after (plist-get confpkg :after))
          requires)
      (dolist (other-confpkg confpkg--list)
        (when (and (not (eq other-confpkg confpkg))
                   (confpkg--rough-uses-p (plist-get confpkg :file)
                                          (plist-get other-confpkg :defines)))
          (push (plist-get other-confpkg :package) requires)))
      (when (and after (symbolp after))
        (push after requires))
```

```
      (plist-put confpkg :requires requires))))
```

Finally, we can use this information to edit the confpkg files to add the necessary `require` statements.

```
(defun confpkg-write-dependencies ()
  (dolist (confpkg confpkg--list)
    (when (plist-get confpkg :requires)
      (with-temp-buffer
        (setq buffer-file-name (plist-get confpkg :file))
        (insert-file-contents buffer-file-name)
        (re-search-forward "^;;; Code:\n")
        (insert "\n")
        (dolist (req (plist-get confpkg :requires))
          (insert (format "(require '%s)\n" req)))
        (write-region nil nil buffer-file-name)
        (set-buffer-modified-p nil)))))
```

2.1.7 Commenting out `package!` statements

It's easy enough to set `package!` statements to tangle to `packages.el`, however with our noweb ref approach they will *also* go to the config files. This could be viewed as a problem, but I actually think it's rather nice to have the package information with the config. So, we can look for an immediate `package!` statement and simply comment it out. As a bonus, we can also then record which packages are needed for each block of config.

```
(defun confpkg-comment-out-package-statements ()
  (dolist (confpkg confpkg--list)
    (with-temp-buffer
      (setq buffer-file-name (plist-get confpkg :file))
      (insert-file-contents buffer-file-name)
      (goto-char (point-min))
      (while (re-search-forward "^;;;
      ↪  Code:\n[[:space:]\n]*(\\(package!\\|unpin!\\)[[:space:]\n]+\\([^[:space:]]+\\)\\b"
      ↪  nil t)
        (plist-put confpkg :package-statements
                   (nconc (plist-get confpkg :package-statements)
                          (list (match-string 2))))
        (let* ((start (progn (beginning-of-line) (point)))
               (end (progn (forward-sexp 1)
                           (if (looking-at "[\t ]*;.*")
                               (line-end-position)
                             (point))))
               (contents (buffer-substring start end))
               paste-start paste-end
```

```
                (comment-start ";")
                (comment-padding "   ")
                (comment-end ""))
          (delete-region start (1+ end))
          (re-search-backward "^;;; Code:")
          (beginning-of-line)
          (insert ";;  Package statement:\n")
          (setq paste-start (point))
          (insert contents)
          (setq paste-end (point))
          (insert  "\n;;\n")
          (comment-region paste-start paste-end 2)))
      (when (buffer-modified-p)
        (write-region nil nil buffer-file-name)
        (set-buffer-modified-p nil)))))
```

2.1.8 Creating the config file

After all the subconfig files have been tangled, we need to collect their content and put them together into `config.el`. For this, all that's needed is a function to go through the registered config groups and put their content in a tempbuffer. We can call this with the finalising step.

```
(defun confpkg-create-config ()
  (let ((revert-without-query '("config\\.el"))
        (keywords (org-collect-keywords '("AUTHOR" "EMAIL")))
        (original-buffer (current-buffer)))
    (with-temp-buffer
      (insert
       (format ";;; config.el -*- lexical-binding: t; -*-

;; SPDX-FileCopyrightText: © 2020-%s %s <%s>
;; SPDX-License-Identifier: MIT

;; Generated at %s from the literate configuration.

(add-to-list 'load-path %S)\n"
               (format-time-string "%Y")
               (cadr (assoc "AUTHOR" keywords))
               (cadr (assoc "EMAIL" keywords))
               (format-time-string "%FT%T%z")
               (replace-regexp-in-string
                (regexp-quote (getenv "HOME")) "~"
                (expand-file-name "subconf/"))))
      (mapc
       (lambda (confpkg)
```

```
        (insert
         (if (eq 'none (plist-get confpkg :via))
             (format "\n;;; %s intentionally omitted.\n" (plist-get confpkg :name))
           (with-temp-buffer
             (cond
              ((eq 'copy (plist-get confpkg :via))
               (insert-file-contents (plist-get confpkg :file))
               (goto-char (point-min))
               (narrow-to-region
                (re-search-forward "^;;; Code:\n+")
                (progn
                  (goto-char (point-max))
                  (re-search-backward (format "[^\n\t ][\n\t ]*\n[\t ]*(provide '%s)"
                  ↪  (plist-get confpkg :package)))
                  (match-end 0))))
              ((eq 'require (plist-get confpkg :via))
               (insert (format "(require '%s)\n" (plist-get confpkg :package))))
              (t (insert (format "(warn \"%s confpkg :via has unrecognised value:
              ↪  %S\" %S %S)"
                                 (plist-get confpkg :name) (plist-get confpkg
                                 ↪  :via)))))
             (goto-char (point-min))
             (insert "\n;;;------------------------"
                     "\n;;; " (plist-get confpkg :name)
                     "\n;;;------------------------\n\n")
             (when (plist-get confpkg :defines)
               (insert ";; This block defines "
                       (mapconcat
                        (lambda (d) (format "`%s'" d))
                        (plist-get confpkg :defines)
                        ", ")
                       ".")
               (when (re-search-backward "\\([^, ]+\\), \\([^, ]+\\), \\([^,
               ↪  ]+\\).\\="
                                         (line-beginning-position) t)
                 (replace-match "\\1, \\2, and \\3."))
               (when (re-search-backward "\\([^, ]+\\), \\([^, ]+\\).\\="
                                         (line-beginning-position) t)
                 (replace-match "\\1 and \\2."))
               (insert "\n\n")
               (forward-line -2)
               (setq-local comment-start ";")
               (fill-comment-paragraph)
               (forward-paragraph 1)
               (forward-line 1))
             (if (equal (plist-get confpkg :package) "config-confpkg-timings")
                 (progn
                   (goto-char (point-max))
```

```
                    (insert "\n\n\
(confpkg-create-record 'doom-pre-config (float-time (time-subtract (current-time)
↪  before-init-time)))
(confpkg-start-record 'config)
(confpkg-create-record 'config-defered 0.0 'config)
(confpkg-create-record 'set-hooks 0.0 'config-defered)
(confpkg-create-record 'load-hooks 0.0 'config-defered)
(confpkg-create-record 'requires 0.0 'root)\n"))
                (let ((after (plist-get confpkg :after))
                      (pre (and (plist-get confpkg :pre)
                                (org-babel-expand-noweb-references
                                 (list "emacs-lisp"
                                       (format "<<%s>>" (plist-get confpkg :pre))
                                       '((:noweb . "yes")
                                         (:comments . "none")))
                                 original-buffer)))
                      (name (replace-regexp-in-string
                             "config--?" ""
                             (plist-get confpkg :package))))
                  (if after
                      (insert (format "(confpkg-with-record '%S\n"
                                      (list (concat "hook: " name) 'set-hooks))
                              (if pre
                                  (concat ";; Begin pre\n" pre "\n;; End pre\n")
                                "")
                              (format (if (symbolp after) ; If single feature.
                                          "  (with-eval-after-load '%s\n"
                                        "  (after! %s\n")
                                      after))
                    (when pre
                      (insert "\n;; Begin pre (unnecesary since after is unused)\n"
                              pre
                              "\n;; End pre\n")))
                  (insert
                   (format "(confpkg-with-record '%S\n"
                           (list (concat "load: " name)
                                 (if after 'load-hooks 'config)))))
                (goto-char (point-max))
                (when (string-match-p ";" (thing-at-point 'line))
                  (insert "\n"))
                (insert ")")
                (when (plist-get confpkg :after)
                  (insert "))"))
                (insert "\n"))
              (buffer-string)))))
        (let ((confpkg-timings ;; Ensure timings is put first.
               (cl-some (lambda (p) (and (equal (plist-get p :package)
               ↪  "config-confpkg-timings") p))
```

```
                    confpkg--list)))
        (append (list confpkg-timings)
                (nreverse (remove confpkg-timings confpkg--list)))))
    (insert "\n(confpkg-finish-record 'config)\n\n;;; config.el ends here")
    (write-region nil nil "config.el" nil :silent))))
```

Applying lexical binding to the config file is good for a number of reasons, among which it's (slightly) faster than dynamic binding (see this blog post for more info).

2.1.9 Quieter output

All the babel evaluation here ends up being quite noisy (along with a few other things during tangle), let's see if we can change that.

```
(when noninteractive
  (unless (fboundp 'doom-shut-up-a)
    (defun doom-shut-up-a (fn &rest args)
      (let ((standard-output #'ignore)
            (inhibit-message t))
        (apply fn args))))
  (advice-add 'org-babel-expand-body:emacs-lisp :around #'doom-shut-up-a)
  ;; Quiet some other annoying messages
  (advice-add 'sh-set-shell :around #'doom-shut-up-a)
  (advice-add 'rng-what-schema :around #'doom-shut-up-a)
  (advice-add 'python-indent-guess-indent-offset :around #'doom-shut-up-a))
```

2.1.10 Reporting load time information

When generating the config we added a form to collect load-time information.

```
(defvar confpkg-load-time-tree (list (list 'root)))
(defvar confpkg-record-branch (list 'root))
(defvar confpkg-record-num 0)
```

It would be good to process `confpkg-load-times` at the end to make it more useful, and provide a function to display load time information from it. This is to aid in identification of confpkgs that take particularly long to load, and thus would benefit from some attention.

To extract the per-confpkg load times, we can just take the difference in `(float-time)` and exclude the first entry.

```
(defun confpkg-create-record (name elapsed &optional parent enclosing)
  (let ((parent (assoc (or parent (car confpkg-record-branch))
                       confpkg-load-time-tree))
        (record (cons name (list (list 'self
                                       :name (format "%s" name)
                                       :num (cl-incf confpkg-record-num)
                                       :elapsed elapsed
                                       :enclosing enclosing)))))
    (push record confpkg-load-time-tree)
    (push record (cdr parent))
    record))

(defun confpkg-start-record (name &optional parent)
  (let ((record (confpkg-create-record name 0.0e+NaN parent t)))
    (plist-put (cdadr record) :start (float-time))
    (push name confpkg-record-branch)
    record))

(defun confpkg-finish-record (name)
  (let ((self-record (cdar (last (cdr (assoc name confpkg-load-time-tree))))))
    (plist-put self-record :elapsed
               (- (float-time) (plist-get self-record :start) 0.0))
    (unless (equal (car confpkg-record-branch) name)
      (message "Warning: Confpkg timing record expected to finish %S, instead found
      ↪  %S. %S"
               name (car confpkg-record-branch) confpkg-record-branch))
    (setq confpkg-record-branch (cdr confpkg-record-branch))))
```

A convenience macro could be nice to have.

```
(defmacro confpkg-with-record (name &rest body)
  "Create a time record around BODY.
The record must have a NAME."
  (declare (indent 1))
  (let ((name-val (make-symbol "name-val"))
        (record-spec (make-symbol "record-spec")))
    `(let* ((,name-val ,name)
            (,record-spec (if (consp ,name-val) ,name-val (list ,name-val))))
       (apply #'confpkg-start-record ,record-spec)
       (unwind-protect
           (progn ,@body)
         (confpkg-finish-record (car ,record-spec))))))
```

It would also be nice to collect some other load-time-related information.

```
(defadvice! +require--log-timing-a (orig-fn feature &optional filename noerror)
  :around #'require
  (if (or (featurep feature)
```

```
          (eq feature 'cus-start) ; HACK Why!?!
          (assoc (format "require: %s" feature) confpkg-load-time-tree))
      (funcall orig-fn feature filename noerror)
    (confpkg-with-record (list (format "require: %s" feature)
                               (and (eq (car confpkg-record-branch) 'root)
                                    'requires))
      (funcall orig-fn feature filename noerror))))
```

At last, we'll go to some pains to make a nice result tabulation function.

I will readily admit that this function is absolutely horrible. I just spent an evening adding to it till it worked then stopped touching it. Maybe in the future I'll go back to it and try to clean up the implementation.

```
(defun confpkg-timings-report (&optional sort-p node)
  "Display a report on load-time information.
Supply SORT-P (or the universal argument) to sort the results.
NODE defaults to the root node."
  (interactive
   (list (and current-prefix-arg t)))
  (let ((buf (get-buffer-create "*Confpkg Load Time Report*"))
        (depth 0)
        num-pad name-pad max-time max-total-time max-depth)
    (cl-labels
        ((sort-records-by-time
          (record)
          (let ((self (assoc 'self record)))
            (append (list self)
                    (sort (nreverse (remove self (cdr record)))
                          (lambda (a b)
                            (> (or (plist-get (alist-get 'self a) :total) 0.0)
                               (or (plist-get (alist-get 'self b) :total) 0.0)))))))
         (print-record
          (record)
          (cond
           ((eq (car record) 'self)
            (insert
             (propertize
              (string-pad (number-to-string (plist-get (cdr record) :num)) num-pad)
              'face 'font-lock-keyword-face)
             " "
             (propertize
              (apply #'concat
                     (make-list (1- depth) "• "))
              'face 'font-lock-comment-face)
             (string-pad (format "%s" (plist-get (cdr record) :name)) name-pad)
             (make-string (* (- max-depth depth) 2) ?\s)
             (propertize
```

```
            (format "%.4fs" (plist-get (cdr record) :elapsed))
            'face
            (list :foreground
                  (doom-blend 'orange 'green
                              (/ (plist-get (cdr record) :elapsed) max-time))))
           (if (= (plist-get (cdr record) :elapsed)
                  (plist-get (cdr record) :total))
               ""
             (concat "   (="
                     (propertize
                      (format "%.3fs" (plist-get (cdr record) :total))
                      'face
                      (list :foreground
                            (doom-blend 'orange 'green
                                        (/ (plist-get (cdr record) :total)
                                        ↪  max-total-time))))
                     ")"))
           "\n"))
         (t
          (cl-incf depth)
          (mapc
           #'print-record
           (if sort-p
               (sort-records-by-time record)
             (reverse (cdr record))))
          (cl-decf depth))))
      (flatten-records
       (records)
       (if (eq (car records) 'self)
           (list records)
         (mapcan
          #'flatten-records
          (reverse (cdr records)))))
      (tree-depth
       (records &optional depth)
       (if (eq (car records) 'self)
           (or depth 0)
         (1+ (cl-reduce #'max (cdr records) :key #'tree-depth))))
      (mapreduceprop
       (list map reduce prop)
       (cl-reduce
        reduce list
        :key
        (lambda (p) (funcall map (plist-get (cdr p) prop)))))
      (elaborate-timings
       (record)
       (if (eq (car record) 'self)
           (plist-get (cdr record) :elapsed)
```

```
          (let ((total (cl-reduce #'+ (cdr record)
                                  :key #'elaborate-timings))
                (self (cdr (assoc 'self record))))
            (if (plist-get self :enclosing)
                (prog1
                    (plist-get self :elapsed)
                  (plist-put self :total (plist-get self :elapsed))
                  (plist-put self :elapsed
                             (- (* 2 (plist-get self :elapsed)) total)))
              (plist-put self :total total)
              total))))
       (elaborated-timings
        (record)
        (let ((record (copy-tree record)))
          (elaborate-timings record)
          record)))
     (let* ((tree
             (elaborated-timings
              (append '(root)
                      (copy-tree
                       (alist-get (or node 'root)
                                  confpkg-load-time-tree
                                  nil nil #'equal))
                      '((self :num 0 :elapsed 0)))))
            (flat-records
             (cl-remove-if
              (lambda (rec) (= (plist-get (cdr rec) :num) 0))
              (flatten-records tree))))
       (setq max-time (mapreduceprop flat-records #'identity #'max :elapsed)
             max-total-time (mapreduceprop flat-records #'identity #'max :total)
             name-pad (mapreduceprop flat-records #'length #'max :name)
             num-pad (mapreduceprop flat-records
                                    (lambda (n) (length (number-to-string n)))
                                    #'max :num)
             max-depth (tree-depth tree))
       (with-current-buffer buf
         (erase-buffer)
         (setq-local outline-regexp "[0-9]+ *\\(?:• \\)*")
         (outline-minor-mode 1)
         (use-local-map (make-sparse-keymap))
         (local-set-key "TAB" #'outline-toggle-children)
         (local-set-key "\t" #'outline-toggle-children)
         (local-set-key (kbd "<backtab>") #'outline-show-subtree)
         (local-set-key (kbd "C-<iso-lefttab>")
                        (eval `(cmd! (if current-prefix-arg
                                         (outline-show-all)
                                       (outline-hide-sublevels (+ ,num-pad 2))))))
         (insert
```

```
          (propertize
           (concat (string-pad "#" num-pad) " "
                   (string-pad "Confpkg"
                               (+ name-pad (* 2 max-depth) -3))
                   (format " Load Time (=%.3fs)\n"
                           (plist-get (cdr (assoc 'self tree)) :total)))
           'face '(:inherit (tab-bar-tab bold) :extend t :underline t))
          (dolist (record (if sort-p
                              (sort-records-by-time tree)
                            (reverse (cdr tree))))
            (unless (eq (car record) 'self)
              (print-record record)))
          (set-buffer-modified-p nil)
          (goto-char (point-min)))
        (pop-to-buffer buf)))))
```

2.1.11 Finalise

At last, to clean up the content inserted by the babel calls we can just revert the buffer. As long as `org-babel-pre-tangle-hook` hasn't been modified, `save-buffer` will be run at the start of the tangle process and so reverting will take us back to just before the tangle started.

Since this is *the* function added as the post-tangle hook, we also need to remove the function from the hook and call the `config.el` creation function.

```
(defun confpkg-tangle-finalise ()
  (remove-hook 'org-babel-tangle-finished-hook #'confpkg-tangle-finalise)
  (revert-buffer t t t)
  (confpkg-comment-out-package-statements)
  (confpkg-annotate-list-dependencies)
  (confpkg-create-config)
  (confpkg-write-dependencies)
  (message "Processed %s elisp files" (length confpkg--list)))
```

Within `confpkg-tangle-finalise` we carefully order each step so that the most important steps go first, to minimise the impact should a particular step fail.

2.1.12 Bootstrap

This system makes use of some recent commits introduced to Org, such as this noweb expansion bugfix which will be included in Org 9.5.4. This is problematic if using Emacs 28.2 or older, so to get around this we must go through a bootstrap process.

To start with, we'll check if we are:

- Running an Org version prior to 9.5.4
- Running in a `noninteractive` session
- Using an Org that's not installed in the user directory
- In a session with the symbol `exit!` defined

```
(let ((required-org-version "9.5.4")
      (standard-output t))
  (when (and (version< (org-version) required-org-version)
             (not (string-match-p (regexp-quote (expand-file-name "~"))
                                  (locate-library "org"))))
    (cond
     ((and noninteractive (fboundp 'exit!))
      (print! (warn (format "Detected conditions provoking a config bootstrap (Org
      ↪  %s)" (org-version))))
      (print! (start "Initiating bootstrap..."))
      <<bootstrap-perform>>
      )
     (t (message "Installed Org version %s is too old, %s is needed.\nRun \"doom
     ↪  sync\" to fix."
                 (org-version) required-org-version)))))
```

If these conditions are met, we can assume that the loaded Org version is insufficient, and that it's likely a Emacs is currently running a command like `doom sync`, and so it makes sense to perform the 3-step bootstrap.

1. Temporarily rename `config.org` to `config.original.org`.
2. Create a new `config.org` that when tangled results in Org being installed.
3. Swap back to the original `config.org`, and re-sync.

```
(print! (item "Temporarily relocating config.org to config.original.org"))
(rename-file "config.org" "config.original.org" t)
<<boostrap-create-transient-config>>
(print! (item "%s") (bold "Re-running sync"))
(exit! :restart) ; Re-run =doom sync= with the transient config.
```

With the approach worked out, we just need to generate a snipped that will create a new `config.org` that when tangled:

- Tangles our Org recipe to `packages.el`
- Swaps back to the original `config.org`
- Re-runs `doom sync`

```
(print! (item "Creating minimal init.el"))

(let ((standard-output #'ignore))
  (with-temp-buffer
    (insert
     ";;; init.el -*- lexical-binding: t; -*-\n\n"
     (pp (quote
          <<bootstrap-init>>
          )))
    (write-region nil nil "init.el")))

(print! (item "Creating boostrap config.el"))

(let ((standard-output #'ignore))
  (with-temp-buffer
    (insert
     (org-element-interpret-data
      (list
       '(keyword (:key "title" :value "Boostrap Stage 1 Config" :post-blank 1))
       `(src-block
         (:language "emacs-lisp"
          :value ,(pp (quote (progn
                              <<boostrap-transition>>
                              )))
          :name "bootstrap-transition"
          :post-blank 1))
       `(src-block
         (:language "emacs-lisp"
          :parameters
          ,(concat ":noweb no-export "
                   ":tangle (expand-file-name (make-temp-name
                   ↪  \"emacs-org-babel-excuses/confpkg-prepare-\")
                   ↪  temporary-file-directory) "
                   ":mkdirp yes")
          :value ,(concat "<<" ; Split to avoid (prematurely) creating a noweb
          ↪  reference.
                          "bootstrap-transition()"
                          ">>\n"))))))
    (write-region nil nil "config.org")))
```

For the bootstrap we need a minimal `init.el`, just the literate module should be sufficient.

```
(doom! :config literate)
```

This `config.org` simply provides an entry point for us to run elisp during tangle. We just need to make use of it to install Org and re-sync the original configuration.

```
(setq standard-output t)

(print! (start "Starting second stage of the bootstrap."))
(print! (item "Creating minimal packages.el"))

(let ((standard-output #'ignore))
  (with-temp-buffer
    (insert
     ";; -*- no-byte-compile: t; -*-\n\n"
     (pp (quote
          <<org-pkg-statement()>>
          )))
    (write-region nil nil "packages.el")))

(doom-packages-install)

(print! (item "Switching back to original config.org"))
(rename-file "config.original.org" "config.org" t)

(print! (item "%s") (bold "Re-running sync"))
(exit! :restart)
```

There we go, that should do the trick, so long as we call the `bootstrap` block at the start of the tangle process. This is done by calling `bootstrap` within the confpkg preparation stage.

2.2 Personal Information

It's useful to have some basic personal information

```
(setq user-full-name "TEC"
      user-mail-address "contact@tecosaur.net")
```

Apparently this is used by `GPG`, and all sorts of other things.

Speaking of `GPG`, I want to use `~/.authinfo.gpg` instead of the default in `~/.config/emacs`. Why? Because my home directory is already cluttered, so this won't make a difference, and I don't want to accidentally purge this file (I have done . I also want to cache as much as possible, as my home machine is pretty safe, and my laptop is shutdown a lot.

```
(setq auth-sources '("~/.authinfo.gpg")
      auth-source-cache-expiry nil) ; default is 7200 (2h)
```

2.3 Better defaults

2.3.1 Simple settings

Inspired by a few sources of modified defaults (such as angrybacon/dotemacs) and my own experiences, I've ended up with a small set of tweaks on top of the changes Doom makes:

```
(setq-default
 delete-by-moving-to-trash t                      ; Delete files to trash
 window-combination-resize t                      ; take new window space from all
 ↪  other windows (not just current)
 x-stretch-cursor t)                              ; Stretch cursor to the glyph width

(setq undo-limit 80000000                         ; Raise undo-limit to 80Mb
      evil-want-fine-undo t                       ; By default while in insert all
      ↪  changes are one big blob. Be more granular
      auto-save-default t                         ; Nobody likes to loose work, I
      ↪  certainly don't
      truncate-string-ellipsis "..."                ; Unicode ellispis are nicer than
      ↪  "...", and also save /precious/ space
      password-cache-expiry nil                   ; I can trust my computers ... can't
      ↪  I?
      ;; scroll-preserve-screen-position 'always     ; Don't have `point' jump around
      scroll-margin 2                             ; It's nice to maintain a little
      ↪  margin
      display-time-default-load-average nil)      ; I don't think I've ever found this
      ↪  useful

(display-time-mode 1)                             ; Enable time in the mode-line
(global-subword-mode 1)                           ; Iterate through CamelCase words
```

When using a device with a battery, it would be nice to display battery information. We can check for a battery during tangle via noweb, and only call `display-battery-mode` when relevant. From a look at the various status functions in `battery.el`, it seems like the `?L` key is consistently `N/A` when there is no battery, so we'll test on that.

```
(require 'battery)
(if (and battery-status-function
         (not (equal (alist-get ?L (funcall battery-status-function))
                     "N/A")))
    (prin1-to-string `(display-battery-mode 1))
  "")
```

Now with noweb we' use the result.

```
<<battery-status-setup()>>
```

2.3.2 Frame sizing

It's nice to control the size of new frames, when launching Emacs that can be done with . After the font size adjustment during initialisation this works out to be `102x31`.

Thanks to hotkeys, it's easy for me to expand a frame to half/full-screen, so it makes sense to be conservative with the sizing of new frames.

Then, for creating new frames within the same Emacs instance, we'll just set the default to be something roughly 80% of that size.

```
(add-to-list 'default-frame-alist '(height . 24))
(add-to-list 'default-frame-alist '(width . 80))
```

2.3.3 Auto-customisations

By default changes made via a customisation interface are added to `init.el`. I prefer the idea of using a separate file for this. We just need to change a setting, and load it if it exists.

```
(setq-default custom-file (expand-file-name ".custom.el" doom-user-dir))
(when (file-exists-p custom-file)
  (load custom-file))
```

2.3.4 Windows

I find it rather handy to be asked which buffer I want to see after splitting the window. Let's make that happen.

First, we'll enter the new window

```
(setq evil-vsplit-window-right t
      evil-split-window-below t)
```

Then, we'll pull up a buffer prompt.

```
(defadvice! prompt-for-buffer (&rest _)
  :after '(evil-window-split evil-window-vsplit)
  (consult-buffer))
```

Window rotation is nice, and can be found under `SPC w r` and `SPC w R`. *Layout* rotation is also nice though. Let's stash this under `SPC w SPC`, inspired by Tmux's use of `C-b SPC` to rotate

windows.

We could also do with adding the missing arrow-key variants of the window navigation/swapping commands.

```
(map! :map evil-window-map
      "SPC" #'rotate-layout
      ;; Navigation
      "<left>"     #'evil-window-left
      "<down>"     #'evil-window-down
      "<up>"       #'evil-window-up
      "<right>"    #'evil-window-right
      ;; Swapping windows
      "C-<left>"       #'+evil/window-move-left
      "C-<down>"       #'+evil/window-move-down
      "C-<up>"         #'+evil/window-move-up
      "C-<right>"      #'+evil/window-move-right)
```

2.3.5 Hippie expand

Completing text based on other availible content is a great idea, and so `dabbrev` (dynamic abbreviations) is throughly useful. There's another similar tool that Emacs comes with though, called hippie expand, which is just a bit nicer yet, and can be used as a swap-in upgrade to `dabbrev`.

```
(global-set-key [remap dabbrev-expand] #'hippie-expand)
```

1. Expansion prioritisation

   Hippie expand works by cycling through a series of expansion-generating functions, listed in the variable `hippie-expand-try-functions-list`.

   By default, it completes (in order):

   - File names
   - Known abbreviations
   - Lists (i.e. bracketed regions)
   - Previous lines
   - Dabbrev (this buffer)
   - Dabbrev (all buffers)
   - Dabbrev (kill ring)

- Known elisp symbols

I find that `try-expand-line` completions often appear when I actually want a dabbrev completion, so let's deprioritise it somewhat. If I actually want to try for a line expansion, it's fairly easy to deliberately trigger it — just invoke `hippie-expand` after typing a space and there will be no dabbrev candidates.

Speaking of dabbrev, I do think of hippie-expand mostly as "a stangely named dabbrev+", so let's prioritise the dabbrev-related expanders a bit. I'll also toss in a nice non-default expansion generator as the first dabbrev candidate function: `try-expand-dabbrev-visible`.

There's another cool source of multi-word expansion (actually multi-line) that isn't used by default, `try-expand-dabbrev-from-kill`. I personally think this one is quite neat, but don't want it to interfere with more common single-word completions, and so will place it just above `try-expand-line`.

```
(setq hippie-expand-try-functions-list
      '(try-expand-list
        try-expand-dabbrev-visible
        try-expand-dabbrev
        try-expand-all-abbrevs
        try-expand-dabbrev-all-buffers
        try-complete-file-name-partially
        try-complete-file-name
        try-expand-dabbrev-from-kill
        try-expand-whole-kill
        try-expand-line
        try-complete-lisp-symbol-partially
        try-complete-lisp-symbol))
```

Unfortunately there's one aspect of `try-expand-dabbrev-from-kill` that I find lets me down a bit, which is that it fails to complete when the killed text starts with a newline and the current line does not. I'll see if I can do something about this in the future.

2. Suffix stripping

I am occasionally annoyed by expansions that I make mid-line and cause a common suffix in the completion to be repeated. For instance, say in an earlier line of a file I have:

```
func foo(int x, int y, int z)
```

where the `int y` argument has just been added. I move to another function that should have the same adjustment and invoke hippie-expand (at `|`) to save me keystrokes:

```
func bar(int x,| int z)
```

This invokes `try-expand-list` and completes to

```
func bar(int x, int y, int z) int z)
```

Clearly, that's not what I want! I suspect that we can make it "just work" the vast majority of the time by looking to see if there's a suffix in the completion that's also a prefix of the remainder of the line, and stripping it. In our example, this would be `int z)` which would turn the completed line into:

```
func bar(int x, int y, int z)
```

Hippie-expand doesn't provide a good point to modify expansion behaviour like this, however the insertion of the expansion is handled by the helper function `he-substitute-strings`, which we can advise to behave as we wish.

```
(defun +he-subst-suffix-overlap (ins rem)
  "The longest suffix of the string INS that is a prefix of REM.
This is intended to be used when INS is a newly inserted string and REM is the
remainder of the line, to allow for handling potentially duplicated content."
  (let ((len (min (length ins) (length rem))))
    (while (and (> len 0)
                (not (eq 't (compare-strings ins (- len) nil rem 0 len))))
      (setq len (1- len)))
    len))

(defun +he-suffix-strip-a (args)
  "Filter ARG list for `he-substitute-string', truncating duplicated suffix.
ARGS is the raw argument list (STRING &optional TRANS-CASE)."
  (pcase-let* ((`(,ins &optional ,trans-case) args)
               (rem (save-excursion
                      (goto-char (marker-position he-string-end))
                      (buffer-substring-no-properties
                       (point) (line-end-position))))
               (ov (+he-subst-suffix-overlap ins rem)))
    (when (>= ov 0)
      (setq ins (substring ins 0 (- (length ins) ov))))
    (list ins trans-case)))

(advice-add #'he-substitute-string :filter-args #'+he-suffix-strip-a)
```

2.3.6 Buffer defaults

I'd much rather have my new buffers in `org-mode` than `fundamental-mode`, hence

```
;; (setq-default major-mode 'org-mode)
```

For some reason this + the mixed pitch hook causes issues with hydra and so I'll just need to resort to `SPC b o` for now.

2.4 Doom configuration

2.4.1 Modules

Doom has this lovely *modular configuration base* that takes a lot of work out of configuring Emacs. Each module (when enabled) can provide a list of packages to install (on `doom sync`) and configuration to be applied. The modules can also have flags applied to tweak their behaviour.

```
;;; init.el -*- lexical-binding: t; -*-

;; This file controls what Doom modules are enabled and what order they load in.
;; Press 'K' on a module to view its documentation, and 'gd' to browse its directory.

(doom! :input
       <<doom-input>>

       :completion
       <<doom-completion>>

       :ui
       <<doom-ui>>

       :editor
       <<doom-editor>>

       :emacs
       <<doom-emacs>>

       :term
       <<doom-term>>

       :checkers
       <<doom-checkers>>

       :tools
       <<doom-tools>>

       :os
       <<doom-os>>

       :lang
       <<doom-lang>>

       :email
       <<doom-email>>
```

```
      :app
      <<doom-app>>

      :config
      <<doom-config>>
      )
```

1. Structure

   As you may have noticed by this point, this is a literate configuration. Doom has good support for this which we access though the `literate` module.

   While we're in the `:config` section, we'll use Dooms nicer defaults, along with the bindings and smartparens behaviour (the flags aren't documented, but they exist).

   ```
   literate
   (default +bindings +smartparens)
   ```

2. Interface

   There's a lot that can be done to enhance Emacs' capabilities. I reckon enabling half the modules Doom provides should do it.

   ```
   ;; company                  ; the ultimate code completion backend
   (corfu +orderless +dabbrev)  ; complete with cap(f), cape and a flying feather!
   ;;helm                      ; the *other* search engine for love and life
   ;;ido                       ; the other *other* search engine...
   ;; (ivy                     ; a search engine for love and life
   ;;  +icons                  ; ... icons are nice
   ;;  +prescient)             ; ... I know what I want(ed)
   (vertico +icons)            ; the search engine of the future
   ```

   ```
   ;;deft                      ; notational velocity for Emacs
   doom                        ; what makes DOOM look the way it does
   doom-dashboard              ; a nifty splash screen for Emacs
   doom-quit                   ; DOOM quit-message prompts when you quit Emacs
   ;; (emoji +unicode)         ; 🙂
   ;;fill-column               ; a `fill-column' indicator
   hl-todo                     ; highlight TODO/FIXME/NOTE/DEPRECATED/HACK/REVIEW
   ;;hydra                     ; quick documentation for related commands
   ;;indent-guides             ; highlighted indent columns, notoriously slow
   (ligatures +extra)          ; ligatures and symbols to make your code pretty
   ↪  again
   ;;minimap                   ; show a map of the code on the side
   modeline                    ; snazzy, Atom-inspired modeline, plus API
   nav-flash                   ; blink the current line after jumping
   ;;neotree                   ; a project drawer, like NERDTree for vim
   ophints                     ; highlight the region an operation acts on
   ```

```
(popup                          ; tame sudden yet inevitable temporary windows
 +all                           ; catch all popups that start with an asterix
 +defaults)                     ; default popup rules
;;(tabs                         ; an tab bar for Emacs
;;  +centaur-tabs)              ; ... with prettier tabs
treemacs                        ; a project drawer, like neotree but cooler
;;unicode                       ; extended unicode support for various languages
(vc-gutter +pretty)             ; vcs diff in the fringe
vi-tilde-fringe                 ; fringe tildes to mark beyond EOB
(window-select +numbers)        ; visually switch windows
workspaces                      ; tab emulation, persistence & separate workspaces
zen                             ; distraction-free coding or writing
```

```
(evil +everywhere)              ; come to the dark side, we have cookies
file-templates                  ; auto-snippets for empty files
fold                            ; (nigh) universal code folding
(format)                        ; automated prettiness
;;god                           ; run Emacs commands without modifier keys
;;lispy                         ; vim for lisp, for people who don't like vim
multiple-cursors                ; editing in many places at once
;;objed                         ; text object editing for the innocent
;;parinfer                      ; turn lisp into python, sort of
rotate-text                     ; cycle region at point between text candidates
snippets                        ; my elves. They type so I don't have to
;;word-wrap                     ; soft wrapping with language-aware indent
```

```
(dired +icons)                  ; making dired pretty [functional]
electric                        ; smarter, keyword-based electric-indent
(ibuffer +icons)                ; interactive buffer management
undo                            ; persistent, smarter undo for your inevitable
↪  mistakes
vc                              ; version-control and Emacs, sitting in a tree
```

```
;;eshell                       ; the elisp shell that works everywhere
;;shell                        ; simple shell REPL for Emacs
;;term                         ; basic terminal emulator for Emacs
vterm                           ; the best terminal emulation in Emacs
```

```
syntax                          ; tasing you for every semicolon you forget
;; spell                        ; tasing you for misspelling mispelling
grammar                         ; tasing grammar mistake every you make
```

```
ansible                         ; a crucible for infrastructure as code
biblio                          ; Writes a PhD for you (citation needed)
;;collab                       ; buffers with friends
;;debugger                     ; FIXME stepping through code, to help you add bugs
;;direnv                       ; be direct about your environment
```

```
docker                          ; port everything to containers
;;editorconfig                  ; let someone else argue about tabs vs spaces
;;ein                           ; tame Jupyter notebooks with emacs
(eval +overlay)                 ; run code, run (also, repls)
;;gist                          ; interacting with github gists
(lookup                         ; helps you navigate your code and documentation
 +dictionary                    ; dictionary/thesaurus is nice
 +docsets)                      ; ...or in Dash docsets locally
lsp                             ; Language Server Protocol
(magit                          ; a git porcelain for Emacs
 +forge)                        ; interface with git forges
make                            ; run make tasks from Emacs
;;pass                          ; password manager for nerds
pdf                             ; pdf enhancements
;;prodigy                       ; FIXME managing external services & code builders
;;terraform                     ; infrastructure as code
;;tmux                          ; an API for interacting with tmux
;;tree-sitter                   ; syntax and parsing, sitting in a tree...
upload                          ; map local to remote projects via ssh/ftp
```

```
(:if (featurep :system 'macos) macos) ; improve compatibility with macOS
tty                             ; improve the terminal Emacs experience
```

3. Language support

   We can be rather liberal with enabling support for languages as the associated packages/configuration are (usually) only loaded when first opening an associated file.

```
;;agda                         ; types of types of types of types...
;;beancount                    ; mind the GAAP
;;(cc +lsp)                    ; C > C++ == 1
;;clojure                      ; java with a lisp
;;common-lisp                  ; if you've seen one lisp, you've seen them all
;;coq                          ; proofs-as-programs
;;crystal                      ; ruby at the speed of c
;;csharp                       ; unity, .NET, and mono shenanigans
data                            ; config/data formats
;;(dart +flutter)              ; paint ui and not much else
;;dhall                        ; JSON with FP sprinkles
;;elixir                       ; erlang done right
;;elm                          ; care for a cup of TEA?
emacs-lisp                      ; drown in parentheses
;;erlang                       ; an elegant language for a more civilized age
ess                             ; emacs speaks statistics
;;faust                        ; dsp, but you get to keep your soul
;;fsharp                       ; ML stands for Microsoft's Language
;;fstar                        ; (dependent) types and (monadic) effects and Z3
;;gdscript                     ; the language you waited for
```

```
;;(graphql +lsp)             ; Give queries a REST
(go +lsp)                    ; the hipster dialect
;;(haskell +lsp)             ; a language that's lazier than I am
;;hy                         ; readability of scheme w/ speed of python
;;idris                      ;
json                         ; At least it ain't XML
;;(java +lsp)                ; the poster child for carpal tunnel syndrome
(javascript +lsp)            ; all(hope(abandon(ye(who(enter(here))))))
(julia +lsp)                 ; Python, R, and MATLAB in a blender
;;kotlin                     ; a better, slicker Java(Script)
(latex                       ; writing papers in Emacs has never been so fun
 +latexmk                    ; what else would you use?
 +cdlatex                    ; quick maths symbols
 +fold)                      ; fold the clutter away nicities
;;lean                       ; proof that mathematicians need help
;;factor                     ; for when scripts are stacked against you
;;ledger                     ; an accounting system in Emacs
lua                          ; one-based indices? one-based indices
markdown                     ; writing docs for people to ignore
;;nim                        ; python + lisp at the speed of c
nix                          ; I hereby declare "nix geht mehr!"
;;ocaml                      ; an objective camel
(org                         ; organize your plain life in plain text
 +dragndrop                  ; drag & drop files/images into org buffers
 ;;+hugo                     ; use Emacs for hugo blogging
 +noter                      ; enhanced PDF notetaking
 +jupyter                    ; ipython/jupyter support for babel
 +pandoc                     ; export-with-pandoc support
 +gnuplot                    ; who doesn't like pretty pictures
 ;;+pomodoro                 ; be fruitful with the tomato technique
 +present                    ; using org-mode for presentations
 +roam2)                     ; wander around notes
;;php                        ; perl's insecure younger brother
;;plantuml                   ; diagrams for confusing people more
;;purescript                 ; javascript, but functional
(python +lsp +pyright)       ; beautiful is better than ugly
;;qt                         ; the 'cutest' gui framework ever
;;racket                     ; a DSL for DSLs
;;raku                       ; the artist formerly known as perl6
;;rest                       ; Emacs as a REST client
;;rst                        ; ReST in peace
;;(ruby +rails)              ; 1.step {|i| p "Ruby is #{i.even? ? 'love' :
↪  'life'}"}
(rust +lsp)                  ; Fe2O3.unwrap().unwrap().unwrap().unwrap()
;;scala                      ; java, but good
scheme                       ; a fully conniving family of lisps
sh                           ; she sells {ba,z,fi}sh shells on the C xor
;;sml                        ; no, the /other/ ML
```

```
;;solidity                ; do you need a blockchain? No.
;;swift                   ; who asked for emoji variables?
;;terra                   ; Earth and Moon in alignment for performance.
web                       ; the tubes
yaml                      ; JSON, but readable
zig                       ; C, but simpler
```

4. Input

```
;;bidi                    ; (tfel ot) thgir etirw uoy gnipleh
;;chinese
;;japanese
;;layout                  ; auie,ctsrnm is the superior home row
```

5. Everything in Emacs

   It's just too convenient being able to have everything in Emacs. I couldn't resist the Email and Feed modules.

```
(:if (executable-find "mu") (mu4e +org))
;;notmuch
;;(wanderlust +gmail)
```

```
;;calendar                ; A dated approach to timetabling
;;emms                    ; Multimedia in Emacs is music to my ears
everywhere                ; *leave* Emacs!? You must be joking.
irc                       ; how neckbeards socialize
(rss +org)                ; emacs as an RSS reader
;;twitter                 ; twitter client https://twitter.com/vnought
```

2.4.2 Profiles

Doom has support for multiple configuration profiles. For general usage, this isn't a particularly useful feature, but for niche use cases it's fantastic.

```
((orgdev (env ("DOOMDIR" . "~/.config/doom.orgdev"))))
```

1. Org development profile For development purposes, it's handy to have a more minimal config without my many customisations and interacting packages. Let's go ahead and create a near-minimal new config:

```
;;; init.el -*- lexical-binding: t; -*-
(doom! :completion vertico
       :editor evil
       :config (default +bindings))
```

```
(unpin! org) ; there be bugs
```

```
(require 'org)
(load-theme 'modus-operandi t)
```

2.4.3 Visual Settings

1. Font Face

   a) Setting fonts

   'Fira Code' is nice, and 'Overpass' makes for a nice sans companion. We just need to fiddle with the font sizes a tad so that they visually match. Just for fun I'm trying out JetBrains Mono though. So far I have mixed feelings on it, some aspects are nice, but on others I prefer Fira.

```
(setq doom-font (font-spec :family "JetBrains Mono" :size 24)
      doom-big-font (font-spec :family "JetBrains Mono" :size 36)
      doom-variable-pitch-font (font-spec :family "Overpass" :size 26)
      doom-symbol-font (font-spec :family "JuliaMono")
      doom-emoji-font (font-spec :family "Twitter Color Emoji") ; Just used
      ↪ by me
      doom-serif-font (font-spec :family "IBM Plex Mono" :size 22 :weight
      ↪ 'light))
```

'Fira Code' is nice, and 'Overpass' makes for a nice sans companion. We just need to fiddle with the font sizes a tad so that they visually match. Just for fun I'm trying out JetBrains Mono though. So far I have mixed feelings on it, some aspects are nice, but on others I prefer Fira.

```
» emacs-lisp
(setq doom-font (font-spec :family "JetBrains Mono" :size 24)
      doom-big-font (font-spec :family "JetBrains Mono" :size 36)
      doom-variable-pitch-font (font-spec :family "Overpass" :size 24)
      doom-serif-font (font-spec :family "IBM Plex Mono" :weight 'light))
«
```

   In addition to these fonts, Merriweather is used with `nov.el`, and Alegreya as a serifed proportional font used by `mixed-pitch-mode` for `writeroom-mode` with Org files.

   b) Emojis

   Emacs (28+) has an `emoji` script table. We're about to use it, but before doing so we're going to excise a few characters that I actually want rendered as using the symbol font (not as emojis).

```
(dolist (char '(?⏩ ?⏪ ?❓))
  (set-char-table-range char-script-table char 'symbol))
```

To actually sort out emojis, all that's really needed here is to apply `doom-emoji-font`, which needs to be done *here* because it's not *actually* a Doom font variable, but rather my own addition.

```
(add-hook! 'after-setting-font-hook
  (defun +emoji-set-font ()
    (set-fontset-font t 'emoji doom-emoji-font nil 'prepend)))
```

We might as well also construct a regexp to make identifying emojis if buffers more convenient.

```
(defvar +emoji-rx
  (let (emojis)
    (map-char-table
     (lambda (char set)
       (when (eq set 'emoji)
         (push (copy-tree char) emojis)))
     char-script-table)
    (rx-to-string `(any ,@emojis)))
  "A regexp to find all emoji-script characters.")
```

For the sake of convenient insertion, we'll also register some emoji aliases based on common usage.

```
(setq emoji-alternate-names
      '(("🙂" ":)")
        ("😄" ":D")
        ("😉" ";)")
        ("😕" ":(")
        ("😆" "laughing face" "xD")
        ("🤣" "ROFL face")
        ("😢" ":'(")
        ("🥲" ":')")
        ("😮" ":o")
        ("😑" ":|")
        ("😎" "cool face")
        ("🤪" "goofy face")
        ("🤥" "pinnochio face" "liar face")
        ("😠" ">:(")
        ("👿" "angry+ face")
        ("🤬" "swearing face")
        ("🤢" "sick face")
        ("😈" "smiling imp")
        ("😈" "frowning imp")
        ("" "<3")
```

```
        ("🧐" "o7")
        ("👍" "+1")
        ("👎" "-1")
        ("👈" "left")
        ("👉" "right")
        ("👆" "up")
        ("💯" "100")
        ("💸" "flying money")))
```

Lastly, when using Emacs 28+ it would be nice to open the nice emoji dispatch with the leader key as well as `C-x 8 e`. Since `SPC e` is unclaimed, let's just use that until we have a better use for it (we could also split up the insertion and querying commands in other parts of the map).

```
(when (>= emacs-major-version 29)
  (map! :leader
        (:prefix ("e" . "Emoji")
         :desc "Search" "s" #'emoji-search
         :desc "Recent" "r" #'emoji-recent
         :desc "List" "l" #'emoji-list
         :desc "Describe" "d" #'emoji-describe
         :desc "Insert" "i" #'emoji-insert
         :desc "Insert" "e" #'emoji-insert)))
```

c) Checking the system

Because we care about how things look let's add a check to make sure we're told if the system doesn't have any of those fonts. We can obtain a list of installed fonts with either `(font-family-list)` or with the `fc-list` command.

```
(setq required-fonts '("JetBrains ?Mono.*" "Overpass" "JuliaMono" "IBM Plex
↪  Mono"
                       "Merriweather" "Alegreya" "Twitter Color Emoji"))

(setq available-fonts
      (delete-dups
       (or (font-family-list)
           (and (executable-find "fc-list")
                (with-temp-buffer
                  (call-process "fc-list" nil t nil ":" "family")
                  (split-string (buffer-string) "[,\n]"))))))

(setq missing-fonts
      (delq nil (mapcar
                 (lambda (font)
                   (unless (delq nil (mapcar (lambda (f)
                                               (string-match-p (format
                                               ↪  "^%s$" font) f))
```

```
                                              available-fonts))
                    font))
                required-fonts)))
```

We can then use this to create a `doctor` check.

```
(let (required-fonts available-fonts missing-fonts)
  (setq required-fonts '("JetBrains ?Mono.*" "Overpass" "JuliaMono" "IBM
  ↪  Plex Mono"
                         "Merriweather" "Alegreya" "Twitter Color Emoji"))

  (setq available-fonts
        (delete-dups
         (or (font-family-list)
             (and (executable-find "fc-list")
                  (with-temp-buffer
                    (call-process "fc-list" nil t nil ":" "family")
                    (split-string (buffer-string) "[,\n]"))))))

  (setq missing-fonts
        (delq nil (mapcar
                   (lambda (font)
                     (unless (delq nil (mapcar (lambda (f)
                                                 (string-match-p (format
                                                 ↪  "^%s$" font) f))
                                               available-fonts))
                       font))
                   required-fonts)))
  (if available-fonts
      (dolist (font missing-fonts)
        (warn! (format "Missing font: %s." font)))
    (warn! "Unable to check for missing fonts, is fc-list installed?")))
```

Furthermore, when fonts *are* missing, it could be good to check the state of affairs on startup.

```
(setq required-fonts '("JetBrains ?Mono.*" "Overpass" "JuliaMono" "IBM Plex
↪  Mono"
                       "Merriweather" "Alegreya" "Twitter Color Emoji"))

(setq available-fonts
      (delete-dups
       (or (font-family-list)
           (and (executable-find "fc-list")
                (with-temp-buffer
                  (call-process "fc-list" nil t nil ":" "family")
                  (split-string (buffer-string) "[,\n]"))))))
```

```
(setq missing-fonts
      (delq nil (mapcar
                 (lambda (font)
                   (unless (delq nil (mapcar (lambda (f)
                                               (string-match-p (format
                                               ↪  "^%s$" font) f))
                                             available-fonts))
                     font))
                 required-fonts)))

(if missing-fonts
    (pp-to-string
     `(unless noninteractive
        (add-hook! 'doom-init-ui-hook
          (run-at-time nil nil
                       (lambda ()
                         (let (required-fonts available-fonts
                         ↪  missing-fonts)
                           (setq required-fonts '("JetBrains ?Mono.*"
                           ↪  "Overpass" "JuliaMono" "IBM Plex Mono"
                                                 "Merriweather" "Alegreya"
                                                 ↪  "Twitter Color
                                                 ↪  Emoji"))

                           (setq available-fonts
                                 (delete-dups
                                  (or (font-family-list)
                                      (and (executable-find "fc-list")
                                           (with-temp-buffer
                                             (call-process "fc-list" nil t
                                             ↪  nil ":" "family")
                                             (split-string (buffer-string)
                                             ↪  "[,\n]"))))))

                           (setq missing-fonts
                                 (delq nil (mapcar
                                            (lambda (font)
                                              (unless (delq nil (mapcar
                                              ↪  (lambda (f)

                                                                   ↪  (string-match-p
                                                                   ↪  (format
                                                                   ↪  "^%s$"
                                                                   ↪  font)
                                                                   ↪  f))

                                                                 ↪  available-fonts))
                                                (font))
```

```
                                        required-fonts)))
                          (message "%s missing the following fonts: %s"
                                   (propertize "Warning!" 'face '(bold
                                   ↪ warning))
                                   (mapconcat (lambda (font)
                                                (propertize font 'face
                                                ↪ 'font-lock-variable-name-face))
                                              ',missing-fonts
                                              ", ")))
                          (sleep-for 0.5))))))
  ";; No missing fonts detected")
```

```
<<warn-missing-fonts()>>
```

This way whenever fonts are missing, after Doom's UI has initialised, a warning listing the missing fonts should appear for at least half a second.

2. Theme

   The `doom-one` theme is nice and all, but I find the `vibrant` variant nicer. With the light themes, I rather like `doom-tomorrow-day`. I'd like to pick the default from them based on the system theme. Thanks to the continued expansion of the `xdg-desktop-portal` protocols, we can read this from D-Bus on most systems.

```
(let ((light-theme 'doom-tomorrow-day)
      (dark-theme 'doom-vibrant)
      (system-theme
       (or (and (memq system-type '(gnu gnu/linux gnu/kfreebsd))
                (require 'dbus nil t)
                (caar
                 (ignore-errors
                   (dbus-call-method
                    :session
                    "org.freedesktop.portal.Desktop"
                    ↪ "/org/freedesktop/portal/desktop"
                    "org.freedesktop.portal.Settings" "Read"
                    "org.freedesktop.appearance" "color-scheme"))))
           0)))
  (pcase system-theme
    (1 dark-theme)
    (2 light-theme)
    (_ dark-theme)))
```

We'll use the appropriate theme as the default, but let's also accept the theme as an environment variable `DOOM_THEME` for fun.

```
(setq doom-theme ; Set according to the env var or system-dependent default
      (let ((env-theme (getenv "DOOM_THEME")))
```

```
        (if env-theme
            (intern env-theme) ; Note: `intern-soft' doesn't work here
          'nil)))
```

Oh, and with the nice selection doom provides there's no reason for me to want the defaults.

```
(delq! t custom-theme-load-path)
```

While the theme environment variable is nice for flexibility, when starting Emacs in a terminal it doesn't help us set the right sort of theme automatically. However, we can check if we're in a terminal and pick a default theme colour accordingly.

```
(declare-function 'xterm-query "xterm")

(defvar term-background-rgb nil
  "A RGB triple corresponding to the current terminal background, if known.")

(defun +interpret-term-bg ()
  "Examine an OSC color query response, and set `term-background-rgb'
  ↪  accordingly."
  (let ((str "")
        chr)
    ;; The reply should be: \e ] 11 ; rgb: NUMBER1 / NUMBER2 / NUMBER3 \e \\
    (while (and (setq chr (xterm--read-event-for-query)) (not (equal chr ?\\)))
      (setq str (concat str (string chr))))
    (when (string-match
           "rgb:\\([a-f0-9]+\\)/\\([a-f0-9]+\\)/\\([a-f0-9]+\\)" str)
      (let ((r (string-to-number (match-string 1 str) 16))
            (g (string-to-number (match-string 2 str) 16))
            (b (string-to-number (match-string 3 str) 16)))
        (setq term-background-rgb (list r g b))))))

(defun +doom-init-theme-termaware ()
  "Update `doom-theme' if in a terminal, unless DOOM_THEME has been set."
  (let (term-shade)
    (when (and (not (display-graphic-p (selected-frame)))
               (not (getenv "DOOM_THEME"))
               (require 'xterm nil t))
      (message "Querying terminal background color")
      (xterm--query "\e]11;?\e\\" '(("\e]11;" . +interpret-term-bg)))
      (when term-background-rgb
        (setq term-shade (if (< (apply #'+ term-background-rgb) (* 0.6 3 65535))
                             'dark 'light))
        (pcase term-shade
          ('dark (setq doom-theme 'doom-vibrant))
          ('light (setq doom-theme 'doom-tomorrow-day)))))
    (doom-init-theme-h)))
```

Lastly, I had some issues with theme race conditions, which seem to be resolved by moving

`doom-init-theme-h` around. Henrik attempted to help with this in May 2021 but we didn't manage to pin down the issue. It may be worth periodically checking back and seeing if this is still needed. We might as well inject `+doom-init-theme-termaware` while we're at it.

```
(remove-hook 'window-setup-hook #'doom-init-theme-h)
(remove-hook 'after-init-hook   #'doom-init-theme-h)
(add-hook    'after-init-hook   #'+doom-init-theme-termaware 'append)
```

3. Line numbers

   Relative line numbers are fantastic for knowing how far away line numbers are, then `ESC 12 <UP>` gets you exactly where you think.

   ```
   (setq display-line-numbers-type 'relative)
   ```

2.4.4 Some helper macros

There are a few handy macros added by doom, namely

- `load!` for loading external `.el` files relative to this one
- `use-package!` for configuring packages
- `add-load-path!` for adding directories to the `load-path` where `Emacs` looks when you load packages with `require` or `use-package`
- `map!` for binding new keys

2.4.5 Allow babel execution in CLI actions

In this config I sometimes generate code to include in my config. This works nicely, but for it to work with `doom sync` et. al. I need to make sure that Org doesn't try to confirm that I want to allow evaluation (I do!).

Thankfully Doom supports `$DOOMDIR/cli.el` file which is sourced every time a CLI command is run, so we can just enable evaluation by setting `org-confirm-babel-evaluate` to `nil` there. While we're at it, we should silence `org-babel-execute-src-block` to avoid polluting the output.

```
;;; cli.el -*- lexical-binding: t; -*-
(setq org-confirm-babel-evaluate nil)
```

```
(defun doom-shut-up-a (orig-fn &rest args)
  (quiet! (apply orig-fn args)))

(advice-add 'org-babel-execute-src-block :around #'doom-shut-up-a)
```

2.4.6 Elisp REPL

I think an elisp REPL sounds like a fun idea, even if not a particularly useful one 😛. We can do this by adding a new command in `cli.el`.

```
(defcli! repl ((in-rlwrap-p ("--rl") "For internal use only."))
  "Start an elisp REPL."
  (require 'core-start)
  (when (and (executable-find "rlwrap") (not in-rlwrap-p))
    ;; For autocomplete
    (setq autocomplete-file "/tmp/doom_elisp_repl_symbols")
    (unless (file-exists-p autocomplete-file)
      (princ "\e[0;33mInitialising autocomplete list...\e[0m\n")
      (with-temp-buffer
        (cl-do-all-symbols (s)
          (let ((sym (symbol-name s)))
            (when (string-match-p "\\`[[:ascii:]][[:ascii:]]+\\'" sym)
              (insert sym "\n"))))
        (write-region nil nil autocomplete-file)))
    (princ "\e[F")
    (exit! "rlwrap" "-f" autocomplete-file
           (concat doom-emacs-dir "bin/doom") "repl" "--rl"))

  (doom-initialize-packages)
  (require 'engrave-faces-ansi)
  (setq engrave-faces-ansi-color-mode '3-bit)

  ;; For some reason (require 'parent-mode) doesn't work :(
  (defun parent-mode-list (mode)
    "Return a list of MODE and all its parent modes.

The returned list starts with the parent-most mode and ends with MODE."
    (let ((result ()))
      (parent-mode--worker mode (lambda (mode)
                                  (push mode result)))
      result))
  (defun parent-mode--worker (mode func)
    "For MODE and all its parent modes, call FUNC.

FUNC is first called for MODE, then for its parent, then for the parent's
```

```
parent, and so on.

MODE shall be a symbol referring to a function.
FUNC shall be a function taking one argument."
    (funcall func mode)
    (when (not (fboundp mode))
      (signal 'void-function (list mode)))
    (let ((modefunc (symbol-function mode)))
      (if (symbolp modefunc)
          ;; Hande all the modes that use (defalias 'foo-parent-mode (stuff)) as
          ;; their parent
          (parent-mode--worker modefunc func)
        (let ((parentmode (get mode 'derived-mode-parent)))
          (when parentmode
            (parent-mode--worker parentmode func))))))
  (provide 'parent-mode)
  ;; Some extra highlighting (needs parent-mode)
  (require 'rainbow-delimiters)
  (require 'highlight-quoted)
  (require 'highlight-numbers)
  (setq emacs-lisp-mode-hook '(rainbow-delimiters-mode
                               highlight-quoted-mode
                               highlight-numbers-mode))
  ;; Pretty print
  (defun pp-sexp (sexp)
    (with-temp-buffer
      (cl-prettyprint sexp)
      (emacs-lisp-mode)
      (font-lock-ensure)
      (with-current-buffer (engrave-faces-ansi-buffer)
        (princ (string-trim (buffer-string)))
        (kill-buffer (current-buffer)))))
  ;; Now do the REPL
  (defvar accumulated-input nil)
  (while t
    (condition-case nil
        (let ((input (if accumulated-input
                         (read-string "\e[31m .\e[0m  ")
                       (read-string "\e[31m:\e[0m "))))
          (setq input (concat accumulated-input
                              (when accumulated-input "\n")
                              input))
          (cond
           ((string-match-p "\\`[[:space:]]*\\'" input)
            nil)
           ((string= input "exit")
            (princ "\n") (kill-emacs 0))
           (t
```

```
            (condition-case err
                (let ((input-sexp (car (read-from-string input))))
                  (setq accumulated-input nil)
                  (pp-sexp (eval input-sexp))
                  (princ "\n"))
              ;; Caused when sexp in unbalanced
              (end-of-file (setq accumulated-input input))
              (error
               (cl-destructuring-bind (backtrace &optional type data . _)
                   (cons (doom-cli--backtrace) err)
                 (princ (concat "\e[1;31mERROR:\e[0m " (get type 'error-message)))
                 (princ "\n       ")
                 (pp-sexp (cons type data))
                 (when backtrace
                   (print! (bold "Backtrace:"))
                   (print-group!
                    (dolist (frame (seq-take backtrace 10))
                      (print!
                       "%0.74s" (replace-regexp-in-string
                                 "[\n\r]" "\\\\n"
                                 (format "%S" frame))))))
                 (princ "\n")))))))
      ;; C-d causes an end-of-file error
      (end-of-file (princ "exit\n") (kill-emacs 0)))
    (unless accumulated-input (princ "\n"))))
```

2.4.7 Htmlize command

Why not have a command to htmlize files? This is basically a little test of my engrave-faces package because it somehow seems to work without a GUI, while the htmlize package doesn't.

```
(defcli! htmlize (file)
  "Export a FILE buffer to HTML."

  (print! "Htmlizing %s" file)

  (doom-initialize)
  (require 'highlight-numbers)
  (require 'highlight-quoted)
  (require 'rainbow-delimiters)
  (require 'engrave-faces-html)

  ;; Lighten org-mode
  (when (string= "org" (file-name-extension file))
    (setcdr (assoc 'org after-load-alist) nil)
```

```
    (setq org-load-hook nil)
    (require 'org)
    (setq org-mode-hook nil)
    (add-hook 'engrave-faces-before-hook
              (lambda () (if (eq major-mode 'org-mode)
                             (org-show-all)))))

  (engrave-faces-html-file file))
```

2.4.8 Org buffer creation

Let's make creating an Org buffer just that little bit easier.

```
(evil-define-command +evil-buffer-org-new (_count file)
  "Creates a new ORG buffer replacing the current window, optionally
   editing a certain FILE"
  :repeat nil
  (interactive "P<f>")
  (if file
      (evil-edit file)
    (let ((buffer (generate-new-buffer "*new org*")))
      (set-window-buffer nil buffer)
      (with-current-buffer buffer
        (org-mode)
        (setq-local doom-real-buffer-p t)))))

(map! :leader
      (:prefix "b"
       :desc "New empty Org buffer" "o" #'+evil-buffer-org-new))
```

2.4.9 Dashboard

1. A fancy splash screen

   Emacs can render an image as the splash screen, but I think we can do better than just a completely static image. Since, SVG images in particular are supported, we can use them as the basis for a fancier splash screen image setup — with themeable, resizing images.

   With the effort I'm putting into this, it would be nice to have a good image, and @MarioRicalde came up with a cracker! He's also provided me with a nice Emacs-style *E*. I was using the black-hole image, but when I stripped down the splash screen to something more minimal I switched to just using the *E*.

```
(defvar fancy-splash-image-directory
  (expand-file-name "misc/splash-images/" doom-user-dir)
  "Directory in which to look for splash image templates.")

(defvar fancy-splash-image-template
  (expand-file-name "emacs-e-template.svg" fancy-splash-image-directory)
  "Default template svg used for the splash image.
Colours are substituted as per `fancy-splash-template-colours'.")
```

Special named colours can be used as the basis for theming, with a simple replacement system.

```
(defvar fancy-splash-template-colours
  '(("#111112" :face default   :attr :foreground)
    ("#8b8c8d" :face shadow)
    ("#eeeeef" :face default   :attr :background)
    ("#e66100" :face highlight :attr :background)
    ("#1c71d8" :face font-lock-keyword-face)
    ("#f5c211" :face font-lock-type-face)
    ("#813d9c" :face font-lock-constant-face)
    ("#865e3c" :face font-lock-function-name-face)
    ("#2ec27e" :face font-lock-string-face)
    ("#c01c28" :face error)
    ("#000001" :face ansi-color-black)
    ("#ff0000" :face ansi-color-red)
    ("#ff00ff" :face ansi-color-magenta)
    ("#00ff00" :face ansi-color-green)
    ("#ffff00" :face ansi-color-yellow)
    ("#0000ff" :face ansi-color-blue)
    ("#00ffff" :face ansi-color-cyan)
    ("#fffffe" :face ansi-color-white))
  "Alist of colour-replacement plists.
Each plist is of the form (\"$placeholder\" :doom-color 'key :face 'face).
If the current theme is a doom theme :doom-color will be used,
otherwise the colour will be face foreground.")
```

If we want to make sure an image is themed, we can look for unrecognised hex strings that are not greyscale (as greyscale can be expected in the form of a transparent overlay).

```
(defun fancy-splash-check-buffer ()
  "Check the current SVG buffer for bad colours."
  (interactive)
  (when (eq major-mode 'image-mode)
    (xml-mode))
  (when (and (featurep 'rainbow-mode)
             (not (bound-and-true-p rainbow-mode)))
    (rainbow-mode 1))
  (let* ((colours (mapcar #'car fancy-splash-template-colours))
         (colourise-hex
          (lambda (hex)
            (propertize
             hex
             'face `((:foreground
                      ,(if (< 0.5
                              (cl-destructuring-bind (r g b) (x-color-values
                              ↪  hex)
                                ;; Values taken from `rainbow-color-luminance'
                                (/ (+ (* .2126 r) (* .7152 g) (* .0722 b))
                                   (* 256 255 1.0))))
                           "white" "black")
                      (:background ,hex))))))
         (cn 96)
         (colour-menu-entries
          (mapcar
           (lambda (colour)
             (cl-incf cn)
             (cons cn
                   (cons
                    (substring-no-properties colour)
                    (format " (%s) %s %s"
                            (propertize (char-to-string cn)
                                        'face 'font-lock-keyword-face)
                            (funcall colourise-hex colour)
                            (propertize
                             (symbol-name
                              (plist-get
                               (cdr (assoc colour
                               ↪  fancy-splash-template-colours))
                               :face))
                             'face 'shadow)))))
           colours))
         (colour-menu-template
          (format
           "Colour %%s is unexpected! Should this be one of the following?\n
%s
 %s to ignore
 %s to quit"
```

```
          (mapconcat
           #'cddr
           colour-menu-entries
           "\n")
          (propertize "SPC" 'face 'font-lock-keyword-face)
          (propertize "ESC" 'face 'font-lock-keyword-face)))
        (colour-menu-choice-keys
         (append (mapcar #'car colour-menu-entries)
                 (list ?\s)))
        (buf (get-buffer-create "*fancy-splash-lint-colours-popup*"))
        (good-colour-p
         (lambda (colour)
           (or (assoc colour fancy-splash-template-colours)
               ;; Check if greyscale
               (or (and (= (length colour) 4)
                        (= (aref colour 1)   ; r
                           (aref colour 2)   ; g
                           (aref colour 3))) ; b
                   (and (= (length colour) 7)
                        (string= (substring colour 1 3)       ; rr =
                                 (substring colour 3 5))      ; gg
                        (string= (substring colour 3 5)       ; gg =
                                 (substring colour 5 7)))))))) ; bb
        (prompt-to-replace
         (lambda (target)
           (with-current-buffer buf
             (erase-buffer)
             (insert (format colour-menu-template
                             (funcall colourise-hex target)))
             (setq-local cursor-type nil)
             (set-buffer-modified-p nil)
             (goto-char (point-min)))
           (save-window-excursion
             (pop-to-buffer buf)
             (fit-window-to-buffer (get-buffer-window buf))
             (car (alist-get
                   (read-char-choice
                    (format "Select replacement, %s-%s or SPC: "
                            (char-to-string (caar colour-menu-entries))
                            (char-to-string (caar (last colour-menu-entries))))
                    colour-menu-choice-keys)
                   colour-menu-entries))))))
    (save-excursion
      (goto-char (point-min))
      (while (re-search-forward "#[0-9A-Fa-f]\\{6\\}\\|#[0-9A-Fa-f]\\{3\\}" nil
      ↪  t)
        (recenter)
        (let* ((colour (match-string 0))
```

```
              (replacement (and (not (funcall good-colour-p colour))
                                (funcall prompt-to-replace colour))))
          (when replacement
            (replace-match replacement t t))))
      (message "Done"))))
```

To make it easier to produce themeable images, we can also provide an Inkscape colour palette.

```
GIMP Palette
Name: Emacs Fancy Splash Template
#
 17  17  18 #111112 Foreground
139 140 141 #8b8c8d Shadow
238 238 239 #eeeeef Background
230  97   0 #e66100 Colour 1 (Highlight)
 28 113 216 #1c71d8 Colour 2 (Keyword)
245 194  17 #f5c211 Colour 3 (Type)
129  61 156 #813d9c Colour 4 (Constant)
134  94  60 #865e3c Colour 5 (Function)
 46 194 126 #2ec27e Colour 6 (String)
192  28  40 #c01c28 Colour 7 (Error)
  0   0   1 #000001 Black
255   0   0 #ff0000 Red
255   0 255 #ff00ff Magenta
  0 255   0 #00ff00 Green
255 255   0 #ffff00 Yellow
  0   0 255 #0000ff Blue
  0 255 255 #00ffff Cyan
255 255 254 #fffffe White
```

Since we're going to be generating theme-specific versions of splash images, it would be good to have a cache directory.

```
(defvar fancy-splash-cache-dir (expand-file-name "theme-splashes/"
↪  doom-cache-dir))
```

To set up dynamic resizing, we'll use a list specifying the image height at various frame-height thresholds, with a few extra bells and whistles (such as the ability to change image too).

```
(defvar fancy-splash-sizes
  `((:height 300 :min-height 50 :padding (0 . 2))
    (:height 250 :min-height 42 :padding (2 . 4))
    (:height 200 :min-height 35 :padding (3 . 3))
    (:height 150 :min-height 28 :padding (3 . 3))
    (:height 100 :min-height 20 :padding (2 . 2))
    (:height 75  :min-height 15 :padding (2 . 1))
```

```
    (:height 50  :min-height 10 :padding (1 . 0))
    (:height 1   :min-height 0  :padding (0 . 0)))
  "List of plists specifying image sizing states.
Each plist should have the following properties:
- :height, the height of the image
- :min-height, the minimum `frame-height' for image
- :padding, a `+doom-dashboard-banner-padding' (top . bottom) padding
  specification to apply
Optionally, each plist may set the following two properties:
- :template, a non-default template file
- :file, a file to use instead of template")
```

Now that's we've set up the customisation approach, we need to work out the mechanics for actually implementing this. To start with, a basic utility function to get the relevant file path.

```
(defun fancy-splash-filename (theme template height)
  "Get the file name for the splash image with THEME and of HEIGHT."
  (expand-file-name (format "%s-%s-%d.svg" theme (file-name-base template)
  ↪  height) fancy-splash-cache-dir))
```

Now to go about actually generating the images. To adjust the sizing on demand, we will offer two mechanisms:

a) A special `$height` token which is replaced with the desired height

b) Recognition of `height=100`, in which case `100` will be replaced with the desired height and any `width` property will be removed.

```
(defun fancy-splash-generate-image (template height)
  "Create a themed image from TEMPLATE of HEIGHT.
The theming is performed using `fancy-splash-template-colours'
and the current theme."
  (with-temp-buffer
    (insert-file-contents template)
    (goto-char (point-min))
    (if (re-search-forward "$height" nil t)
        (replace-match (number-to-string height) t t)
      (if (re-search-forward "height=\"100\\(?:\\.0[0-9]*\\)?\"" nil t)
          (progn
            (replace-match (format "height=\"%s\"" height) t t)
            (goto-char (point-min))
            (when (re-search-forward "\\([ \t\n]\\)width=\"[\\.0-9]+\"[ \t\n]*"
            ↪  nil t)
              (replace-match "\\1")))
        (warn "Warning! fancy splash template: neither $height nor height=100
        ↪  not found in %s" template)))
    (dolist (substitution fancy-splash-template-colours)
      (goto-char (point-min))
```

```
      (let* ((replacement-colour
              (face-attribute (plist-get (cdr substitution) :face)
                              (or (plist-get (cdr substitution) :attr)
                              ↪  :foreground)
                              nil 'default))
             (replacement-hex
              (if (string-prefix-p "#" replacement-colour)
                  replacement-colour
                (apply 'format "#%02x%02x%02x"
                       (mapcar (lambda (c) (ash c -8))
                               (color-values replacement-colour))))))
        (while (search-forward (car substitution) nil t)
          (replace-match replacement-hex nil nil))))
    (unless (file-exists-p fancy-splash-cache-dir)
      (make-directory fancy-splash-cache-dir t))
    (let ((inhibit-message t))
      (write-region nil nil (fancy-splash-filename (car custom-enabled-themes)
      ↪  template height)))))
```

We may as well generate each theme's appropriate images in bunk.

```
(defun fancy-splash-generate-all-images ()
  "Perform `fancy-splash-generate-image' in bulk."
  (dolist (size fancy-splash-sizes)
    (unless (plist-get size :file)
      (fancy-splash-generate-image
       (or (plist-get size :template)
           fancy-splash-image-template)
       (plist-get size :height)))))
```

It would be nice to have a simple check function which will just generate the set of relevant images if needed, and do nothing if they already exist.

```
(defun fancy-splash-ensure-theme-images-exist (&optional height)
  "Ensure that the relevant images exist.
Use the image of HEIGHT to check, defaulting to the height of the first
specification in `fancy-splash-sizes'. If that file does not exist for
the current theme, `fancy-splash-generate-all-images' is called. "
  (unless (file-exists-p
           (fancy-splash-filename
            (car custom-enabled-themes)
            fancy-splash-image-template
            (or height (plist-get (car fancy-splash-sizes) :height))))
    (fancy-splash-generate-all-images)))
```

In case we switch out the images used (or something else goes wrong), it would be good to have a convenient method to clear this cache.

```
(defun fancy-splash-clear-cache (&optional delete-files)
  "Clear all cached fancy splash images.
Optionally delete all cache files and regenerate the currently relevant set."
  (interactive (list t))
  (dolist (size fancy-splash-sizes)
    (unless (plist-get size :file)
      (let ((image-file
             (fancy-splash-filename
              (car custom-enabled-themes)
              (or (plist-get size :template)
                  fancy-splash-image-template)
              (plist-get size :height))))
        (image-flush (create-image image-file) t))))
  (message "Fancy splash image cache cleared!")
  (when delete-files
    (delete-directory fancy-splash-cache-dir t)
    (fancy-splash-generate-all-images)
    (message "Fancy splash images cache deleted!")))
```

In a similar way, it could be fun to allow for switching the template used. We can support this by looking for files ending in `-template.svg` and running `image-flush` via `fancy-splash-clear-cache`

```
(defun fancy-splash-switch-template ()
  "Switch the template used for the fancy splash image."
  (interactive)
  (let ((new (completing-read
              "Splash template: "
              (mapcar
               (lambda (template)
                 (replace-regexp-in-string "-template\\.svg$" "" template))
               (directory-files fancy-splash-image-directory nil
               ↪  "-template\\.svg\\'"))
              nil t)))
    (setq fancy-splash-image-template
          (expand-file-name (concat new "-template.svg")
          ↪  fancy-splash-image-directory))
    (fancy-splash-clear-cache)
    (message "") ; Clear message from `fancy-splash-clear-cache'.
    (setq fancy-splash--last-size nil)
    (fancy-splash-apply-appropriate-image)))
```

Now we can ensure that the desired images exist, we need to work out which particular one we want. This is really just a matter of comparing the frame height to the set of presets.

```
(defun fancy-splash-get-appropriate-size ()
  "Find the firt `fancy-splash-sizes' with min-height of at least frame
  ↪  height."
  (let ((height (frame-height)))
```

```
    (cl-some (lambda (size) (when (>= height (plist-get size :min-height))
    ↪  size))
             fancy-splash-sizes)))
```

We now want to apply the appropriate image to the dashboard. At the same time, we don't want to do so needlessly, so we may as well record the size and theme to determine when a refresh is actually needed.

```
(setq fancy-splash--last-size nil)
(setq fancy-splash--last-theme nil)

(defun fancy-splash-apply-appropriate-image (&rest _)
  "Ensure the appropriate splash image is applied to the dashboard.
This function's signature is \"&rest _\" to allow it to be used
in hooks that call functions with arguments."
  (let ((appropriate-size (fancy-splash-get-appropriate-size)))
    (unless (and (equal appropriate-size fancy-splash--last-size)
                 (equal (car custom-enabled-themes) fancy-splash--last-theme))
      (unless (plist-get appropriate-size :file)
        (fancy-splash-ensure-theme-images-exist (plist-get appropriate-size
        ↪  :height)))
      (setq fancy-splash-image
            (or (plist-get appropriate-size :file)
                (fancy-splash-filename (car custom-enabled-themes)
                                       fancy-splash-image-template
                                       (plist-get appropriate-size :height)))
            +doom-dashboard-banner-padding (plist-get appropriate-size :padding)
            fancy-splash--last-size appropriate-size
            fancy-splash--last-theme (car custom-enabled-themes))
      (+doom-dashboard-reload))))
```

2. ASCII banner

   If we're operating in a terminal (or `emacclient`) we see an ASCII banner instead of the graphical one. I'd also like to use something simple for this.

```
(defun doom-dashboard-draw-ascii-emacs-banner-fn ()
  (let* ((banner
          '(",---.,-.-.,---.,---.,---."
            "|---'| | |,---||    `---."
            "`---'` ' '`---^`---'`---'"))
         (longest-line (apply #'max (mapcar #'length banner))))
    (put-text-property
     (point)
     (dolist (line banner (point))
       (insert (+doom-dashboard--center
                +doom-dashboard--width
                (concat
```

```
                line (make-string (max 0 (- longest-line (length line)))
                                  32)))
              "\n"))
    'face 'doom-dashboard-banner)))
```

Now we just need this as Doom's ASCII banner function.

```
(unless (display-graphic-p) ; for some reason this messes up the graphical
↪  splash screen atm
  (setq +doom-dashboard-ascii-banner-fn
  ↪  #'doom-dashboard-draw-ascii-emacs-banner-fn))
```

3. Splash phrases

   Having an aesthetically pleasing image is all very well and good, but I'm aiming for minimal, not clinical — it would be good to inject some fun into the dashboard. After trawling around the internet for a bit, I've found three sources of fun phrases, namely:

   - a nonsense corporate jargon generator,
   - a selection of random developer excuses, and
   - a collection of fun but rather useless facts.

   I used to have a fancy method that used web APIs for these and inserted an invisible placeholder into the dashboard which was asynchronously replaced on the result of (debounced) requests to the APIs. While that actually worked quite well, I realised that it would be much better and simpler if I simply copied the phrases sources to local files and did the random selection / generation in elisp.

   Let's start off by setting the local folder to put the phrase source files in.

```
(defvar splash-phrase-source-folder
  (expand-file-name "misc/splash-phrases" doom-user-dir)
  "A folder of text files with a fun phrase on each line.")
```

   Now we want to support two "phrase systems"

   a) A complete file of phrases, one phrase per line

   b) A collection of phrase-components, put together to form a phrase

   It would be good to specify/detect which of the two cases apply based on the file name alone. I've done this by setting the simple check that if the file name contains `-N-` (where `N` is some number) then it is taken as the `N`th phrase component, with everything preceding the `-N-` token taken as the collection identifier, and everything after `-N-` ignored.

```
(defvar splash-phrase-sources
  (let* ((files (directory-files splash-phrase-source-folder nil "\\.txt\\'"))
         (sets (delete-dups (mapcar
```

```
                          (lambda (file)
                            (replace-regexp-in-string
                            ↪  "\\(?:-[0-9]+-\\w+\\)?\\.txt" "" file))
                          files))))
    (mapcar (lambda (sset)
              (cons sset
                    (delq nil (mapcar
                               (lambda (file)
                                 (when (string-match-p (regexp-quote sset) file)
                                   file))
                               files))))
            sets))
  "A list of cons giving the phrase set name, and a list of files which contain
  ↪  phrase components.")
```

Let's fix the phrase set in use, and pick a random phrase source on startup.

```
(defvar splash-phrase-set
  (nth (random (length splash-phrase-sources)) (mapcar #'car
  ↪  splash-phrase-sources))
  "The default phrase set. See `splash-phrase-sources'.")
```

While having a random set of phrases is fantastic the vast majority of the time, I expect that occasionally I'll feel in the mood to change the phrase set or pick a particular one, so some functions for that would be nice.

```
(defun splash-phrase-set-random-set ()
  "Set a new random splash phrase set."
  (interactive)
  (setq splash-phrase-set
        (nth (random (1- (length splash-phrase-sources)))
             (cl-set-difference (mapcar #'car splash-phrase-sources) (list
             ↪  splash-phrase-set))))
  (+doom-dashboard-reload t))

(defun splash-phrase-select-set ()
  "Select a specific splash phrase set."
  (interactive)
  (setq splash-phrase-set (completing-read "Phrase set: " (mapcar #'car
  ↪  splash-phrase-sources)))
  (+doom-dashboard-reload t))
```

If we're going to be selecting phrases from a large list of lines, it could be worth caching the list of lines.

```
(defvar splash-phrase--cached-lines nil)
```

Now let's write a function that will pick a random line from a file, using `splash-phrase--cached-lines` if possible.

```
(defun splash-phrase-get-from-file (file)
  "Fetch a random line from FILE."
  (let ((lines (or (cdr (assoc file splash-phrase--cached-lines))
                   (cdar (push (cons file
                                     (with-temp-buffer
                                       (insert-file-contents (expand-file-name
                                       ↪  file splash-phrase-source-folder))
                                       (split-string (string-trim
                                       ↪  (buffer-string)) "\n")))
                               splash-phrase--cached-lines)))))
    (nth (random (length lines)) lines)))
```

With this, we now have enough to generate random phrases on demand.

```
(defun splash-phrase (&optional set)
  "Construct a splash phrase from SET. See `splash-phrase-sources'."
  (mapconcat
   #'splash-phrase-get-from-file
   (cdr (assoc (or set splash-phrase-set) splash-phrase-sources))
   " "))
```

I originally thought this might be enough, but some phrases are a tad long, and this isn't exactly doom-dashboard appropriate. In such cases we need to split lines, re-centre them, and add some whitespace. While we're at it, we may as well make it that you can click on the phrase to replace it with new one.

```
(defun splash-phrase-dashboard-formatted ()
  "Get a splash phrase, flow it over multiple lines as needed, and fontify it."
  (mapconcat
   (lambda (line)
     (+doom-dashboard--center
      +doom-dashboard--width
      (with-temp-buffer
        (insert-text-button
         line
         'action
         (lambda (_) (+doom-dashboard-reload t))
         'face 'doom-dashboard-menu-title
         'mouse-face 'doom-dashboard-menu-title
         'help-echo "Random phrase"
         'follow-link t)
        (buffer-string))))
   (split-string
    (with-temp-buffer
      (insert (splash-phrase))
      (setq fill-column (min 70 (/ (* 2 (window-width)) 3)))
      (fill-region (point-min) (point-max))
      (buffer-string))
```

```
    "\n")
   "\n"))
```

Almost there now, this just needs some centreing and newlines.

```
(defun splash-phrase-dashboard-insert ()
  "Insert the splash phrase surrounded by newlines."
  (insert "\n" (splash-phrase-dashboard-formatted) "\n"))
```

4. Quick actions

   When using the dashboard, there are often a small number of actions I will take. As the dashboard is it's own major mode, there is no need to suffer the tyranny of unnecessary keystrokes — we can simply bind common actions to a single key!

```
(defun +doom-dashboard-setup-modified-keymap ()
  (setq +doom-dashboard-mode-map (make-sparse-keymap))
  (map! :map +doom-dashboard-mode-map
        :desc "Find file" :ng "f" #'find-file
        :desc "Recent files" :ng "r" #'consult-recent-file
        :desc "Config dir" :ng "C" #'doom/open-private-config
        :desc "Open config.org" :ng "c" (cmd! (find-file (expand-file-name
        ↪  "config.org" doom-user-dir)))
        :desc "Open org-mode root" :ng "O" (cmd! (find-file (expand-file-name
        ↪  "lisp/org/" doom-user-dir)))
        :desc "Open dotfile" :ng "." (cmd! (doom-project-find-file
        ↪  "~/.config/"))
        :desc "Notes (roam)" :ng "n" #'org-roam-node-find
        :desc "Switch buffer" :ng "b" #'+vertico/switch-workspace-buffer
        :desc "Switch buffers (all)" :ng "B" #'consult-buffer
        :desc "IBuffer" :ng "i" #'ibuffer
        :desc "Previous buffer" :ng "p" #'previous-buffer
        :desc "Set theme" :ng "t" #'consult-theme
        :desc "Quit" :ng "Q" #'save-buffers-kill-terminal
        :desc "Show keybindings" :ng "h" (cmd! (which-key-show-keymap
        ↪  '+doom-dashboard-mode-map))))

(add-transient-hook! #'+doom-dashboard-mode
↪  (+doom-dashboard-setup-modified-keymap))
(add-transient-hook! #'+doom-dashboard-mode :append
↪  (+doom-dashboard-setup-modified-keymap))
(add-hook! 'doom-init-ui-hook :append (+doom-dashboard-setup-modified-keymap))
```

Unfortunately the show keybindings help doesn't currently work as intended, but this is still quite nice overall.

Now that the dashboard is so convenient, I'll want to make it easier to get to.

```
(map! :leader :desc "Dashboard" "d" #'+doom-dashboard/open)
```

5. Putting it all together

   With the splash image and phrase generation worked out, we can almost put together the desired dashboard from scratch, we just need to re-create the benchmark information by itself.

```
(defun +doom-dashboard-benchmark-line ()
  "Insert the load time line."
  (when doom-init-time
    (insert
     "\n\n"
     (propertize
      (+doom-dashboard--center
       +doom-dashboard--width
       (doom-display-benchmark-h 'return))
      'face 'doom-dashboard-loaded))))
```

   With `doom-display-benchmark-h` displayed here, I don't see the need for it to be shown in the minibuffer as well.

```
(remove-hook 'doom-after-init-hook #'doom-display-benchmark-h)
```

   Now we can create the desired dashboard by setting `+doom-dashboard-functions` to just have:

   - The "widget banner" (splash image)
   - The benchmark line
   - A random phrase

   This gets rid of two segments I'm not particularly interested in seeing

   - The shortmenu
   - The footer (github link)

```
(setq +doom-dashboard-functions
      (list #'doom-dashboard-widget-banner
            #'+doom-dashboard-benchmark-line
            #'splash-phrase-dashboard-insert))
```

   At this point there are just a few minor tweaks I'd still like to make to the dashboard.

```
(defun +doom-dashboard-tweak (&optional _)
  (with-current-buffer (get-buffer +doom-dashboard-name)
    (setq-local line-spacing 0.2
                mode-line-format nil
                mode-name ""
                evil-normal-state-cursor (list nil))))
```

Now we can just add this as a mode hook.

```
(add-hook '+doom-dashboard-mode-hook #'+doom-dashboard-tweak)
```

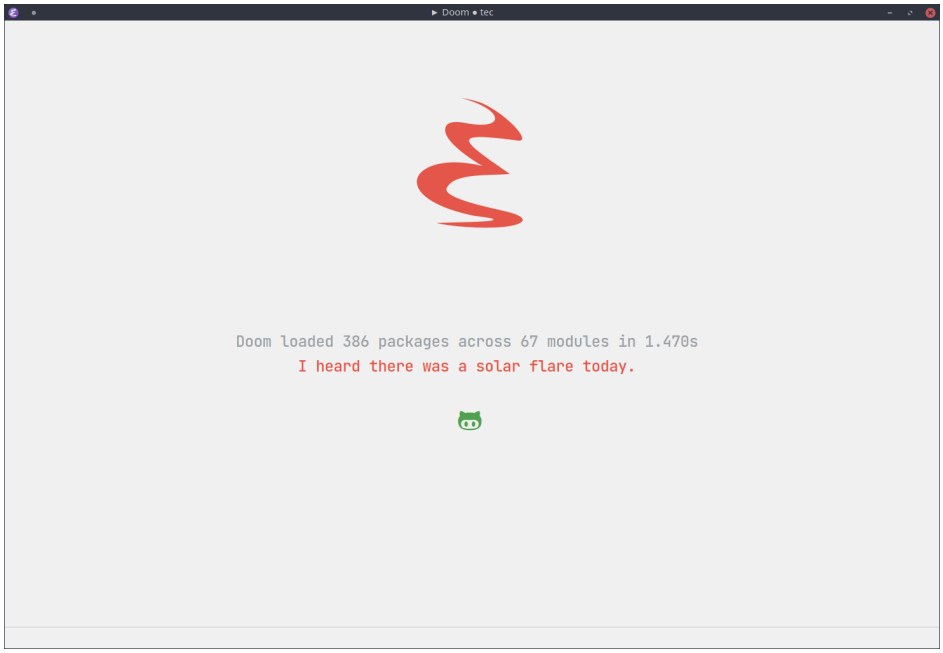
Unfortunately, the initialisation of `doom-modeline` interferes with the set `mode-line-format` value. To get around this, we can re-apply `+doom-dashboard-tweak` as a slightly late init hook, after `doom-modeline` has been loaded.

```
(add-hook 'doom-after-init-hook #'+doom-dashboard-tweak 1)
```

Lastly, with the buffer name being shown in the frame title thanks to some other configuration, we might as well display something a bit prettier than `*doom*`.

```
(setq +doom-dashboard-name " Doom"
      doom-fallback-buffer-name +doom-dashboard-name)
```

The end result is a minimal but rather nice splash screen.



To keep the splash image up to date, we just need to check it every time the frame size or theme is changed.

```
(add-hook 'window-size-change-functions #'fancy-splash-apply-appropriate-image)
(add-hook 'doom-load-theme-hook #'fancy-splash-apply-appropriate-image)
```

2.4.10 Config doctor

We can collect checks throughout this config and put them in a `doctor.el` file that will be run as part of `doom doctor`. This will complement the `setup.sh` approach.

```
;;; doctor.el -*- lexical-binding: t; no-byte-compile: t; -*-

(let (required-fonts available-fonts missing-fonts)
  (setq required-fonts '("JetBrains ?Mono.*" "Overpass" "JuliaMono" "IBM Plex Mono"
                         "Merriweather" "Alegreya" "Twitter Color Emoji"))

  (setq available-fonts
        (delete-dups
         (or (font-family-list)
             (and (executable-find "fc-list")
                  (with-temp-buffer
                    (call-process "fc-list" nil t nil ":" "family")
                    (split-string (buffer-string) "[,\n]"))))))

  (setq missing-fonts
        (delq nil (mapcar
                   (lambda (font)
                     (unless (delq nil (mapcar (lambda (f)
                                                 (string-match-p (format "^%s$" font)
                                                 ↪  f))
                                               available-fonts))
                       font))
                   required-fonts)))
  (if available-fonts
      (dolist (font missing-fonts)
        (warn! (format "Missing font: %s." font)))
    (warn! "Unable to check for missing fonts, is fc-list installed?")))
(unless (string= "enabled\n" (shell-command-to-string "systemctl --user is-enabled
↪  emacs.service"))
  (warn! "Emacsclient service is not enabled."))
(unless (executable-find "hunspell")
  (warn! "Couldn't find hunspell executable."))
(unless (file-exists-p "~/.local/share/hunspell/en-custom.dic")
  (warn! "Custom hunspell dictionary is not present."))
(unless (executable-find "aspell")
  (warn! "Couldn't find aspell executable."))
(unless (file-exists-p "~/.config/enchant/aspell/en-custom.multi")
  (warn! "Custom aspell dictionary is not present."))
(unless (executable-find "wal")
  (warn! "Couldn't find the pywal executable (wal), theme-magic will not function."))
(if (executable-find "sdcv")
    (let ((dict-root (concat (or (getenv "STARDICT_DATA_DIR")
```

```
                                (concat (or "~/.local/share"
                                            (getenv "XDG_DATA_HOME"))
                                        "/stardict"))
                            "/dic"))
          (dicts '("webster" "synonyms" "etymology" "en-to-latin" "hitchcock"
          ↪  "elements")))
      (if (file-exists-p dict-root)
          (dolist (dict dicts)
            (unless (file-exists-p (file-name-concat dict-root dict))
              (warn! (format "Absent sdcv dictionary: %s." dict))))
        (warn! "Couldn't find any stcv dictionaries, lexic will not function")))
  (warn! "Couldn't find sdcv executable, lexic will be disabled"))
(when (file-exists-p "~/.mail") ; We care about mail when the mail folder exists
  (unless (executable-find "mu")
    (error! "Couldn't find mail dependency mu."))
  (unless (executable-find "mbsync")
    (error! "Couldn't find mail dependency mbsync."))
  (unless (executable-find "msmtp")
    (error! "Couldn't find mail dependency msmtp."))
  (unless (executable-find "goimapnotify")
    (warn! "Couldn't find mail helper goimapnotify, mail syncs will be slower.")))
(when (and (executable-find "goimapnotify")
           (not (file-exists-p "~/.config/imapnotify")))
  (warn! "goimapnotify is installed but not configured."))
(when (executable-find "mbsync")
  (unless (string= "enabled\n" (shell-command-to-string "systemctl --user is-enabled
  ↪  mbsync.timer"))
    (warn! "The mbsync timer is not enabled.")))
(when (and (executable-find "mu")
           (not (string= (shell-command-to-string "xdg-mime query default
           ↪  x-scheme-handler/mailto")
                         "emacsmail.desktop\n")))
  (warn! "Emacs is not registered as a mailto handler."))
(if (string= (shell-command-to-string "xdg-mime query default text/org") "")
  (warn! "text/org is not a registered mime type.")
  (unless (string= (shell-command-to-string "xdg-mime query default text/org")
  ↪  "emacs-client.desktop\n")
    (warn! "Emacs(client) is not set up as the text/org handler.")))
(unless (executable-find "latex2text")
  (warn! "Couldn't find latex2text executable (from pylatexenc), will be unable to
  ↪  render LaTeX fragments in org→text exports."))
```

2.5 Other things

2.5.1 Editor interaction

1. Mouse buttons

```
(map! :n [mouse-8] #'better-jumper-jump-backward
      :n [mouse-9] #'better-jumper-jump-forward)
```

2.5.2 Window title

I'd like to have just the buffer name, then if applicable the project folder

```
(setq frame-title-format
      '(""
        (:eval
         (if (string-match-p (regexp-quote (or (bound-and-true-p org-roam-directory)
         ↪  "\u0000"))
                             (or buffer-file-name ""))
             (replace-regexp-in-string
              ".*/[0-9]*-?" " "
              (subst-char-in-string ?_ ?\s buffer-file-name))
           "%b"))
        (:eval
         (when-let ((project-name (and (featurep 'projectile)
         ↪  (projectile-project-name))))
           (unless (string= "-" project-name)
             (format (if (buffer-modified-p)  " ◉ %s" "  %s") project-name))))))
```

For example when I open my config file it the window will be titled `config.org  doom` then as soon as I make a change it will become `config.org  doom`.

2.5.3 Systemd daemon

For running a systemd service for a Emacs server I have the following. `zsh -c` is used to ensure that `.zshenv` is loaded.

```
[Unit]
Description=Emacs server daemon
Documentation=info:emacs man:emacs(1) https://gnu.org/software/emacs/
Wants=gpg-agent.service
```

```
[Service]
Type=forking
ExecStart=zsh -c 'emacs --daemon && emacsclient -c --eval "(delete-frame)"'
ExecStop=/usr/bin/emacsclient --no-wait --eval "(progn (setq kill-emacs-hook nil)
↪  (kill emacs))"
Environment=COLORTERM=truecolor
Restart=on-failure

[Install]
WantedBy=default.target
```

which is then enabled by

```
systemctl --user enable emacs.service
```

We can also add a `doctor` warning should this not be enabled.

```
(unless (string= "enabled\n" (shell-command-to-string "systemctl --user is-enabled
↪  emacs.service"))
  (warn! "Emacsclient service is not enabled."))
```

For some reason if a frame isn't opened early in the initialisation process, the daemon doesn't seem to like opening frames later — hence the `&& emacsclient` part of the `ExecStart` value.

It can now be nice to use this as a 'default app' for opening files. If we add an appropriate desktop entry, and enable it in the desktop environment.

```
[Desktop Entry]
Name=Emacs client
GenericName=Text Editor
Comment=A flexible platform for end-user applications
MimeType=text/english;text/plain;text/x-makefile;text/x-c++hdr;text/x-c++src;text/x-chdr;text/x-csrc;text/x
Exec=emacsclient -create-frame --alternate-editor="" --no-wait %F
Icon=emacs
Type=Application
Terminal=false
Categories=TextEditor;Utility;
StartupWMClass=Emacs
Keywords=Text;Editor;
X-KDE-StartupNotify=false
```

When the daemon is running, I almost always want to do a few particular things with it, so I may as well eat the load time at startup. We also want to keep `mu4e` running.

It would be good to start the IRC client (`circe`) too, but that seems to have issues when started in a non-graphical session.

Lastly, while I'm not sure quite why it happens, but after a bit it seems that new Emacsclient frames start on the `*scratch*` buffer instead of the dashboard. I prefer the dashboard, so let's ensure that's always switched to in new frames.

```
(defun greedily-do-daemon-setup ()
  (require 'org)
  (when (require 'mu4e nil t)
    (setq mu4e-confirm-quit t)
    (setq +mu4e-lock-greedy t)
    (setq +mu4e-lock-relaxed t)
    (when (+mu4e-lock-available t)
      (mu4e--start)))
  (when (require 'elfeed nil t)
    (run-at-time nil (* 8 60 60) #'elfeed-update)))

(when (daemonp)
  (add-hook 'emacs-startup-hook #'greedily-do-daemon-setup)
  (add-hook! 'server-after-make-frame-hook
    (unless (string-match-p "\\*draft\\|\\*stdin\\|emacs-everywhere" (buffer-name))
      (switch-to-buffer +doom-dashboard-name))))
```

2.5.4 Emacs client wrapper

I frequently want to make use of Emacs while in a terminal emulator. To make this easier, I can construct a few handy aliases.

However, a little convenience script in `~/.local/bin` can have the same effect, be available beyond the specific shell I plop the alias in, then also allow me to add a few bells and whistles — namely:

- Accepting stdin by putting it in a temporary file and immediately opening it.
- Guessing that the `tty` is a good idea when `$DISPLAY` is unset (relevant with SSH sessions, among other things).
- With a whiff of 24-bit colour support, sets `TERM` variable to a `terminfo` that (probably) announces 24-bit colour support.
- Changes GUI `emacsclient` instances to be non-blocking by default (`--no-wait`), and instead take a flag to suppress this behaviour (`-w`).

I would use `sh`, but using arrays for argument manipulation is just too convenient, so I'll raise the requirement to `bash`. Since arrays are the only 'extra' compared to `sh`, other shells like `ksh` etc. should work too.

```
#!/usr/bin/env bash
force_tty=false
force_wait=false
stdin_mode=""

args=()

while :; do
    case "$1" in
        -t | -nw | --tty)
            force_tty=true
            shift ;;
        -w | --wait)
            force_wait=true
            shift ;;
        -m | --mode)
            stdin_mode=" ($2-mode)"
            shift 2 ;;
        -h | --help)
            echo -e "\033[1mUsage: e [-t] [-m MODE] [OPTIONS] FILE [-]\033[0m

Emacs client convenience wrapper.

\033[1mOptions:\033[0m
\033[0;34m-h, --help\033[0m            Show this message
\033[0;34m-t, -nw, --tty\033[0m        Force terminal mode
\033[0;34m-w, --wait\033[0m            Don't supply \033[0;34m--no-wait\033[0m to
↪  graphical emacsclient
\033[0;34m-\033[0m                     Take \033[0;33mstdin\033[0m (when last
↪  argument)
\033[0;34m-m MODE, --mode MODE\033[0m  Mode to open \033[0;33mstdin\033[0m with

Run \033[0;32memacsclient --help\033[0m to see help for the emacsclient."
            exit 0 ;;
        --*=*)
            set -- "$@" "${1%%=*}" "${1#*=}"
            shift ;;
        *)
            if [ "$#" = 0 ]; then
                break; fi
            args+=("$1")
            shift ;;
    esac
done

if [ ! "${#args[*]}" = 0 ] && [ "${args[-1]}" = "-" ]; then
    unset 'args[-1]'
    TMP="$(mktemp /tmp/emacsstdin-XXX)"
```

```
    cat > "$TMP"
    args+=(--eval "(let ((b (generate-new-buffer \"*stdin*\"))) (switch-to-buffer b)
    ↪  (insert-file-contents \"$TMP\") (delete-file \"$TMP\")${stdin_mode})")
fi

if [ -z "$DISPLAY" ] || $force_tty; then
    # detect terminals with sneaky 24-bit support
    if { [ "$COLORTERM" = truecolor ] || [ "$COLORTERM" = 24bit ]; } \
        && [ "$(tput colors 2>/dev/null)" -lt 257 ]; then
        if echo "$TERM" | grep -q "^\w\+-[0-9]"; then
            termstub="${TERM%%-*}"; else
            termstub="${TERM#*-}"; fi
        if infocmp "$termstub-direct" >/dev/null 2>&1; then
            TERM="$termstub-direct"; else
            TERM="xterm-direct"; fi # should be fairly safe
    fi
    emacsclient --tty -create-frame --alternate-editor="$ALTERNATE_EDITOR"
    ↪  "${args[@]}"
else
    if ! $force_wait; then
        args+=(--no-wait); fi
    emacsclient -create-frame --alternate-editor="$ALTERNATE_EDITOR" "${args[@]}"
fi
```

Now, to set an alias to use e with Magit, and then for maximum laziness we can set aliases for the terminal-forced variants.

```
alias m='e --eval "(progn (magit-status) (delete-other-windows))"'
alias mt="m -t"
alias et="e -t"
```

2.5.5 Prompt to run setup script

At various points in this config, content is conditionally tangled to `./setup.sh`. It's no good just putting content there if it isn't run though. To help remind me to run it when needed, let's add a little prompt when there's anything to be run.

```
(if (file-exists-p "setup.sh")
    (if (string-empty-p (string-trim (with-temp-buffer (insert-file-contents
    ↪  "setup.sh") (buffer-string)) "#!/usr/bin/env bash"))
        (message ";; Setup script is empty")
      (message ";; Detected content in the setup script")
      (pp-to-string
       `(unless noninteractive
          (defun +config-run-setup ()
```

```
            (when-let ((setup-file (expand-file-name "setup.sh" doom-user-dir))
                       ((file-exists-p setup-file))
                       (setup-content (string-trim (with-temp-buffer
                       ↪  (insert-file-contents setup-file) (buffer-string))
                                                   "#!/usr/bin/env bash"))
                       ((not (string-empty-p setup-content)))
                       ((yes-or-no-p (format "%s The setup script has content. Check
                       ↪  and run the script?"
                                             (propertize "Warning!" 'face '(bold
                                             ↪  warning))))))
              (find-file setup-file)
              (when (yes-or-no-p "Would you like to run this script?")
                (async-shell-command "./setup.sh"))))
          (add-hook! 'doom-init-ui-hook
            (run-at-time nil nil #'+config-run-setup)))))
  (message ";; setup.sh did not exist during tangle. Tangle again.")
  (pp-to-string
   `(unless noninteractive
      (add-hook! 'doom-init-ui-hook #'+literate-tangle-async-h))))
```

```
<<run-setup()>>
```

2.5.6 Grabbing source block content as a string

In a few places in this configuration, it is desirable to grab a source block's content as a string. We can use a noweb `<<replacement>>` form, however that doesn't work with string escaping.

We can get around this by using noweb execution and write an name (unexported) babel block that will grab the content of another named source block as a string. Note that this does not currently expand nested noweb references.

```
;; Babel block: grab(name &optional pre post)
;; NAME is the name of the source block to grab.
;; PRE is a string to prepend to the content of the block.
;; POST is a string to append to the content of the block.
(if-let ((block-pos (org-babel-find-named-block name))
         (block (org-element-at-point block-pos)))
    (format "%S" (concat pre (string-trim (org-element-property :value block)) post))
  ;; look for :noweb-ref matches
  (let (block-contents)
    (org-element-cache-map
     (lambda (src)
       (when (and (not (org-in-commented-heading-p nil src))
                  (not (org-in-archived-heading-p nil src))
                  (let* ((lang (org-element-property :language src))
```

```
                        (params
                         (apply
                          #'org-babel-merge-params
                          (append
                           (org-with-point-at (org-element-property :begin src)
                             (org-babel-params-from-properties lang t))
                           (mapcar
                            (lambda (h)
                              (org-babel-parse-header-arguments h t))
                            (cons (org-element-property :parameters src)
                                  (org-element-property :header src))))))
                        (ref (alist-get :noweb-ref params)))
                   (equal ref name)))
        (push (org-babel--normalize-body src)
              block-contents)))
     :granularity 'element
     :restrict-elements '(src-block))
    (and block-contents
         (format "%S"
                 (concat
                  pre
                  (mapconcat
                   #'identity
                   (nreverse block-contents)
                   "\n\n")
                  post)))))
```

There we go, that's all it takes! This can be used via the form `<<grab("block-name")>>`.

Chapter 3 Packages

3.1 Loading instructions

This is where you install packages, by declaring them with the `package!` macro in `packages.el`, then running `doom refresh` on the command line. This file shouldn't be byte compiled.

```
;; -*- no-byte-compile: t; -*-
```

You'll then need to restart Emacs for your changes to take effect! Or at least, run `M-x doom/reload`.

Warning: Don't disable core packages listed in `~/.config/emacs/core/packages.el`. Doom requires these, and disabling them may have terrible side effects.

3.1.1 Packages in MELPA/ELPA/emacsmirror

To install `some-package` from MELPA, ELPA or emacsmirror:

```
(package! some-package)
```

3.1.2 Packages from git repositories

To install a package directly from a particular repo, you'll need to specify a `:recipe`. You'll find documentation on what `:recipe` accepts here:

```
(package! another-package
  :recipe (:host github :repo "username/repo"))
```

If the package you are trying to install does not contain a `PACKAGENAME.el` file, or is located in a subdirectory of the repo, you'll need to specify `:files` in the `:recipe`:

```
(package! this-package
  :recipe (:host github :repo "username/repo"
           :files ("some-file.el" "src/lisp/*.el")))
```

3.1.3 Disabling built-in packages

If you'd like to disable a package included with Doom, for whatever reason, you can do so here with the `:disable` property:

```
(package! builtin-package :disable t)
```

You can override the recipe of a built in package without having to specify all the properties for `:recipe`. These will inherit the rest of its recipe from Doom or MELPA/ELPA/Emacsmirror:

```
(package! builtin-package :recipe (:nonrecursive t))
(package! builtin-package-2 :recipe (:repo "myfork/package"))
```

Specify a `:branch` to install a package from a particular branch or tag.

```
(package! builtin-package :recipe (:branch "develop"))
```

3.2 Convenience

3.2.1 Avy

From the `:config default` *module.*

What a wonderful way to jump to buffer positions, and it uses the QWERTY home-row for jumping. Very convenient ... except I'm using Colemak.

```
(after! avy
  ;; home row priorities: 8 6 4 5 - - 1 2 3 7
  (setq avy-keys '(?n ?e ?i ?s ?t ?r ?i ?a)))
```

Now let's just have this included when an ErgoDox is found via `dmesg`.

```
(if (= 0 (call-process "sh" nil nil nil "-c" "dmesg | grep -q 'ErgoDox'"))
    (pp '<<avy-colemak-setup>>)
  ";; Avy: Colemak layout not detected (ErgoDox not mentioned in dmesg).")
```

```
<<avy-detect-colemak()>>
```

3.2.2 Rotate (window management)

The `rotate` package just adds the ability to rotate window layouts, but that sounds nice to me.

```
(package! rotate :pin "4e9ac3ff800880bd9b705794ef0f7c99d72900a6")
```

3.2.3 Emacs Everywhere

The name says it all. It's loaded and set up (a bit) by `:app everywhere`, however as I develop this I want the unpinned version I have as a submodule.

```
(package! emacs-everywhere :recipe (:local-repo "lisp/emacs-everywhere"))
(unpin! emacs-everywhere)
```

Additionally, I'm going to make some personal choices that aren't made in the Doom module.

```
(use-package! emacs-everywhere
  :if (daemonp)
  :config
  (require 'spell-fu)
  (setq emacs-everywhere-major-mode-function #'org-mode
        emacs-everywhere-frame-name-format "Edit  %s - %s")
  (defadvice! emacs-everywhere-raise-frame ()
    :after #'emacs-everywhere-set-frame-name
    (setq emacs-everywhere-frame-name (format emacs-everywhere-frame-name-format
                                (emacs-everywhere-app-class
                                ↪  emacs-everywhere-current-app)
                                (truncate-string-to-width
                                 (emacs-everywhere-app-title
                                 ↪  emacs-everywhere-current-app)
                                 45 nil nil "...")))
    ;; need to wait till frame refresh happen before really set
    (run-with-timer 0.1 nil #'emacs-everywhere-raise-frame-1))
  (defun emacs-everywhere-raise-frame-1 ()
    (call-process "wmctrl" nil nil nil "-a" emacs-everywhere-frame-name)))
```

3.2.4 Which-key

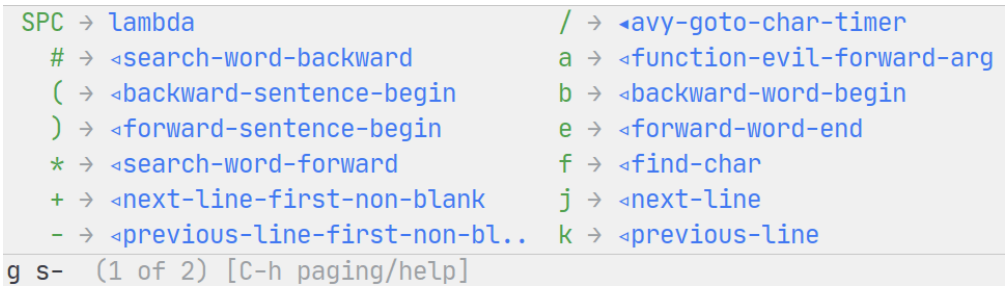
From the `:core packages` *module.*

Let's make this popup a bit faster

```
(setq which-key-idle-delay 0.5) ;; I need the help, I really do
```

I also think that having `evil-` appear in so many popups is a bit too verbose, let's change that, and do a few other similar tweaks while we're at it.

```
(setq which-key-allow-multiple-replacements t)
(after! which-key
  (pushnew!
   which-key-replacement-alist
   '(("" . "\\`+?evil[-:]?\\(?:a-\\)?\\(.*\\)") . (nil . "\\1"))
   '(("\\`g s" . "\\`evilem--?motion-\\(.*\\)") . (nil . "\\1"))
   ))
```



3.3 Tools

3.3.1 Abbrev

Abbrev mode is great, and something I make use of in multiple ways. As such, I want it on by default.

```
(setq-default abbrev-mode t)
```

Abbrev-mode can save and load abbreviations from an "abbrev file", which I'd like to locate in my Doom config folder.

```
(setq abbrev-file-name (expand-file-name "abbrev.el" doom-user-dir))
```

I need to think more on how I want to manage abbrev changes in the current session, but for now I'm going to be overly cautious and avoid any modifications to the global abbrev file that I don't make myself.

```
(setq save-abbrevs nil)
```

3.3.2 Very large files

The *very large files* mode loads large files in chunks, allowing one to open ridiculously large files.

```
(package! vlf :recipe (:host github :repo "emacs-straight/vlf" :files ("*.el"))
  :pin "d500f39672b35bf8551fdfafa892c551626c8d54")
```

To make VLF available without delaying startup, we'll just load it in quiet moments.

```
(use-package! vlf-setup
  :defer-incrementally vlf-tune vlf-base vlf-write
  vlf-search vlf-occur vlf-follow vlf-ediff vlf
  :commands vlf vlf-mode
  :init
  (defvar vlf-application 'ask) ; Avoid load-order issues
  <<vlf-largefile-prompt>>
  :config
  (advice-remove 'abort-if-file-too-large #'ad-Advice-abort-if-file-too-large)
  <<vlf-linenum-offset>>
  <<vlf-search-chunking>>)
```

Now, there are one or two tweaks worth applying to VLF. For starters, it goes to the liberty of advising `abort-if-file-too-large`, and in doing so removes the option of opening files literally. I think that's a bit much, so we can remove the advice and instead override `files--ask-user-about-large-` (the more appropriate function, I think) as a simpler approach, just sacrificing the original behaviour with `(setq vlf-application 'always)` (which I can't imagine using anyway).

```
(defadvice! +files--ask-about-large-file-vlf (size op-type filename offer-raw)
  "Like `files--ask-user-about-large-file', but with support for `vlf'."
  :override #'files--ask-user-about-large-file
  (if (eq vlf-application 'dont-ask)
      (progn (vlf filename) (error ""))
    (let ((prompt (format "File %s is large (%s), really %s?"
                          (file-name-nondirectory filename)
                          (funcall byte-count-to-string-function size) op-type)))
      (if (not offer-raw)
          (if (y-or-n-p prompt) nil 'abort)
        (let ((choice
               (car
                (read-multiple-choice
                 prompt '((?y "yes")
                          (?n "no")
                          (?l "literally")
                          (?v "vlf"))
                 (files--ask-user-about-large-file-help-text
                  op-type (funcall byte-count-to-string-function size))))))
          (cond ((eq choice ?y) nil)
```

```
                ((eq choice ?l) 'raw)
                ((eq choice ?v)
                 (vlf filename)
                 (error ""))
                (t 'abort)))))))
```

As you go from one chunk fetched by VLF to the next, the displayed line number of the first line *in each chunk* is unchanged. I think it's reasonable to hope for an *overall* line number, and by tracking chunk's cumulative line numbers we can implement this behaviour fairly easily.

```
(defvar-local +vlf-cumulative-linenum '((0 . 0))
  "An alist keeping track of the cumulative line number.")

(defun +vlf-update-linum ()
  "Update the line number offset."
  (let ((linenum-offset (alist-get vlf-start-pos +vlf-cumulative-linenum)))
    (setq display-line-numbers-offset (or linenum-offset 0))
    (when (and linenum-offset (not (assq vlf-end-pos +vlf-cumulative-linenum)))
      (push (cons vlf-end-pos (+ linenum-offset
                                 (count-lines (point-min) (point-max))))
            +vlf-cumulative-linenum))))

(add-hook 'vlf-after-chunk-update-hook #'+vlf-update-linum)

;; Since this only works with absolute line numbers, let's make sure we use them.
(add-hook! 'vlf-mode-hook (setq-local display-line-numbers t))
```

The other thing that doesn't work too well with VLF is searching with anything other than `M-x occur`. This is because trying to go to the next match at the end of a chunk usually wraps the point to the beginning of the chunk, instead of moving to the next chunk.

```
(defun +vlf-next-chunk-or-start ()
  (if (= vlf-file-size vlf-end-pos)
      (vlf-jump-to-chunk 1)
    (vlf-next-batch 1))
  (goto-char (point-min)))

(defun +vlf-last-chunk-or-end ()
  (if (= 0 vlf-start-pos)
      (vlf-end-of-file)
    (vlf-prev-batch 1))
  (goto-char (point-max)))

(defun +vlf-isearch-wrap ()
  (if isearch-forward
      (+vlf-next-chunk-or-start)
    (+vlf-last-chunk-or-end)))
```

```
(add-hook! 'vlf-mode-hook (setq-local isearch-wrap-function #'+vlf-isearch-wrap))
```

Unfortunately, since evil-search doesn't have an analogue to `isearch-wrap-function`, we can't easily add support to it.

3.3.3 Eros

From the `:tools eval` *module.*

This package enables the very nice inline evaluation with `gr` and `gR`. The prefix could be slightly nicer though.

```
(setq eros-eval-result-prefix " ") ; default =>
```

3.3.4 EVIL

From the `:editor evil` *module.*

When I want to make a substitution, I want it to be global more often than not — so let's make that the default.

Now, EVIL cares a fair bit about keeping compatibility with Vim's default behaviour. I don't. There are some particular settings that I'd rather be something else, so let's change them.

```
(after! evil
  (setq evil-ex-substitute-global t     ; I like my s/../.. to by global by default
        evil-move-cursor-back nil       ; Don't move the block cursor when toggling
        ↪ insert mode
        evil-kill-on-visual-paste nil)) ; Don't put overwritten text in the kill ring
```

I don't use `evil-escape-mode`, so I may as well turn it off, I've heard it contributes a typing delay. I'm not sure it's much, but it is an extra `pre-command-hook` that I don't benefit from, so... It seems that there's a dedicated package for this, so instead of just disabling the mode on startup, let's prevent installation of the package.

```
(package! evil-escape :disable t)
```

3.3.5 GPTel

```
(package! gptel :pin "94bf19da93aee9a101429d7ecbfbb9c7c5b67216")
```

```
(use-package! gptel
  :commands gptel gptel-menu gptel-mode gptel-send
  :config
  (let ((groq-backend
         (gptel-make-openai "Groq"
           :host "api.groq.com"
           :endpoint "/openai/v1/chat/completions"
           :stream t
           :key (lambda () (or (secrets-get-secret "Login" "groq")
                               (secrets-get-secret "kdewallet" "groq")))
           :models '("llama3-70b-8192"
                     "llama3-8b-8192"
                     "llama-3.1-70b-versatile"
                     "llama-3.1-8b-instant"
                     "llama-3.2-1b-preview"
                     "deepseek-r1-distill-llama-70b"
                     "mixtral-8x7b-32768"
                     "gemma-7b-it"
                     "gemma2-9b-it")))
        (openai-backend
         (gptel-make-openai "ChatGPT"
           :host "api.openai.com"
           :stream t
           :key (lambda () (or (secrets-get-secret "Login" "openai")
                               (secrets-get-secret "kdewallet" "openai")))
           :models '("gpt-4o" "gpt-4o-mini" "chatgpt-4o-latest"
                     "o1" "o1-mini")))
        (anthropic-backend
         (gptel-make-anthropic "Claude"
           :stream t
           :key (lambda () (or (secrets-get-secret "Login" "anthropic")
                               (secrets-get-secret "kdewallet" "anthropic")))
           :models '("claude-3-5-sonnet-20240620"
                     "claude-3-sonnet-20240229"
                     "claude-3-haiku-20240307")))
        (ollama-backend
         (let (ollama-models)
           (when (executable-find "ollama")
             (with-temp-buffer
               (call-process "ollama" nil t nil "list")
               (goto-char (point-min))
               (forward-line 1)
               (while (and (not (eobp)) (looking-at "[^ \t]+"))
```

```
                (push (match-string 0) ollama-models)
                (forward-line 1)))
            (gptel-make-ollama "Ollama" :models ollama-models :stream t)))))
  (setq-default gptel-model "llama-3.1-70b-versatile"
                gptel-backend groq-backend))
(delete (assoc "ChatGPT" gptel--known-backends) gptel--known-backends)
(setq gptel-default-mode #'org-mode))
```

3.3.6 Headlice

Dealing with licenses and in particular license headers is frankly a bit of a pain, and so I've written a package so that this just takes care of itself and I don't have to think about it.

```
(package! headlice :recipe (:local-repo "lisp/headlice"
                            :files (:defaults "licenses" "headers")))
```

The author of this package has set some pretty good defaults, but as usual there are some specific personal preferences I'd like to apply, and then there's the minor matter of hooking it into Emacs/Doom.

```
(use-package! headlice
  :hook (prog-mode . headlice-auto-insert)
  :config
  (setq headlice-preferred-license 'mpl
        headlice-use-spdx-headers t
        headlice-ignored-licenses '(gpl-3)
        headlice-user-email "contact@tecosaur.net")
  (defalias '+file-templates/insert-license #'headlice-create-license))
```

3.3.7 Consult

From the `:completion vertico` *module.*

Since we're using Section 3.4.10 too, the separation between buffers and files is already clear, and there's no need for a different face.

```
(after! consult
  (set-face-attribute 'consult-file nil :inherit 'consult-buffer)
  (setf (plist-get (alist-get 'perl consult-async-split-styles-alist) :initial) ";"))
```

3.3.8 Magit

From the `:tools magit` *module.*

Magit is great as-is, thanks for making such a lovely package Jonas!

There's still a room for a little tweaking though...

```
<<magit-toplevel>>
(after! magit
  <<magit-tweaks>>)
```

1. Easier forge remotes When creating a new project, I often want the remote to be to my personal Forgejo instance. Let's make that a bit more streamlined by introducing a quick-entry "default forge" option.

   ```
   (defvar +magit-default-forge-remote "git@ssh.tecosaur.net:tec/%s.git"
     "Format string that fills out to a remote from the repo name.
   Set to nil to disable this functionality.")
   ```

   While we're at it, when creating a remote with the same name as my Github username in a project where an HTTPS GitHub remote already exists, let's make the pre-filled remote URL use ssh.

   ```
   (defadvice! +magit-remote-add--streamline-forge-a (args)
     "Prompt to setup a remote using `+magit-default-forge-remote'."
     :filter-args #'magit-remote-add
     (interactive
      (let ((default-name
             (subst-char-in-string
              ?\s ?-
              (file-name-nondirectory
               (directory-file-name
                (or (doom-project-root) default-directory))))))
        (or (and +magit-default-forge-remote
                 (not (magit-list-remotes))
                 (eq (read-char-choice
                      (format "Setup %s remote? [y/n]: "
                              (replace-regexp-in-string
                               "\\`\\(?:[^@]+@\\|https://\\)\\([^:/]+\\)[:/].*\\'"
                               "\\1"
                               +magit-default-forge-remote))
                      '(?y ?n))
                     ?y)
                 (let ((name (read-string "Name: " default-name)))
                   (list "origin" (format +magit-default-forge-remote name)
   ```

```
                    (transient-args 'magit-remote))))
        (let ((origin (magit-get "remote.origin.url"))
              (remote (magit-read-string-ns "Remote name"))
              (gh-user (magit-get "github.user")))
          (and (equal remote gh-user)
               (if origin
                   (and
                    (string-match
                    ↪  "\\`https://github\\.com/\\([^/]+\\)/\\([^/]+\\)\\.git\\'"
                                origin)
                    (not (string= (match-string 1 origin) gh-user)))
                 t)
               (setq origin
                     (if origin
                         (replace-regexp-in-string
                          "\\`https://github\\.com/" "git@github.com:"
                          origin)
                       (format "git@github.com:%s/%s" gh-user (read-string
                       ↪  "GitHub repo Name: " default-name)))))
          (list remote
                (magit-read-url
                 "Remote url"
                 (and origin
                      (string-match "\\([^:/]+\\)/[^/]+\\(\\.git\\)?\\'"
                      ↪  origin)
                      (replace-match remote t t origin 1)))
                (transient-args 'magit-remote))))))
  args)
```

2. Commit message templates One little thing I want to add is some per-project commit message templates.

```
(defvar +magit-project-commit-templates-alist nil
  "Alist of toplevel dirs and template hf strings/functions.")
```

```
(defun +magit-fill-in-commit-template ()
  "Insert template from `+magit-fill-in-commit-template' if applicable."
  (when-let ((template (and (save-excursion (goto-char (point-min))
  ↪  (string-match-p "\\`\\s-*$" (thing-at-point 'line)))
                            (cdr (assoc (file-name-base (directory-file-name
                            ↪  (magit-toplevel)))

                                        ↪  +magit-project-commit-templates-alist)))))
    (goto-char (point-min))
    (insert (if (stringp template) template (funcall template)))
    (goto-char (point-min))
    (end-of-line)))
(add-hook 'git-commit-setup-hook #'+magit-fill-in-commit-template 90)
```

This is particularly useful when creating commits for Org, as they need to follow a certain format and sometimes I forget elements (oops!).

```
(defun +org-commit-message-template ()
  "Create a skeleton for an Org commit message based on the staged diff."
  (let (change-data last-file file-changes temp-point)
    (with-temp-buffer
      (apply #'call-process magit-git-executable
             nil t nil
             (append
              magit-git-global-arguments
              (list "diff" "--cached")))
      (goto-char (point-min))
      (while (re-search-forward "^@@\\|^\\+\\+\\+ b/" nil t)
        (if (looking-back "^\\+\\+\\+ b/" (line-beginning-position))
            (progn
              (push (list last-file file-changes) change-data)
              (setq last-file (buffer-substring-no-properties (point)
              ↪  (line-end-position))
                    file-changes nil))
          (setq temp-point (line-beginning-position))
          (re-search-forward "^\\+\\|^-" nil t)
          (end-of-line)
          (cond
           ((string-match-p "\\.el$" last-file)
            (when (re-search-backward "^\\(?:[+-]? *\\|@@[ +-\\d,]+@@
            ↪  \\)\\(?:cl-\\)?\\(?:defun\\|defvar\\|defmacro\\|defcustom\\)"
            ↪  temp-point t)
              (re-search-forward
              ↪  "\\(?:cl-\\)?\\(?:defun\\|defvar\\|defmacro\\|defcustom\\)
              ↪  \\([^[:space:]\n]+\\)" nil t)
              (push (match-string 1) file-changes)))
           ((string-match-p "\\.org$" last-file)
            (when (re-search-backward "^[+-]\\*+ \\|^@@[ +-\\d,]+@@ \\*+ "
            ↪  temp-point t)
              (re-search-forward "@@ \\*+ " nil t)
              (push (buffer-substring-no-properties (point) (line-end-position))
              ↪  file-changes)))))))
    (setq file-changes (delete-dups file-changes))
    (push (list last-file file-changes) change-data)
    (setq change-data (delete '(nil nil) change-data))
    (concat
     (if (= 1 (length change-data))
         (replace-regexp-in-string "^.*/\\|.[a-z]+$" "" (caar change-data))
       "?")
     ": \n\n"
     (mapconcat
      (lambda (file-changes)
```

```
        (if (cadr file-changes)
            (format "* %s (%s): "
                    (car file-changes)
                    (mapconcat #'identity (cadr file-changes) ", "))
          (format "* %s: " (car file-changes))))
      change-data
      "\n\n"))))

(add-to-list '+magit-project-commit-templates-alist (cons "org"
↪  #'+org-commit-message-template))
```

This relies on two small entries in the git config files which improves the hunk heading line selection for elisp and Org files.

```
[diff "lisp"]
  xfuncname = "^(((;;;+ )|\\(|([
  ↪  \t]+\\(((cl-|el-patch-)?def(un|var|macro|method|custom)|gb/))).*)$"

[diff "org"]
  xfuncname = "^(\\*+ +.*)$"
```

3. Magit delta

   Delta is a git diff syntax highlighter written in rust. The author also wrote a package to hook this into the Magit diff view (which don't get any syntax highlighting by default). This requires the `delta` binary. It's packaged on some distributions, but most reliably installed through Rust's package manager cargo.

   ```
   cargo install git-delta
   ```

   Now we can make use of the package for this.

   ```
   ;; (package! magit-delta :recipe (:host github :repo "dandavison/magit-delta")
   ↪  :pin "5fc7dbddcfacfe46d3fd876172ad02a9ab6ac616")
   ```

   All that's left is to hook it into magit

   ```
   ;; (magit-delta-mode +1)
   ```

   Unfortunately this currently seems to mess things up, which is something I'll want to look into later.

3.3.9 MPRIS

It's nice to be able to interact with MPRIS players. This would just be a dependency of `org-music` or `doom-modeline-media-player`, but I haven't made it available on any an elisp archives.

Thankfully most Emacs package managers make using Git repository URLs pretty easy these days.

```
(package! mpris :recipe (:local-repo "lisp/mpris"))
```

3.3.10 Smerge

For repeated operations, a hydra would be helpful. But I prefer transient.

```
(defun smerge-repeatedly ()
  "Perform smerge actions again and again"
  (interactive)
  (smerge-mode 1)
  (smerge-transient))
(after! transient
  (transient-define-prefix smerge-transient ()
    [["Move"
      ("n" "next" (lambda () (interactive) (ignore-errors (smerge-next))
      ↪  (smerge-repeatedly)))
      ("p" "previous" (lambda () (interactive) (ignore-errors (smerge-prev))
      ↪  (smerge-repeatedly)))]
     ["Keep"
      ("b" "base" (lambda () (interactive) (ignore-errors (smerge-keep-base))
      ↪  (smerge-repeatedly)))
      ("u" "upper" (lambda () (interactive) (ignore-errors (smerge-keep-upper))
      ↪  (smerge-repeatedly)))
      ("l" "lower" (lambda () (interactive) (ignore-errors (smerge-keep-lower))
      ↪  (smerge-repeatedly)))
      ("a" "all" (lambda () (interactive) (ignore-errors (smerge-keep-all))
      ↪  (smerge-repeatedly)))
      ("RET" "current" (lambda () (interactive) (ignore-errors (smerge-keep-current))
      ↪  (smerge-repeatedly)))]
     ["Diff"
      ("<" "upper/base" (lambda () (interactive) (ignore-errors
      ↪  (smerge-diff-base-upper)) (smerge-repeatedly)))
      ("=" "upper/lower" (lambda () (interactive) (ignore-errors
      ↪  (smerge-diff-upper-lower)) (smerge-repeatedly)))
      (">" "base/lower" (lambda () (interactive) (ignore-errors
      ↪  (smerge-diff-base-lower)) (smerge-repeatedly)))
      ("R" "refine" (lambda () (interactive) (ignore-errors (smerge-refine))
      ↪  (smerge-repeatedly)))
      ("E" "ediff" (lambda () (interactive) (ignore-errors (smerge-ediff))
      ↪  (smerge-repeatedly)))]
     ["Other"
```

```
      ("c" "combine" (lambda () (interactive) (ignore-errors
      ↪  (smerge-combine-with-next)) (smerge-repeatedly)))
      ("r" "resolve" (lambda () (interactive) (ignore-errors (smerge-resolve))
      ↪  (smerge-repeatedly)))
      ("k" "kill current" (lambda () (interactive) (ignore-errors
      ↪  (smerge-kill-current)) (smerge-repeatedly)))
      ("q" "quit" (lambda () (interactive) (smerge-auto-leave)))]]))
```

3.3.11 Corfu

From the `:completion corfu` *module.*

I like completion, but I don't like to feel spammed by it, so let's up the delay.

```
(setq corfu-auto-delay 0.5)
```

3.3.12 Projectile

From the `:core packages` *module.*

Looking at documentation via `SPC h f` and `SPC h v` and looking at the source can add package src directories to projectile. This isn't desirable in my opinion.

```
(setq projectile-ignored-projects
      (list "~/" "/tmp" (expand-file-name "straight/repos" doom-local-dir)))
(defun projectile-ignored-project-function (filepath)
  "Return t if FILEPATH is within any of `projectile-ignored-projects'"
  (or (mapcar (lambda (p) (string-prefix-p p filepath)) projectile-ignored-projects)))
```

3.3.13 Jinx

Minad's Jinx spell-checker looks pretty nifty. When Henrik and I (or someone else) have some more bandwidth, I think it would be good to incorporate with Doom.

In the meantime, let's use it here.

```
(package! jinx)
```

1. Configuration

   Jinx has some pretty lovely defaults out of the box, we'll just be making a few tweaks.

```
(use-package! jinx
  :defer t
  :init
  (add-hook 'doom-init-ui-hook #'global-jinx-mode)
  :config
  ;; Use my custom dictionary
  (setq jinx-languages "en-custom")
  ;; Extra face(s) to ignore
  (push 'org-inline-src-block
        (alist-get 'org-mode jinx-exclude-faces))
  ;; Take over the relevant bindings.
  (after! ispell
    (global-set-key [remap ispell-word] #'jinx-correct))
  (after! evil-commands
    (global-set-key [remap evil-next-flyspell-error] #'jinx-next)
    (global-set-key [remap evil-prev-flyspell-error] #'jinx-previous))
  ;; I prefer for `point' to end up at the start of the word,
  ;; not just after the end.
  (advice-add 'jinx-next :after (lambda (_) (left-word))))
```

2. Autocorrect

   I used to have a small collection of configuration here, but then it grew larger, and now it's a package.

```
(package! autocorrect :recipe (:local-repo "lisp/autocorrect"))
```

   To integrate Jinx with the `autocorrect` package, we need to tell it:

   - About corrections made with Jinx
   - How to tell if a word is spelled correctly with Jinx
   - When it's appropriate to make an autocorrection

```
(use-package! autocorrect
  :after jinx
  :config
  ;; Integrate with Jinx
  (defun autocorrect-jinx-record-correction (overlay corrected)
    "Record that Jinx corrected the text in OVERLAY to CORRECTED."
    (let ((text
           (buffer-substring-no-properties
            (overlay-start overlay)
            (overlay-end overlay))))
      (autocorrect-record-correction text corrected)))
```

```
(defun autocorrect-jinx-check-spelling (word)
  "Check if WORD is valid."
  ;; Mostly a copy of `jinx--word-valid-p', just without the buffer substring.
  ;; It would have been nice if `jinx--word-valid-p' implemented like this
  ;; with `jinx--this-word-valid-p' (or similar) as the at-point variant.
  (or (member word jinx--session-words)
      ;; Allow capitalized words
      (and (string-match-p "\\`[[:upper:]][[:lower:]]+\\'" word)
           (cl-loop
            for w in jinx--session-words
            thereis (and (string-equal-ignore-case word w)
                         (string-match-p "\\`[[:lower:]]+\\'" w))))
      (cl-loop for dict in jinx--dicts
               thereis (jinx--mod-check dict word))))

(defun autocorrect-jinx-appropriate (pos)
  "Return non-nil if it is appropriate to spellcheck at POS according to
  ↪ jinx."
  (and (not (jinx--face-ignored-p pos))
       (not (jinx--regexp-ignored-p pos))))

(setq autocorrect-check-spelling-function #'autocorrect-jinx-check-spelling)
(add-to-list 'autocorrect-predicates #'autocorrect-jinx-appropriate)
(advice-add 'jinx--correct-replace :before
↪  #'autocorrect-jinx-record-correction)

;; Run setup
(run-with-idle-timer 0.5 nil #'autocorrect-setup)

;; Make work with evil-mode
(evil-collection-set-readonly-bindings 'autocorrect-list-mode-map)
(evil-collection-define-key 'normal 'autocorrect-list-mode-map
  (kbd "a") #'autocorrect-create-correction
  (kbd "x") #'autocorrect-remove-correction
  (kbd "i") #'autocorrect-ignore-word))
```

3. Downloading dictionaries

   Let's get a nice big dictionary from SCOWL Custom List/Dictionary Creator with the following configuration

   size 80 (huge)

   spellings British(-ise) and Australian

   spelling variants level 0

   diacritics keep

   extra lists hacker, roman numerals

a) Hunspell

```
cd /tmp
if [ ! -d hunspell-en-custom ]; then
    curl -o "hunspell-en-custom.zip"
    ↪  'http://app.aspell.net/create?max_size=80&spelling=GBs&spelling=AU&max_variant=0&diacrit
    unzip "hunspell-en-custom.zip" -d hunspell-en-custom
fi

cd hunspell-en-custom
DESTDIR1="$HOME/.local/share/hunspell"
DESTDIR2="$HOME/.config/enchant/hunspell"
mkdir -p "$DESTDIR1"
mkdir -p "$DESTDIR2"
cp en-custom.{aff,dic} "$DESTDIR1"
cp en-custom.{aff,dic} "$DESTDIR2"
```

We will also add an accompanying `doctor` warning.

```
(unless (executable-find "hunspell")
  (warn! "Couldn't find hunspell executable."))
(unless (file-exists-p "~/.local/share/hunspell/en-custom.dic")
  (warn! "Custom hunspell dictionary is not present."))
```

b) Aspell

```
cd /tmp
if [ ! -d aspell6-en-custom ]; then
    curl -o "aspell6-en-custom.tar.bz2"
    ↪  'http://app.aspell.net/create?max_size=80&spelling=GBs&spelling=AU&max_variant=0&diacrit
    tar -xjf "aspell6-en-custom.tar.bz2"
fi

cd aspell6-en-custom
DESTDIR="$HOME/.config/enchant/" ./configure
sed -i 's/dictdir = .*/dictdir = "aspell"/' Makefile
sed -i 's/datadir = .*/datadir = "aspell"/' Makefile
make && make install
```

We will also add an accompanying `doctor` warning.

```
(unless (executable-find "aspell")
  (warn! "Couldn't find aspell executable."))
(unless (file-exists-p "~/.config/enchant/aspell/en-custom.multi")
  (warn! "Custom aspell dictionary is not present."))
```

3.3.14 TRAMP

Another lovely Emacs feature, TRAMP stands for *Transparent Remote Access, Multiple Protocol*. In brief, it's a lovely way to wander around outside your local filesystem.

1. Prompt recognition

   Unfortunately, when connecting to remote machines Tramp can be a wee pit picky with the prompt format. Let's try to get Bash, and be a bit more permissive with prompt recognition.

   ```
   (after! tramp
     (setenv "SHELL" "/bin/bash")
     (setq tramp-shell-prompt-pattern "\\(?:^\\|\n\\|\x0d\\)[^]#$%>\n]*#?[]#$%>]
     ↪  *\\(\e\\[[0-9;]*[a-zA-Z] *\\)*")) ;; default +
   ```

2. Troubleshooting

   In case the remote shell is misbehaving, here are some things to try

   a) Zsh

      There are some escape code you don't want, let's make it behave more considerately.

      ```
      if [[ "$TERM" == "dumb" ]]; then
          unset zle_bracketed_paste
          unset zle
          PS1='$ '
          return
      fi
      ```

3. Guix

   Guix puts some binaries that TRAMP looks for in unexpected locations. That's no problem though, we just need to help TRAMP find them.

   ```
   (after! tramp
     (appendq! tramp-remote-path
               '("~/.guix-profile/bin" "~/.guix-profile/sbin"
                 "/run/current-system/profile/bin"
                 "/run/current-system/profile/sbin")))
   ```

3.3.15 Auto activating snippets

Sometimes pressing `TAB` is just too much.

```
(package! aas :recipe (:host github :repo "ymarco/auto-activating-snippets")
  :pin "ddc2b7a58a2234477006af348b30e970f73bc2c1")
```

```
(use-package! aas
  :commands aas-mode)
```

3.3.16 Screenshot

This makes it a breeze to take lovely screenshots.

```
(package! screenshot :recipe (:local-repo "lisp/screenshot"))
```

Some light configuring is all we need, so we can make use of the 0x0 wrapper file uploading script (which I've renamed to `upload`).

```
(use-package! screenshot
  :defer t
  :config (setq screenshot-upload-fn "upload %s 2>/dev/null"))
```

3.3.17 Etrace

The *Emacs Lisp Profiler* (ELP) does a nice job recording information, but it isn't the best for looking at results. `etrace` converts ELP's results to the "Chromium Catapult Trace Event Format". This means that the output of `etrace` can be loaded in something like the speedscope webapp for easier profile investigation.

```
(package! etrace :recipe (:host github :repo "aspiers/etrace")
  :pin "2291ccf2f2ccc80a6aac4664e8ede736ceb672b7")
```

```
(use-package! etrace
  :after elp)
```

3.3.18 YASnippet

From the `:editor snippets` *module.*

Nested snippets are good, so let's enable that.

```
(setq yas-triggers-in-field t)
```

3.3.19 String inflection

For when you want to change the case pattern for a symbol.

```
(package! string-inflection :pin "617df25e91351feffe6aff4d9e4724733449d608")
```

```
(use-package! string-inflection
  :commands (string-inflection-all-cycle
             string-inflection-toggle
             string-inflection-camelcase
             string-inflection-lower-camelcase
             string-inflection-kebab-case
             string-inflection-underscore
             string-inflection-capital-underscore
             string-inflection-upcase)
  :init
  (map! :leader :prefix ("c~" . "naming convention")
        :desc "cycle" "~" #'string-inflection-all-cycle
        :desc "toggle" "t" #'string-inflection-toggle
        :desc "CamelCase" "c" #'string-inflection-camelcase
        :desc "downCase" "d" #'string-inflection-lower-camelcase
        :desc "kebab-case" "k" #'string-inflection-kebab-case
        :desc "under_score" "_" #'string-inflection-underscore
        :desc "Upper_Score" "u" #'string-inflection-capital-underscore
        :desc "UP_CASE" "U" #'string-inflection-upcase)
  (after! evil
    (evil-define-operator evil-operator-string-inflection (beg end _type)
      "Define a new evil operator that cycles symbol casing."
      :move-point nil
      (interactive "<R>")
      (string-inflection-all-cycle)
```

```
    (setq evil-repeat-info '([?g ?~])))
  (define-key evil-normal-state-map (kbd "g~") 'evil-operator-string-inflection)))
```

3.3.20 Smart parentheses

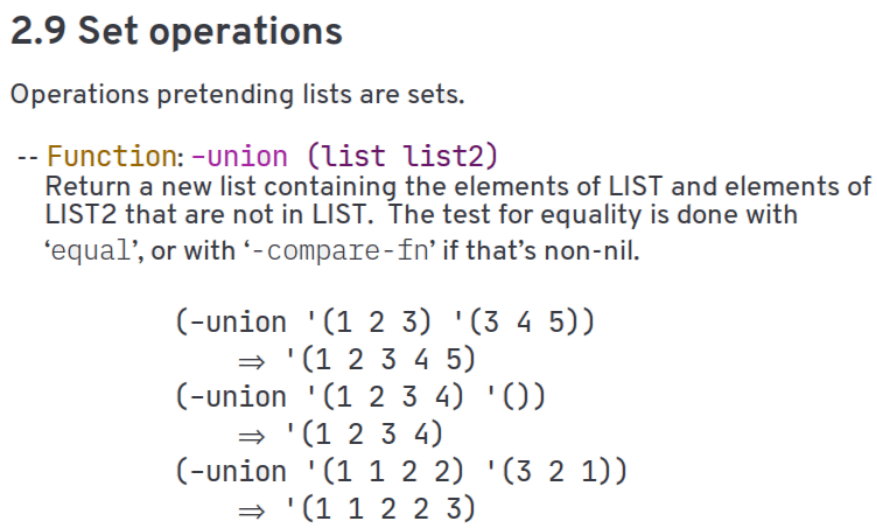
From the `:core packages` *module.*

```
(sp-local-pair
 '(org-mode)
 "<<" ">>"
 :actions '(insert))
```

3.4 Visuals

3.4.1 Info colours

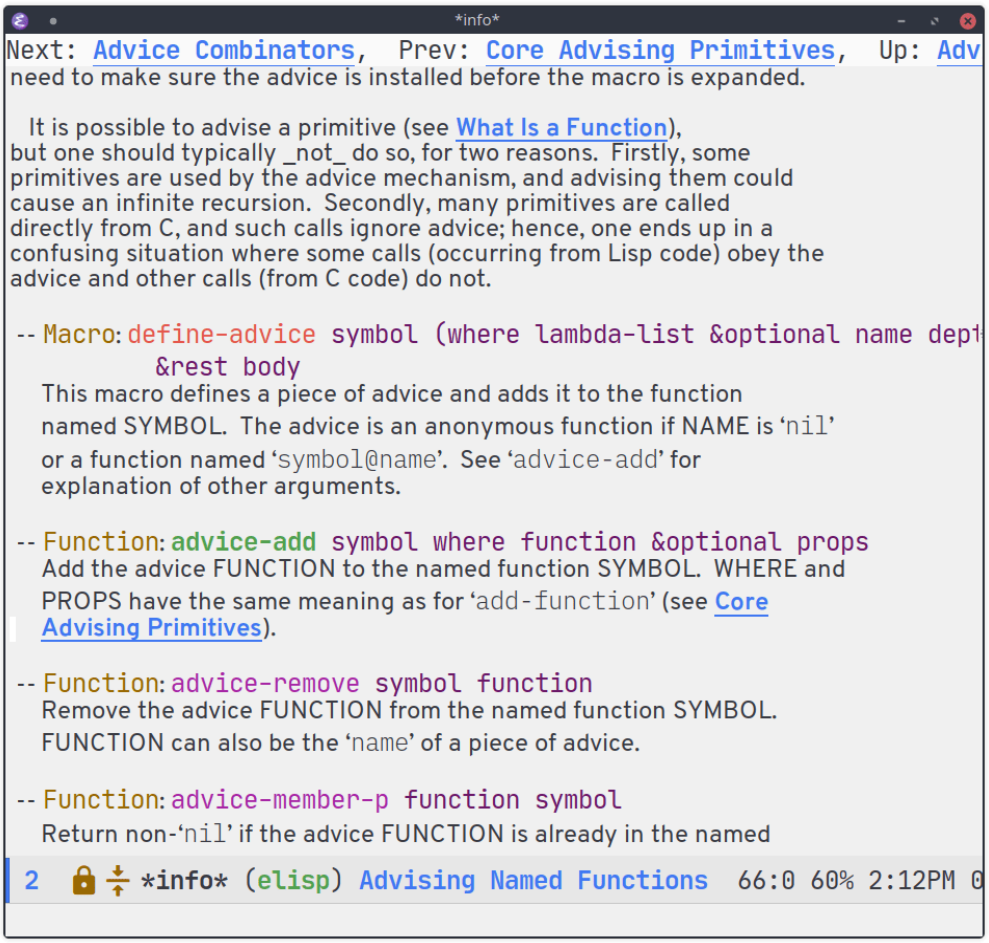
This makes manual pages nicer to look at by adding variable pitch fontification and colouring 🙂.




```
(package! info-colors :pin "2e237c301ba62f0e0286a27c1abe48c4c8441143")
```

To use this we'll just hook it into `Info`.

```
(use-package! info-colors
  :commands (info-colors-fontify-node))

(add-hook 'Info-selection-hook 'info-colors-fontify-node)
```



3.4.2 Modus themes

Proteolas did a lovely job with the Modus themes, so much so that they were welcomed into Emacs 28. However, he is also rather attentive with updates, and so I'd like to make sure we have a recent version.

```
(package! modus-themes :pin "f3cd4d6983566dab0ef3bcddf812cfd565d00d08" :pin
↪  "3576d14f06f245c3111496bfb035bb0926f48089")
```

3.4.3 Spacemacs themes

```
(package! spacemacs-theme :pin "a7c5dccb4a037ba1f090015fc8ffb9566c64e369")
```

3.4.4 Theme magic

With all our fancy Emacs themes, my terminal is missing out!

```
(package! theme-magic :pin "844c4311bd26ebafd4b6a1d72ddcc65d87f074e3")
```

This operates using `pywal`, which is present in some repositories, but most reliably installed with `pip`.

```
sudo python3 -m pip install pywal
```

We can also add a `doctor` check.

```
(unless (executable-find "wal")
  (warn! "Couldn't find the pywal executable (wal), theme-magic will not function."))
```

Theme magic takes a look at a number of faces, the saturation levels, and colour differences to try to cleverly pick eight colours to use. However, it uses the same colours for the light variants, and doesn't always make the best picks. Since we're using `doom-themes`, our life is a little easier and we can use the colour utilities from Doom themes to easily grab sensible colours and generate lightened versions — let's do that.

```
(use-package! theme-magic
  :commands theme-magic-from-emacs
  :config
  (defadvice! theme-magic--auto-extract-16-doom-colors ()
    :override #'theme-magic--auto-extract-16-colors
    (list
     (face-attribute 'default :background)
     (doom-color 'error)
     (doom-color 'success)
     (doom-color 'type)
     (doom-color 'keywords)
     (doom-color 'constants)
     (doom-color 'functions)
     (face-attribute 'default :foreground)
     (face-attribute 'shadow :foreground)
     (doom-blend 'base8 'error 0.1)
     (doom-blend 'base8 'success 0.1)
     (doom-blend 'base8 'type 0.1)
```

```
    (doom-blend 'base8 'keywords 0.1)
    (doom-blend 'base8 'constants 0.1)
    (doom-blend 'base8 'functions 0.1)
    (face-attribute 'default :foreground))))
```

3.4.5 Simple comment markup

I find that every now and then I sprinkle a little markup in code comments. Of course, this doesn't get fortified as it's ultimately meaningless ... but it would be nice if it was, just slightly. Surprisingly, I couldn't find a package for this, so I made one.

```
(package! simple-comment-markup :recipe (:local-repo "lisp/simple-comment-markup"))
```

Let's use both basic Org markup and Markdown code backticks, to cover most situations decently.

```
(use-package! simple-comment-markup
  :hook (prog-mode . simple-comment-markup-mode)
  :config
  (setq simple-comment-markup-set '(org markdown-code)))
```

3.4.6 Doom modeline

From the `:ui modeline` *module.*

1. Modified buffer colour

   The modeline is very nice and pretty, however I have a few niggles with the defaults. For starters, by default `red` text is used to indicate an unsaved file. This makes me feel like something's gone *wrong*, so let's tone that down to orange.

   ```
   (custom-set-faces!
     '(doom-modeline-buffer-modified :foreground "orange"))
   ```

2. Height

   The default size (25) makes for a rather narrow mode line. To me, the modeline feels a bit comfier if we give it a bit more space. I find `45` adds roughly a third of the line height as padding above and below.

   ```
   (setq doom-modeline-height 45)
   ```

3. File encoding

While we're modifying the modeline, when we have the default file encoding (`LF UTF-8`), it really isn't worth noting in the modeline. So, why not conditionally hide it?

```
(defun doom-modeline-conditional-buffer-encoding ()
  "We expect the encoding to be LF UTF-8, so only show the modeline when this is
  ↪ not the case"
  (setq-local doom-modeline-buffer-encoding
              (unless (and (memq (plist-get (coding-system-plist
              ↪ buffer-file-coding-system) :category)
                                 '(coding-category-undecided
                                 ↪ coding-category-utf-8))
                           (not (memq (coding-system-eol-type
                           ↪ buffer-file-coding-system) '(1 2))))
                t)))

(add-hook 'after-change-major-mode-hook
↪ #'doom-modeline-conditional-buffer-encoding)
```

4. Analogue clock

   Now that my code for an analogue clock icon has been upstreamed, all I do here is adjust the size slightly 🙂.

   ```
   (setq doom-modeline-time-clock-size 0.65)
   ```

5. Media player

   Sometimes (particularly when reading a novel, with Emacs full-screened) it would be nice to know what I'm listening to. We can put this information in the modeline with my media player package.

   ```
   (package! doom-modeline-media-player
     :recipe (:local-repo "lisp/doom-modeline-media-player"))
   ```

   To enable the lazy loading, we make `doom-modeline` aware of the segment function in `:init`, and the segment function itself is autoloaded.

   ```
   (use-package! doom-modeline-media-player
     :defer t
     :init
     (after! doom-modeline
       (add-to-list 'doom-modeline-fn-alist
                    (cons 'media-player #'doom-modeline-segment--media-player)))
     :config
     (defun +single-fullscreen-window-p ()
       (and (memq (frame-parameter nil 'fullscreen) '(fullscreen fullboth))
            (not (consp (car (window-tree))))))
     (setq doom-modeline-media-player #'+single-fullscreen-window-p
           doom-modeline-media-player-playback-indication 'dim))
   ```

6. PDF modeline

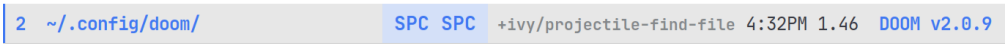
   I think the PDF modeline could do with tweaking. I raised an issue on this, however the response was basically "put your preferences in your personal config, the current default is sensible" — so here we are.

   First up I'm going to want a segment for just the buffer file name, and a PDF icon. Then we'll redefine two functions used to generate the modeline.

```
(doom-modeline-def-segment buffer-name
  "Display the current buffer's name, without any other information."
  (concat
   (doom-modeline-spc)
   (doom-modeline--buffer-name)))

(doom-modeline-def-segment pdf-icon
  "PDF icon from nerd-icons."
  (concat
   (doom-modeline-icon sucicon "nf-seti-pdf" nil nil
   (doom-modeline-spc)
                       :face (if (doom-modeline--active)
                                 'nerd-icons-red
                               'mode-line-inactive)
                       :v-adjust 0.02)))

(defun doom-modeline-update-pdf-pages ()
  "Update PDF pages."
  (setq doom-modeline--pdf-pages
        (let ((current-page-str (number-to-string (eval
        ↪  `(pdf-view-current-page))))
              (total-page-str (number-to-string (pdf-cache-number-of-pages))))
          (concat
           (propertize
            (concat (make-string (- (length total-page-str) (length
            ↪  current-page-str)) ? )
                    " P" current-page-str)
            'face 'mode-line)
           (propertize (concat "/" total-page-str) 'face
           ↪  'doom-modeline-buffer-minor-mode)))))

(doom-modeline-def-segment pdf-pages
  "Display PDF pages."
  (if (doom-modeline--active) doom-modeline--pdf-pages
    (propertize doom-modeline--pdf-pages 'face 'mode-line-inactive)))

(doom-modeline-def-modeline 'pdf
  '(bar window-number pdf-pages pdf-icon buffer-name)
  '(media-player misc-info matches major-mode process vcs))
```

3.4.7 Keycast

For some reason, I find myself demoing Emacs every now and then. Showing what keyboard stuff I'm doing on-screen seems helpful. While screenkey does exist, having something that doesn't cover up screen content is nice.




```
(package! keycast :pin "53514c3dc3dfb7d4c3a65898b0b3edb69b6536c2")
```

Let's just make sure this is lazy-loaded appropriately.

```
(use-package! keycast
  :commands keycast-mode
  :config
  (define-minor-mode keycast-mode
    "Show current command and its key binding in the mode line."
    :global t
    (if keycast-mode
        (progn
          (add-hook 'pre-command-hook 'keycast--update t)
          (add-to-list 'global-mode-string '("" mode-line-keycast " ")))
      (remove-hook 'pre-command-hook 'keycast--update)
      (setq global-mode-string (remove '("" mode-line-keycast " ")
      ↪  global-mode-string))))
  (custom-set-faces!
    '(keycast-command :inherit doom-modeline-debug
                      :height 0.9)
    '(keycast-key :inherit custom-modified
                  :height 1.1
                  :weight bold)))
```

3.4.8 Screencast

In a similar manner to Section 3.4.7, gif-screencast may come in handy.

```
(package! gif-screencast :pin "6798656d3d3107d16e30cc26bc3928b00e50c1ca")
```

We can lazy load this using the start/stop commands.

I initially installed `scrot` for this, since it was the default capture program. However it raised `glib error: Saving to file ... failed` each time it was run. Google didn't reveal any

easy fixed, so I switched to maim. We now need to pass it the window ID. This doesn't change throughout the lifetime of an Emacs instance, so as long as a single window is used `xdotool getactivewindow` will give a satisfactory result.

It seems that when new colours appear, that tends to make `gifsicle` introduce artefacts. To avoid this we pre-populate the colour map using the current doom theme.

```
(use-package! gif-screencast
  :commands gif-screencast-mode
  :config
  (map! :map gif-screencast-mode-map
        :g "<f8>" #'gif-screencast-toggle-pause
        :g "<f9>" #'gif-screencast-stop)
  (setq gif-screencast-program "maim"
        gif-screencast-args `("--quality" "3" "-i" ,(string-trim-right
                                                     (shell-command-to-string
                                                      "xdotool getactivewindow")))
        gif-screencast-optimize-args '("--batch" "--optimize=3"
        ↪  "--usecolormap=/tmp/doom-color-theme"))
  (defun gif-screencast-write-colormap ()
    (write-region
     (replace-regexp-in-string
      "\n+" "\n"
      (mapconcat (lambda (c) (if (listp (cdr c))
                                 (cadr c))) doom-themes--colors "\n"))
     nil "/tmp/doom-color-theme"))
  (gif-screencast-write-colormap)
  (add-hook 'doom-load-theme-hook #'gif-screencast-write-colormap))
```

3.4.9 Mixed pitch

From the `:ui zen` *module.*

We'd like to use mixed pitch in certain modes. If we simply add a hook, when directly opening a file with (a new) Emacs `mixed-pitch-mode` runs before UI initialisation, which is problematic. To resolve this, we create a hook that runs after UI initialisation and both

- conditionally enables `mixed-pitch-mode`
- sets up the mixed pitch hooks

```
(defvar mixed-pitch-modes '(org-mode LaTeX-mode markdown-mode gfm-mode Info-mode)
  "Modes that `mixed-pitch-mode' should be enabled in, but only after UI
  ↪  initialisation.")
```

```
(defun init-mixed-pitch-h ()
  "Hook `mixed-pitch-mode' into each mode in `mixed-pitch-modes'.
Also immediately enables `mixed-pitch-modes' if currently in one of the modes."
  (when (memq major-mode mixed-pitch-modes)
    (mixed-pitch-mode 1))
  (dolist (hook mixed-pitch-modes)
    (add-hook (intern (concat (symbol-name hook) "-hook")) #'mixed-pitch-mode)))
(add-hook 'doom-init-ui-hook #'init-mixed-pitch-h)
```

As mixed pitch uses the variable `mixed-pitch-face`, we can create a new function to apply mixed pitch with a serif face instead of the default (see the subsequent face definition). This was created for writeroom mode.

```
(autoload #'mixed-pitch-serif-mode "mixed-pitch"
  "Change the default face of the current buffer to a serifed variable pitch, while
  ↪ keeping some faces fixed pitch." t)

(setq! variable-pitch-serif-font (font-spec :family "Alegreya" :size 27))

(after! mixed-pitch
  (setq mixed-pitch-set-height t)
  (set-face-attribute 'variable-pitch-serif nil :font variable-pitch-serif-font)
  (defun mixed-pitch-serif-mode (&optional arg)
    "Change the default face of the current buffer to a serifed variable pitch, while
    ↪ keeping some faces fixed pitch."
    (interactive)
    (let ((mixed-pitch-face 'variable-pitch-serif))
      (mixed-pitch-mode (or arg 'toggle)))))
```

Now, as Harfbuzz is currently used in Emacs, we'll be missing out on the following Alegreya ligatures:

ff ff ffi ffi ffj ffj ffl ffl fft fft fi fi fj fj ft ft Th Th

Thankfully, it isn't to hard to add these to the `composition-function-table`.

```
(set-char-table-range composition-function-table ?f '(["\\(?:ff?[fijlt]\\)" 0
↪ font-shape-gstring]))
(set-char-table-range composition-function-table ?T '(["\\(?:Th\\)" 0
↪ font-shape-gstring]))
```

1. Variable pitch serif font

   It would be nice if we were able to make use of a serif version of the `variable-pitch` face. Since this doesn't already exist, let's create it.

```
(defface variable-pitch-serif
    '((t (:family "serif")))
    "A variable-pitch face with serifs."
    :group 'basic-faces)
```

For ease of use, let's also set up an easy way of setting the `:font` attribute.

```
(defcustom variable-pitch-serif-font (font-spec :family "serif")
  "The font face used for `variable-pitch-serif'."
  :group 'basic-faces
  :type '(restricted-sexp :tag "font-spec" :match-alternatives (fontp))
  :set (lambda (symbol value)
         (set-face-attribute 'variable-pitch-serif nil :font value)
         (set-default-toplevel-value symbol value)))
```

3.4.10 Marginalia

Part of the `:completion vertico` *module.*

Marginalia is nice, but the file metadata annotations are a little too plain. Specifically, I have these gripes

- File attributes would be nicer if coloured
- I don't care about the user/group information if the user/group is me
- When a file time is recent, a relative age (e.g. `2h ago`) is more useful than the date
- An indication of file fatness would be nice

Thanks to the `marginalia-annotator-registry`, we don't have to advise, we can just add a new `file` annotator.

Another small thing is the face used for docstrings. At the moment it's `(italic shadow)`, but I don't like that.

```
(after! marginalia
  (setq marginalia-censor-variables nil)

  (defadvice! +marginalia--anotate-local-file-colorful (cand)
    "Just a more colourful version of `marginalia--anotate-local-file'."
    :override #'marginalia--annotate-local-file
    (when-let (attrs (file-attributes (substitute-in-file-name
                                       (marginalia--full-candidate cand))
                                      'integer))
```

```
    (marginalia--fields
     ((marginalia--file-owner attrs)
      :width 12 :face 'marginalia-file-owner)
     ((marginalia--file-modes attrs))
     ((+marginalia-file-size-colorful (file-attribute-size attrs))
      :width 7)
     ((+marginalia--time-colorful (file-attribute-modification-time attrs))
      :width 12))))

(defun +marginalia--time-colorful (time)
  (let* ((seconds (float-time (time-subtract (current-time) time)))
         (color (doom-blend
                 (face-attribute 'marginalia-date :foreground nil t)
                 (face-attribute 'marginalia-documentation :foreground nil t)
                 (/ 1.0 (log (+ 3 (/ (+ 1 seconds) 345600.0)))))))
    ;; 1 - log(3 + 1/(days + 1)) % grey
    (propertize (marginalia--time time) 'face (list :foreground color))))

(defun +marginalia-file-size-colorful (size)
  (let* ((size-index (/ (log (+ 1 size)) 7.0))
         (color (if (< size-index 10000000) ; 10m
                    (doom-blend 'orange 'green size-index)
                  (doom-blend 'red 'orange (- size-index 1)))))
    (propertize (file-size-human-readable size) 'face (list :foreground color))))
```

3.4.11 Centaur Tabs

From the `:ui tabs` *module.*

We want to make the tabs a nice, comfy size (36), with icons. The modifier marker is nice, but the particular default Unicode one causes a lag spike, so let's just switch to an `o`, which still looks decent but doesn't cause any issues. An 'active-bar' is nice, so let's have one of those. If we have it `under` needs us to turn on `x-underline-at-decent` though. For some reason this didn't seem to work inside the `(after! ... )` block ¯_(ツ)_/¯. Then let's change the font to a sans serif, but the default one doesn't fit too well somehow, so let's switch to 'P22 Underground Book'; it looks much nicer.

```
(after! centaur-tabs
  (centaur-tabs-mode -1)
  (setq centaur-tabs-height 36
        centaur-tabs-set-icons t
        centaur-tabs-modified-marker "o"
        centaur-tabs-close-button "×"
        centaur-tabs-set-bar 'above
```

```
        centaur-tabs-gray-out-icons 'buffer)
  (centaur-tabs-change-fonts "P22 Underground Book" 160))
;; (setq x-underline-at-descent-line t)
```

3.4.12 Nerd Icons

From the `:core packages` *module.*

`nerd-icons` does a generally great job giving file names icons. One minor niggle I have is that when *I* open a `.m` file, it's much more likely to be Matlab than Objective-C. As such, it'll be switching the icon associated with `.m`.

```
(after! nerd-icons
  (when-let ((matlab-icon (assoc "matlab" nerd-icons-extension-icon-alist)))
    (setcdr (assoc "m" nerd-icons-extension-icon-alist)
            (cdr matlab-icon))))
```

3.4.13 Prettier page breaks

In some files, `^L` appears as a page break character. This isn't that visually appealing, and Steve Purcell has been nice enough to make a package to display these as horizontal rules.

```
(package! page-break-lines :recipe (:host github :repo "purcell/page-break-lines")
  :pin "982571749c8fe2b5e2997dd043003a1b9fe87b38")
```

We can go from "better" to "where has this been all my life?" by now making page navigation easy with some simple keybindings lifted from Xah Lee's post on the form feed. Making `forward-page` and `backward-page` work with Evil mode also takes a little tweaking, so we might as well do that too while we're at it.

We can also make the displayed horizontal rule communicate more useful information by making it the same as the fill column. While this could be accomplished by just `setq`ing the rule width to the default `fill-column` value, it would be better for it to always match the local buffer value. This may be accomplished with advise, but it's a bit cleaner (and even simpler) to just turn the width variable into an alias for `fill-column`.

```
(use-package! page-break-lines
  :hook (prog-mode . page-break-lines-mode)
  :init
  (autoload 'turn-on-page-break-lines-mode "page-break-lines")
  :config
```

```
(defvaralias 'page-break-lines-max-width 'fill-column)
(defun +evil-forward-page ()
  "Call `forward-page', such that it works as intended with evil-mode."
  (interactive)
  (when (eq (char-after (point)) ?\^L)
    (forward-char 1))
  (forward-page))
(defun +evil-backward-page ()
  "Call `backward-page', such that it works as intended with evil-mode."
  (interactive)
  (when (eq (char-after (point)) ?\^L)
    (backward-char 1))
  (backward-page))
(map! :prefix "g"
      :desc "Prev page break" :nv "[" #'+evil-backward-page
      :desc "Next page break" :nv "]" #'+evil-forward-page)
(map! "<C-M-prior>" #'+evil-backward-page
      "<C-M-next>" #'+evil-forward-page))
```

With this setup, I find form-feeds to be a really convenient addition to my coding workflow. Despite generally poor adoption, they are the only language-independent form that "just works". While you could also use specially crafted comment forms and a more complex setup, it's not as though the form-feed is being used for anything else — it's free real estate! 😉

3.4.14 Writeroom

From the `:ui zen` *module.*

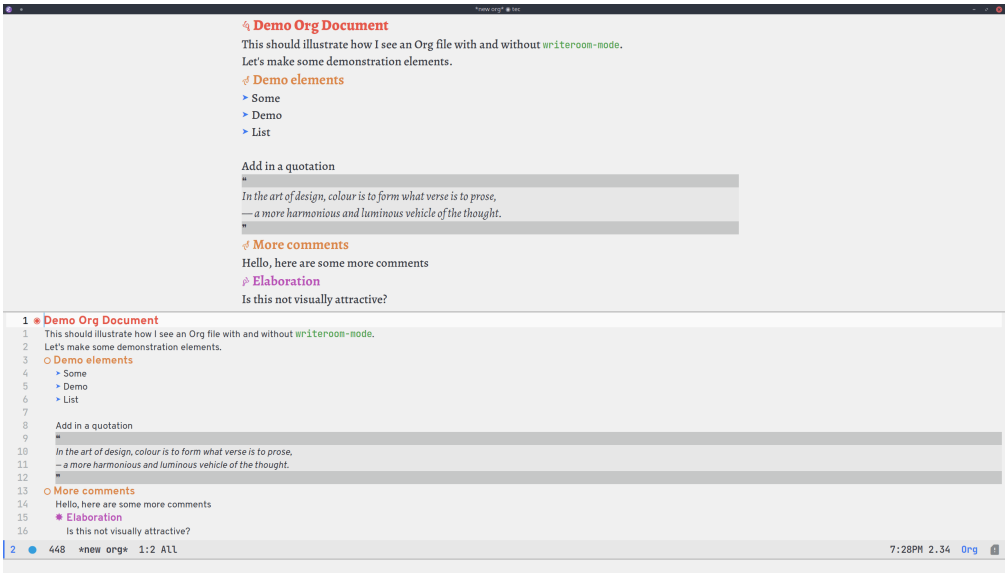
For starters, I think Doom is a bit over-zealous when zooming in

```
(setq +zen-text-scale 0.8)
```

Then, when using Org it would be nice to make a number of other aesthetic tweaks. Namely:

- Use a serifed variable-pitch font
- Hiding headline leading stars
- Using fleurons as headline bullets
- Hiding line numbers
- Removing outline indentation
- Centring the text

```
(defvar +zen-serif-p t
  "Whether to use a serifed font with `mixed-pitch-mode'.")
(defvar +zen-org-starhide t
  "The value `org-modern-hide-stars' is set to.")

(after! writeroom-mode
  (defvar-local +zen--original-org-indent-mode-p nil)
  (defvar-local +zen--original-mixed-pitch-mode-p nil)
  (defun +zen-enable-mixed-pitch-mode-h ()
    "Enable `mixed-pitch-mode' when in `+zen-mixed-pitch-modes'."
    (when (apply #'derived-mode-p +zen-mixed-pitch-modes)
      (if writeroom-mode
          (progn
            (setq +zen--original-mixed-pitch-mode-p mixed-pitch-mode)
            (funcall (if +zen-serif-p #'mixed-pitch-serif-mode #'mixed-pitch-mode) 1))
        (funcall #'mixed-pitch-mode (if +zen--original-mixed-pitch-mode-p 1 -1)))))
  (defun +zen-prose-org-h ()
    "Reformat the current Org buffer appearance for prose."
    (when (eq major-mode 'org-mode)
      (setq display-line-numbers nil
            visual-fill-column-width 60
            org-adapt-indentation nil)
      (when (featurep 'org-modern)
        (setq-local org-modern-star '("" "" "" "")
                    ;; org-modern-star '("" "" "" "" "" "" "" "")
                    org-modern-hide-stars +zen-org-starhide)
        (org-modern-mode -1)
        (org-modern-mode 1))
      (setq
       +zen--original-org-indent-mode-p org-indent-mode)
      (org-indent-mode -1)))
  (defun +zen-nonprose-org-h ()
    "Reverse the effect of `+zen-prose-org'."
    (when (eq major-mode 'org-mode)
      (when (bound-and-true-p org-modern-mode)
        (org-modern-mode -1)
        (org-modern-mode 1))
      (when +zen--original-org-indent-mode-p (org-indent-mode 1))))
  (pushnew! writeroom--local-variables
            'display-line-numbers
            'visual-fill-column-width
            'org-adapt-indentation
            'org-modern-mode
            'org-modern-star
            'org-modern-hide-stars)
  (add-hook 'writeroom-mode-enable-hook #'+zen-prose-org-h)
  (add-hook 'writeroom-mode-disable-hook #'+zen-nonprose-org-h))
```



3.4.15 Treemacs

From the `:ui treemacs` *module.*

Quite often there are superfluous files I'm not that interested in. There's no good reason for them to take up space. Let's add a mechanism to ignore them.

```
(after! treemacs
  (defvar treemacs-file-ignore-extensions '()
    "File extension which `treemacs-ignore-filter' will ensure are ignored")
  (defvar treemacs-file-ignore-globs '()
    "Globs which will are transformed to `treemacs-file-ignore-regexps' which
    ↪  `treemacs-ignore-filter' will ensure are ignored")
  (defvar treemacs-file-ignore-regexps '()
    "RegExps to be tested to ignore files, generated from
    ↪  `treeemacs-file-ignore-globs'")
  (defun treemacs-file-ignore-generate-regexps ()
    "Generate `treemacs-file-ignore-regexps' from `treemacs-file-ignore-globs'"
    (setq treemacs-file-ignore-regexps (mapcar 'dired-glob-regexp
    ↪  treemacs-file-ignore-globs)))
  (if (equal treemacs-file-ignore-globs '()) nil
  ↪  (treemacs-file-ignore-generate-regexps))
  (defun treemacs-ignore-filter (file full-path)
    "Ignore files specified by `treemacs-file-ignore-extensions', and
    ↪  `treemacs-file-ignore-regexps'"
    (or (member (file-name-extension file) treemacs-file-ignore-extensions)
```

```
        (let ((ignore-file nil))
          (dolist (regexp treemacs-file-ignore-regexps ignore-file)
            (setq ignore-file (or ignore-file (if (string-match-p regexp full-path) t
            ↪  nil)))))))
  (add-to-list 'treemacs-ignored-file-predicates #'treemacs-ignore-filter))
```

Now, we just identify the files in question.

```
(setq treemacs-file-ignore-extensions
      '(;; LaTeX
        "aux"
        "ptc"
        "fdb_latexmk"
        "fls"
        "synctex.gz"
        "toc"
        ;; LaTeX - glossary
        "glg"
        "glo"
        "gls"
        "glsdefs"
        "ist"
        "acn"
        "acr"
        "alg"
        ;; LaTeX - pgfplots
        "mw"
        ;; LaTeX - pdfx
        "pdfa.xmpi"
        ))
(setq treemacs-file-ignore-globs
      '(;; LaTeX
        "*/_minted-*"
        ;; AucTeX
        "*/.auctex-auto"
        "*/_region_.log"
        "*/_region_.tex"))
```

3.4.16 Visual fill column

This is already loaded by Doom, but it needs a patch applied for Emacs 29. I've emailed this to the maintainer, hopefully Joost will take a look at it.

```
Account for remapping in window width calculation
```

```
The window width calculation in
`visual-fill-column--window-max-text-width' uses `window-width' with the
active window as the sole argument. As of Emacs 29, this returns the
width of the window using the default face, even if the default face has
been remapped in the window: causing incorrect results when the window
is remapped.

Emacs 29 also introduces a special second argument value, `remap'
which (as we want) uses the remapped face, if applicable. This corrects
the width calculation. However, margin calculations are still done in
terms of the non-remapped default face, and so a conversion factor needs
to be applied when considering margins.
```

That's the problem/fix, I'll just overwrite the two functions in question with the fixed versions for now.

```
(defun +visual-fill-column--window-max-text-width--fixed (&optional window)
  "Return the maximum possible text width of WINDOW.
The maximum possible text width is the width of the current text
area plus the margins, but excluding the fringes, scroll bar, and
right divider.  WINDOW defaults to the selected window.  The
return value is scaled to account for `text-scale-mode-amount'
and `text-scale-mode-step'."
  (or window (setq window (selected-window)))
  (let* ((margins (window-margins window))
         (buffer (window-buffer window))
         (scale (if (and visual-fill-column-adjust-for-text-scale
                         (boundp 'text-scale-mode-step)
                         (boundp 'text-scale-mode-amount))
                    (with-current-buffer buffer
                      (expt text-scale-mode-step
                            text-scale-mode-amount))
                  1.0))
         (remap-scale
          (if (>= emacs-major-version 29)
              (/ (window-width window 'remap) (float (window-width window)))
            1.0)))
    (truncate (/ (+ (window-width window (and (>= emacs-major-version 29) 'remap))
                    (* (or (car margins) 0) remap-scale)
                    (* (or (cdr margins) 0) remap-scale))
                 (float scale)))))

(advice-add 'visual-fill-column--window-max-text-width
            :override #'+visual-fill-column--window-max-text-width--fixed)
```

```
(defun +visual-fill-column--set-margins--fixed (window)
  "Set window margins for WINDOW."
  ;; Calculate left & right margins.
  (let* ((total-width (visual-fill-column--window-max-text-width window))
         (remap-scale
          (if (>= emacs-major-version 29)
              (/ (window-width window 'remap) (float (window-width window)))
            1.0))
         (width (or visual-fill-column-width
                    fill-column))
         (margins (if (< (- total-width width) 0) ; margins must be >= 0
                      0
                    (round (/ (- total-width width) remap-scale))))
         (left (if visual-fill-column-center-text
                   (/ margins 2)
                 0))
         (right (- margins left)))

    (if visual-fill-column-extra-text-width
        (let ((add-width (visual-fill-column--add-extra-width left right
        ↪  visual-fill-column-extra-text-width)))
          (setq left (car add-width)
                right (cdr add-width))))

    ;; put an explicitly R2L buffer on the right side of the window
    (when (and (eq bidi-paragraph-direction 'right-to-left)
               (= left 0))
      (setq left right)
      (setq right 0))

    (set-window-margins window left right)))

(advice-add 'visual-fill-column--set-margins
            :override #'+visual-fill-column--set-margins--fixed)
```

3.5 Frivolities

3.5.1 xkcd

XKCD comics are fun.

```
(package! xkcd :pin "80011da2e7def8f65233d4e0d790ca60d287081d")
```

We want to set this up so it loads nicely in Extra links.

```
(use-package! xkcd
  :commands (xkcd-get-json
             xkcd-download xkcd-get
             ;; now for funcs from my extension of this pkg
             +xkcd-find-and-copy +xkcd-find-and-view
             +xkcd-fetch-info +xkcd-select)
  :config
  (setq xkcd-cache-dir (expand-file-name "xkcd/" doom-cache-dir)
        xkcd-cache-latest (concat xkcd-cache-dir "latest"))
  (unless (file-exists-p xkcd-cache-dir)
    (make-directory xkcd-cache-dir))
  (after! evil-snipe
    (add-to-list 'evil-snipe-disabled-modes 'xkcd-mode))
  :general (:states 'normal
            :keymaps 'xkcd-mode-map
            "<right>" #'xkcd-next
            "n"       #'xkcd-next ; evil-ish
            "<left>"  #'xkcd-prev
            "N"       #'xkcd-prev ; evil-ish
            "r"       #'xkcd-rand
            "a"       #'xkcd-rand ; because image-rotate can interfere
            "t"       #'xkcd-alt-text
            "q"       #'xkcd-kill-buffer
            "o"       #'xkcd-open-browser
            "e"       #'xkcd-open-explanation-browser
            ;; extras
            "s"       #'+xkcd-find-and-view
            "/"       #'+xkcd-find-and-view
            "y"       #'+xkcd-copy))
```

Let's also extend the functionality a whole bunch.

```
(after! xkcd
  (require 'emacsql-sqlite)

  (defun +xkcd-select ()
    "Prompt the user for an xkcd using `completing-read' and `+xkcd-select-format'.
    ↪  Return the xkcd number or nil"
    (let* (prompt-lines
           (-dummy (maphash (lambda (key xkcd-info)
                              (push (+xkcd-select-format xkcd-info) prompt-lines))
                            +xkcd-stored-info))
           (num (completing-read (format "xkcd (%s): " xkcd-latest) prompt-lines)))
      (if (equal "" num) xkcd-latest
        (string-to-number (replace-regexp-in-string "\\([0-9]+\\).*" "\\1" num)))))

  (defun +xkcd-select-format (xkcd-info)
```

```
  "Creates each completing-read line from an xkcd info plist. Must start with the
  ↪  xkcd number"
  (format "%-4s  %-30s %s"
          (propertize (number-to-string (plist-get xkcd-info :num))
                      'face 'counsel-key-binding)
          (plist-get xkcd-info :title)
          (propertize (plist-get xkcd-info :alt)
                      'face '(variable-pitch font-lock-comment-face))))

(defun +xkcd-fetch-info (&optional num)
  "Fetch the parsed json info for comic NUM. Fetches latest when omitted or 0"
  (require 'xkcd)
  (when (or (not num) (= num 0))
    (+xkcd-check-latest)
    (setq num xkcd-latest))
  (let ((res (or (gethash num +xkcd-stored-info)
                 (puthash num (+xkcd-db-read num) +xkcd-stored-info))))
    (unless res
      (+xkcd-db-write
       (let* ((url (format "https://xkcd.com/%d/info.0.json" num))
              (json-assoc
               (if (gethash num +xkcd-stored-info)
                   (gethash num +xkcd-stored-info)
                 (json-read-from-string (xkcd-get-json url num)))))
         json-assoc))
      (setq res (+xkcd-db-read num)))
    res))

;; since we've done this, we may as well go one little step further
(defun +xkcd-find-and-copy ()
  "Prompt for an xkcd using `+xkcd-select' and copy url to clipboard"
  (interactive)
  (+xkcd-copy (+xkcd-select)))

(defun +xkcd-copy (&optional num)
  "Copy a url to xkcd NUM to the clipboard"
  (interactive "i")
  (let ((num (or num xkcd-cur)))
    (gui-select-text (format "https://xkcd.com/%d" num))
    (message "xkcd.com/%d copied to clipboard" num)))

(defun +xkcd-find-and-view ()
  "Prompt for an xkcd using `+xkcd-select' and view it"
  (interactive)
  (xkcd-get (+xkcd-select))
  (switch-to-buffer "*xkcd*"))

(defvar +xkcd-latest-max-age (* 60 60) ; 1 hour
```

```
    "Time after which xkcd-latest should be refreshed, in seconds")

  ;; initialise `xkcd-latest' and `+xkcd-stored-info' with latest xkcd
  (add-transient-hook! '+xkcd-select
    (require 'xkcd)
    (+xkcd-fetch-info xkcd-latest)
    (setq +xkcd-stored-info (+xkcd-db-read-all)))

  (add-transient-hook! '+xkcd-fetch-info
    (xkcd-update-latest))

  (defun +xkcd-check-latest ()
    "Use value in `xkcd-cache-latest' as long as it isn't older thabn
    ↪  `+xkcd-latest-max-age'"
    (unless (and (file-exists-p xkcd-cache-latest)
                 (< (- (time-to-seconds (current-time))
                       (time-to-seconds (file-attribute-modification-time
                       ↪  (file-attributes xkcd-cache-latest))))
                    +xkcd-latest-max-age))
      (let* ((out (xkcd-get-json "http://xkcd.com/info.0.json" 0))
             (json-assoc (json-read-from-string out))
             (latest (cdr (assoc 'num json-assoc))))
        (when (/= xkcd-latest latest)
          (+xkcd-db-write json-assoc)
          (with-current-buffer (find-file xkcd-cache-latest)
            (setq xkcd-latest latest)
            (erase-buffer)
            (insert (number-to-string latest))
            (save-buffer)
            (kill-buffer (current-buffer)))))
      (shell-command (format "touch %s" xkcd-cache-latest))))

  (defvar +xkcd-stored-info (make-hash-table :test 'eql)
    "Basic info on downloaded xkcds, in the form of a hashtable")

  (defadvice! xkcd-get-json--and-cache (url &optional num)
    "Fetch the Json coming from URL.
If the file NUM.json exists, use it instead.
If NUM is 0, always download from URL.
The return value is a string."
    :override #'xkcd-get-json
    (let* ((file (format "%s%d.json" xkcd-cache-dir num))
           (cached (and (file-exists-p file) (not (eq num 0))))
           (out (with-current-buffer (if cached
                                         (find-file file)
                                       (url-retrieve-synchronously url))
                  (goto-char (point-min))
                  (unless cached (re-search-forward "^$"))
```

```
                (prog1
                    (buffer-substring-no-properties (point) (point-max))
                  (kill-buffer (current-buffer))))))
    (unless (or cached (eq num 0))
      (xkcd-cache-json num out))
    out))

(defadvice! +xkcd-get (num)
  "Get the xkcd number NUM."
  :override 'xkcd-get
  (interactive "nEnter comic number: ")
  (xkcd-update-latest)
  (get-buffer-create "*xkcd*")
  (switch-to-buffer "*xkcd*")
  (xkcd-mode)
  (let (buffer-read-only)
    (erase-buffer)
    (setq xkcd-cur num)
    (let* ((xkcd-data (+xkcd-fetch-info num))
           (num (plist-get xkcd-data :num))
           (img (plist-get xkcd-data :img))
           (safe-title (plist-get xkcd-data :safe-title))
           (alt (plist-get xkcd-data :alt))
           title file)
      (message "Getting comic...")
      (setq file (xkcd-download img num))
      (setq title (format "%d: %s" num safe-title))
      (insert (propertize title
                          'face 'outline-1))
      (center-line)
      (insert "\n")
      (xkcd-insert-image file num)
      (if (eq xkcd-cur 0)
          (setq xkcd-cur num))
      (setq xkcd-alt alt)
      (message "%s" title))))

(defconst +xkcd-db--sqlite-available-p
  (with-demoted-errors "+org-xkcd initialization: %S"
    (emacsql-sqlite-ensure-binary)
    t))

(defvar +xkcd-db--connection (make-hash-table :test #'equal)
  "Database connection to +org-xkcd database.")

(defun +xkcd-db--get ()
  "Return the sqlite db file."
  (expand-file-name "xkcd.db" xkcd-cache-dir))
```

```
  (defun +xkcd-db--get-connection ()
    "Return the database connection, if any."
    (gethash (file-truename xkcd-cache-dir)
             +xkcd-db--connection))

  (defconst +xkcd-db--table-schema
    '((xkcds
       [(num integer :unique :primary-key)
        (year        :not-null)
        (month       :not-null)
        (link        :not-null)
        (news        :not-null)
        (safe_title  :not-null)
        (title       :not-null)
        (transcript  :not-null)
        (alt         :not-null)
        (img         :not-null)])))

  (defun +xkcd-db--init (db)
    "Initialize database DB with the correct schema and user version."
    (emacsql-with-transaction db
      (pcase-dolist (`(,table . ,schema) +xkcd-db--table-schema)
        (emacsql db [:create-table $i1 $S2] table schema))))

  (defun +xkcd-db ()
    "Entrypoint to the +org-xkcd sqlite database.
Initializes and stores the database, and the database connection.
Performs a database upgrade when required."
    (unless (and (+xkcd-db--get-connection)
                 (emacsql-live-p (+xkcd-db--get-connection)))
      (let* ((db-file (+xkcd-db--get))
             (init-db (not (file-exists-p db-file))))
        (make-directory (file-name-directory db-file) t)
        (let ((conn (emacsql-sqlite db-file)))
          (set-process-query-on-exit-flag (emacsql-process conn) nil)
          (puthash (file-truename xkcd-cache-dir)
                   conn
                   +xkcd-db--connection)
          (when init-db
            (+xkcd-db--init conn)))))
    (+xkcd-db--get-connection))

  (defun +xkcd-db-query (sql &rest args)
    "Run SQL query on +org-xkcd database with ARGS.
SQL can be either the emacsql vector representation, or a string."
    (if  (stringp sql)
        (emacsql (+xkcd-db) (apply #'format sql args))
```

```
    (apply #'emacsql (+xkcd-db) sql args)))

(defun +xkcd-db-read (num)
  (when-let ((res
              (car (+xkcd-db-query [:select * :from xkcds
                                    :where (= num $s1)]
                                   num
                                   :limit 1))))
    (+xkcd-db-list-to-plist res)))

(defun +xkcd-db-read-all ()
  (let ((xkcd-table (make-hash-table :test 'eql :size 4000)))
    (mapcar (lambda (xkcd-info-list)
              (puthash (car xkcd-info-list) (+xkcd-db-list-to-plist xkcd-info-list)
              ↪  xkcd-table))
            (+xkcd-db-query [:select * :from xkcds]))
    xkcd-table))

(defun +xkcd-db-list-to-plist (xkcd-datalist)
  `(:num ,(nth 0 xkcd-datalist)
    :year ,(nth 1 xkcd-datalist)
    :month ,(nth 2 xkcd-datalist)
    :link ,(nth 3 xkcd-datalist)
    :news ,(nth 4 xkcd-datalist)
    :safe-title ,(nth 5 xkcd-datalist)
    :title ,(nth 6 xkcd-datalist)
    :transcript ,(nth 7 xkcd-datalist)
    :alt ,(nth 8 xkcd-datalist)
    :img ,(nth 9 xkcd-datalist)))

(defun +xkcd-db-write (data)
  (+xkcd-db-query [:insert-into xkcds
                   :values $v1]
                  (list (vector
                         (cdr (assoc 'num        data))
                         (cdr (assoc 'year       data))
                         (cdr (assoc 'month      data))
                         (cdr (assoc 'link       data))
                         (cdr (assoc 'news       data))
                         (cdr (assoc 'safe_title data))
                         (cdr (assoc 'title      data))
                         (cdr (assoc 'transcript data))
                         (cdr (assoc 'alt        data))
                         (cdr (assoc 'img        data))
                         )))))
```

3.5.2 Selectric

Every so often, you want everyone else to *know* that you're typing, or just to amuse oneself. Introducing: typewriter sounds!

```
(package! selectric-mode :pin "1840de71f7414b7cd6ce425747c8e26a413233aa")
```

```
(use-package! selectic-mode
  :commands selectic-mode)
```

3.5.3 Wttrin

Hey, let's get the weather in here while we're at it. Unfortunately this seems slightly unmaintained (few open bugfix PRs) so let's roll our own version.

```
(package! wttrin :recipe (:local-repo "lisp/wttrin"))
```

```
(use-package! wttrin
  :commands wttrin)
```

3.5.4 Spray

Why not flash words on the screen. Why not — hey, it could be fun.

```
(package! spray :pin "74d9dcfa2e8b38f96a43de9ab0eb13364300cb46"
  :recipe (:host github :repo "emacsmirror/spray")) ; sr.ht can be flaky
```

It would be nice if Spray's default speed suited me better, and the keybindings worked in evil mode. Let's do that and make the display slightly nicer while we're at it.

```
(use-package! spray
  :commands spray-mode
  :config
  (setq spray-wpm 600
        spray-height 800)
  (defun spray-mode-hide-cursor ()
    "Hide or unhide the cursor as is appropriate."
    (if spray-mode
        (setq-local spray--last-evil-cursor-state evil-normal-state-cursor
                    evil-normal-state-cursor '(nil))
      (setq-local evil-normal-state-cursor spray--last-evil-cursor-state)))
```

```
  (add-hook 'spray-mode-hook #'spray-mode-hide-cursor)
  (map! :map spray-mode-map
        "<return>" #'spray-start/stop
        "f" #'spray-faster
        "s" #'spray-slower
        "t" #'spray-time
        "<right>" #'spray-forward-word
        "h" #'spray-forward-word
        "<left>" #'spray-backward-word
        "l" #'spray-backward-word
        "q" #'spray-quit))
```

3.5.5 Elcord

What's even the point of using Emacs unless you're constantly telling everyone about it?

```
(package! elcord :pin "deeb22f84378b382f09e78f1718bc4c39a3582b8")
```

```
(use-package! elcord
  :commands elcord-mode
  :config
  (setq elcord-use-major-mode-as-main-icon t))
```

3.6 File types

3.6.1 Systemd

For editing systemd unit files

```
(package! systemd :pin "8742607120fbc440821acbc351fda1e8e68a8806")
```

```
(use-package! systemd
  :defer t)
```

Chapter 4
Applications

4.1 Ebooks

For managing my ebooks, I'll hook into the well-established ebook library manager calibre. A number of Emacs clients for this exist, but this seems like a good option.

```
(package! calibredb :pin "7d33947462c77f9e87e8078fa7b7b398feeef0f7")
```

Then for reading them, the only currently viable options seems to be nov.el.

```
(package! nov :pin "b37d9380752e541db3f4b947c219ca54d50ca273")
```

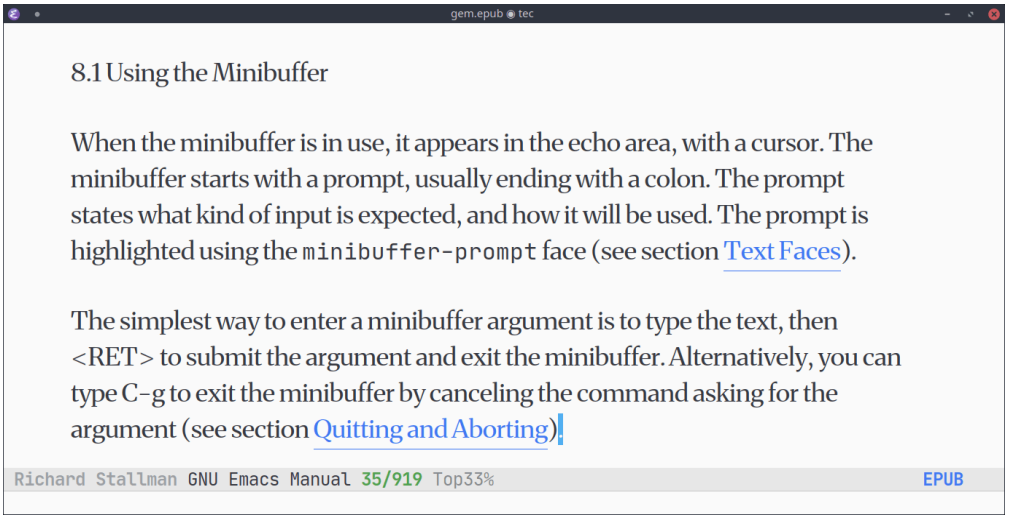
Together these should give me a rather good experience reading ebooks.

`calibredb` lets us use calibre through Emacs, because who wouldn't want to use something through Emacs?

```
(use-package! calibredb
  :commands calibredb
  :config
  (setq calibredb-root-dir "~/.local/share/calibre-library"
        calibredb-db-dir (expand-file-name "metadata.db" calibredb-root-dir))
  (map! :map calibredb-show-mode-map
        :ne "?" #'calibredb-entry-dispatch
        :ne "o" #'calibredb-find-file
        :ne "O" #'calibredb-find-file-other-frame
        :ne "V" #'calibredb-open-file-with-default-tool
        :ne "s" #'calibredb-set-metadata-dispatch
        :ne "e" #'calibredb-export-dispatch
        :ne "q" #'calibredb-entry-quit
        :ne "." #'calibredb-open-dired
        :ne [tab] #'calibredb-toggle-view-at-point
        :ne "M-t" #'calibredb-set-metadata--tags
        :ne "M-a" #'calibredb-set-metadata--author_sort
        :ne "M-A" #'calibredb-set-metadata--authors
        :ne "M-T" #'calibredb-set-metadata--title
        :ne "M-c" #'calibredb-set-metadata--comments)
  (map! :map calibredb-search-mode-map
        :ne [mouse-3] #'calibredb-search-mouse
        :ne "RET" #'calibredb-find-file
        :ne "?" #'calibredb-dispatch
        :ne "a" #'calibredb-add
        :ne "A" #'calibredb-add-dir
```

```
        :ne "c" #'calibredb-clone
        :ne "d" #'calibredb-remove
        :ne "D" #'calibredb-remove-marked-items
        :ne "j" #'calibredb-next-entry
        :ne "k" #'calibredb-previous-entry
        :ne "l" #'calibredb-virtual-library-list
        :ne "L" #'calibredb-library-list
        :ne "n" #'calibredb-virtual-library-next
        :ne "N" #'calibredb-library-next
        :ne "p" #'calibredb-virtual-library-previous
        :ne "P" #'calibredb-library-previous
        :ne "s" #'calibredb-set-metadata-dispatch
        :ne "S" #'calibredb-switch-library
        :ne "o" #'calibredb-find-file
        :ne "O" #'calibredb-find-file-other-frame
        :ne "v" #'calibredb-view
        :ne "V" #'calibredb-open-file-with-default-tool
        :ne "." #'calibredb-open-dired
        :ne "b" #'calibredb-catalog-bib-dispatch
        :ne "e" #'calibredb-export-dispatch
        :ne "r" #'calibredb-search-refresh-and-clear-filter
        :ne "R" #'calibredb-search-clear-filter
        :ne "q" #'calibredb-search-quit
        :ne "m" #'calibredb-mark-and-forward
        :ne "f" #'calibredb-toggle-favorite-at-point
        :ne "x" #'calibredb-toggle-archive-at-point
        :ne "h" #'calibredb-toggle-highlight-at-point
        :ne "u" #'calibredb-unmark-and-forward
        :ne "i" #'calibredb-edit-annotation
        :ne "DEL" #'calibredb-unmark-and-backward
        :ne [backtab] #'calibredb-toggle-view
        :ne [tab] #'calibredb-toggle-view-at-point
        :ne "M-n" #'calibredb-show-next-entry
        :ne "M-p" #'calibredb-show-previous-entry
        :ne "/" #'calibredb-search-live-filter
        :ne "M-t" #'calibredb-set-metadata--tags
        :ne "M-a" #'calibredb-set-metadata--author_sort
        :ne "M-A" #'calibredb-set-metadata--authors
        :ne "M-T" #'calibredb-set-metadata--title
        :ne "M-c" #'calibredb-set-metadata--comments))
```

Then, to actually read the ebooks we use `nov`.




```
(use-package! nov
  :mode ("\\.epub\\'" . nov-mode)
  :config
  (map! :map nov-mode-map
        :n "RET" #'nov-scroll-up)

  (advice-add 'nov-render-title :override #'ignore)

  (defun +nov-mode-setup ()
    "Tweak nov-mode to our liking."
    (face-remap-add-relative 'variable-pitch
                             :family "Merriweather"
                             :height 1.4
                             :width 'semi-expanded)
    (face-remap-add-relative 'default :height 1.3)
    (variable-pitch-mode 1)
    (setq-local line-spacing 0.2
                next-screen-context-lines 4
                shr-use-colors nil)
    (when (require 'visual-fill-column nil t)
      (setq-local visual-fill-column-center-text t
                  visual-fill-column-width 64
                  nov-text-width 106)
      (visual-fill-column-mode 1))
    (when (featurep 'hl-line-mode)
      (hl-line-mode -1))
    ;; Re-render with new display settings
    (nov-render-document)
    ;; Look up words with the dictionary.
    (add-to-list '+lookup-definition-functions #'+lookup/dictionary-definition))
```

```
  (add-hook 'nov-mode-hook #'+nov-mode-setup))
```

To enhance the reading experience, we can create a nice minimal modeline, with just the basic bare minimum, information about the book/chapter, and possibly currently playing media.

```
(after! doom-modeline
  (defvar doom-modeline-nov-title-max-length 40)
  (doom-modeline-def-segment nov-author
    (propertize
     (cdr (assoc 'creator nov-metadata))
     'face (doom-modeline-face 'doom-modeline-project-parent-dir)))
  (doom-modeline-def-segment nov-title
    (let ((title (or (cdr (assoc 'title nov-metadata)) "")))
      (if (<= (length title) doom-modeline-nov-title-max-length)
          (concat " " title)
        (propertize
         (concat " " (truncate-string-to-width title
         ↪  doom-modeline-nov-title-max-length nil nil t))
         'help-echo title))))
  (doom-modeline-def-segment nov-current-page
    (let ((words (count-words (point-min) (point-max))))
      (propertize
       (format " %d/%d"
               (1+ nov-documents-index)
               (length nov-documents))
       'face (doom-modeline-face 'doom-modeline-info)
       'help-echo (if (= words 1) "1 word in this chapter"
                    (format "%s words in this chapter" words)))))
  (doom-modeline-def-segment scroll-percentage-subtle
    (concat
     (doom-modeline-spc)
     (propertize (format-mode-line '("" doom-modeline-percent-position "%%"))
                 'face (doom-modeline-face 'shadow)
                 'help-echo "Buffer percentage")))

  (doom-modeline-def-modeline 'nov
    '(workspace-name window-number nov-author nov-title nov-current-page
    ↪  scroll-percentage-subtle)
    '(media-player misc-info major-mode time))

  (add-to-list 'doom-modeline-mode-alist '(nov-mode . nov)))
```

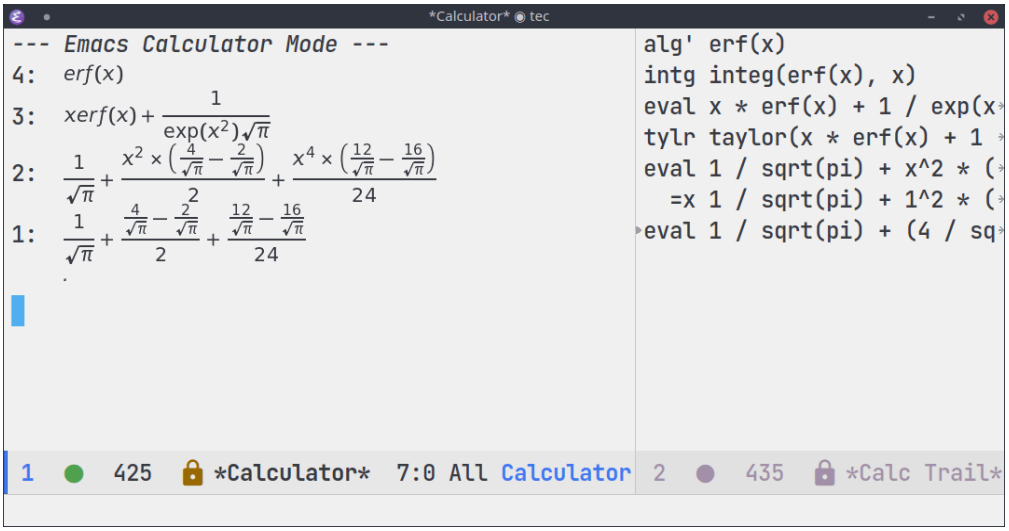
4.2 Calculator

Emacs includes the venerable `calc`, which is a pretty impressive RPN (Reverse Polish Notation) calculator. However, we can do a bit to improve the experience.

4.2.1 CalcTeX

Everybody knows that mathematical expressions look best with LaTeX, so `calc`'s ability to create LaTeX representations of its expressions provides a lovely opportunity which is taken advantage of in the CalcTeX package.

```
(package! calctex :recipe (:host github :repo "johnbcoughlin/calctex"
                           :files ("*.el" "calctex/*.el" "calctex-contrib/*.el"
                           ↪  "org-calctex/*.el" "vendor"))
  :pin "67a2e76847a9ea9eff1f8e4eb37607f84b380ebb")
```



We'd like to use CalcTeX too, so let's set that up, and fix some glaring inadequacies — why on earth would you commit a hard-coded path to an executable that *only works on your local machine*, consequently breaking the package for everyone else!?

```
(use-package! calctex
  :commands calctex-mode
  :init
  (add-hook 'calc-mode-hook #'calctex-mode)
  :config
```

```
  (setq calctex-additional-latex-packages "
\\usepackage[usenames]{xcolor}
\\usepackage{soul}
\\usepackage{adjustbox}
\\usepackage{amsmath}
\\usepackage{amssymb}
\\usepackage{siunitx}
\\usepackage{cancel}
\\usepackage{mathtools}
\\usepackage{mathalpha}
\\usepackage{xparse}
\\usepackage{arevmath}"
        calctex-additional-latex-macros
        (concat calctex-additional-latex-macros
                "\n\\let\\evalto\\Rightarrow"))
  (defadvice! no-messaging-a (orig-fn &rest args)
    :around #'calctex-default-dispatching-render-process
    (let ((inhibit-message t) message-log-max)
      (apply orig-fn args)))
  ;; Fix hardcoded dvichop path (whyyyyyyy)
  (let ((vendor-folder (concat (file-truename doom-local-dir)
                               "straight/"
                               (format "build-%s" emacs-version)
                               "/calctex/vendor/")))
    (setq calctex-dvichop-sty (concat vendor-folder "texd/dvichop")
          calctex-dvichop-bin (concat vendor-folder "texd/dvichop")))
  (unless (file-exists-p calctex-dvichop-bin)
    (message "CalcTeX: Building dvichop binary")
    (let ((default-directory (file-name-directory calctex-dvichop-bin)))
      (call-process "make" nil nil nil))))
```

4.2.2 Defaults

Any sane person prefers radians and exact values.

```
(setq calc-angle-mode 'rad  ; radians are rad
      calc-symbolic-mode t) ; keeps expressions like \sqrt{2} irrational for as long
      ↪  as possible
```

4.2.3 Embedded calc

Embedded calc is a lovely feature which let's us use calc to operate on LaTeX maths expressions. The standard keybinding is a bit janky however (`C-x * e`), so we'll add a localleader-based

alternative.

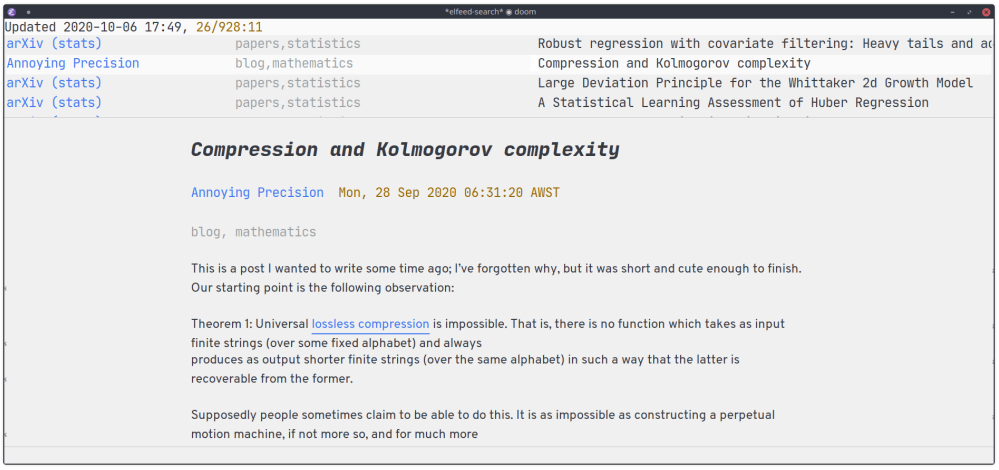
```
(map! :map calc-mode-map
      :after calc
      :localleader
      :desc "Embedded calc (toggle)" "e" #'calc-embedded)
(map! :map org-mode-map
      :after org
      :localleader
      :desc "Embedded calc (toggle)" "E" #'calc-embedded)
(map! :map latex-mode-map
      :after latex
      :localleader
      :desc "Embedded calc (toggle)" "e" #'calc-embedded)
```

Unfortunately this operates without the (rather informative) calculator and trail buffers, but we can advice it that we would rather like those in a side panel.

```
(defvar calc-embedded-trail-window nil)
(defvar calc-embedded-calculator-window nil)

(defadvice! calc-embedded-with-side-pannel (&rest _)
  :after #'calc-do-embedded
  (when calc-embedded-trail-window
    (ignore-errors
      (delete-window calc-embedded-trail-window))
    (setq calc-embedded-trail-window nil))
  (when calc-embedded-calculator-window
    (ignore-errors
      (delete-window calc-embedded-calculator-window))
    (setq calc-embedded-calculator-window nil))
  (when (and calc-embedded-info
             (> (* (window-width) (window-height)) 1200))
    (let ((main-window (selected-window))
          (vertical-p (> (window-width) 80)))
      (select-window
       (setq calc-embedded-trail-window
             (if vertical-p
                 (split-window-horizontally (- (max 30 (/ (window-width) 3))))
               (split-window-vertically (- (max 8 (/ (window-height) 4)))))))
      (switch-to-buffer "*Calc Trail*")
      (select-window
       (setq calc-embedded-calculator-window
             (if vertical-p
                 (split-window-vertically -6)
               (split-window-horizontally (- (/ (window-width) 2))))))
      (switch-to-buffer "*Calculator*")
      (select-window main-window))))
```

4.3 Newsfeed

RSS feeds are still a thing. Why not make use of them with `elfeed`. I really like what fuxialexander has going on, but I don't think I need a custom module. Let's just try to patch on the main things I like the look of.



4.3.1 Keybindings

```
(map! :map elfeed-search-mode-map
      :after elfeed-search
      [remap kill-this-buffer] "q"
      [remap kill-buffer] "q"
      :n doom-leader-key nil
      :n "q" #'+rss/quit
      :n "e" #'elfeed-update
      :n "r" #'elfeed-search-untag-all-unread
      :n "u" #'elfeed-search-tag-all-unread
      :n "s" #'elfeed-search-live-filter
      :n "RET" #'elfeed-search-show-entry
      :n "p" #'elfeed-show-pdf
      :n "+" #'elfeed-search-tag-all
      :n "-" #'elfeed-search-untag-all
      :n "S" #'elfeed-search-set-filter
      :n "b" #'elfeed-search-browse-url
      :n "y" #'elfeed-search-yank)
(map! :map elfeed-show-mode-map
      :after elfeed-show
      [remap kill-this-buffer] "q"
```

```
      [remap kill-buffer] "q"
      :n doom-leader-key nil
      :nm "q" #'+rss/delete-pane
      :nm "o" #'ace-link-elfeed
      :nm "RET" #'org-ref-elfeed-add
      :nm "n" #'elfeed-show-next
      :nm "N" #'elfeed-show-prev
      :nm "p" #'elfeed-show-pdf
      :nm "+" #'elfeed-show-tag
      :nm "-" #'elfeed-show-untag
      :nm "s" #'elfeed-show-new-live-search
      :nm "y" #'elfeed-show-yank)
```

4.3.2 Usability enhancements

```
(after! elfeed-search
  (set-evil-initial-state! 'elfeed-search-mode 'normal))
(after! elfeed-show-mode
  (set-evil-initial-state! 'elfeed-show-mode   'normal))

(after! evil-snipe
  (push 'elfeed-show-mode   evil-snipe-disabled-modes)
  (push 'elfeed-search-mode evil-snipe-disabled-modes))
```

4.3.3 Visual enhancements

```
(after! elfeed

  (elfeed-org)
  (use-package! elfeed-link)

  (setq elfeed-search-filter "@1-week-ago +unread"
        elfeed-search-print-entry-function '+rss/elfeed-search-print-entry
        elfeed-search-title-min-width 80
        elfeed-show-entry-switch #'pop-to-buffer
        elfeed-show-entry-delete #'+rss/delete-pane
        elfeed-show-refresh-function #'+rss/elfeed-show-refresh--better-style
        shr-max-image-proportion 0.6)

  (add-hook! 'elfeed-show-mode-hook (hide-mode-line-mode 1))
  (add-hook! 'elfeed-search-update-hook #'hide-mode-line-mode)

  (defface elfeed-show-title-face '((t (:weight ultrabold :slant italic :height 1.5)))
```

```
    "title face in elfeed show buffer"
    :group 'elfeed)
  (defface elfeed-show-author-face `((t (:weight light)))
    "title face in elfeed show buffer"
    :group 'elfeed)
  (set-face-attribute 'elfeed-search-title-face nil
                      :foreground 'nil
                      :weight 'light)

  (defadvice! +rss-elfeed-wrap-h-nicer ()
    "Enhances an elfeed entry's readability by wrapping it to a width of
`fill-column' and centering it with `visual-fill-column-mode'."
    :override #'+rss-elfeed-wrap-h
    (setq-local truncate-lines nil
                shr-width 120
                visual-fill-column-center-text t
                default-text-properties '(line-height 1.1))
    (let ((inhibit-read-only t)
          (inhibit-modification-hooks t))
      (visual-fill-column-mode)
      ;; (setq-local shr-current-font '(:family "Merriweather" :height 1.2))
      (set-buffer-modified-p nil)))

  (defun +rss/elfeed-search-print-entry (entry)
    "Print ENTRY to the buffer."
    (let* ((elfeed-goodies/tag-column-width 40)
           (elfeed-goodies/feed-source-column-width 30)
           (title (or (elfeed-meta entry :title) (elfeed-entry-title entry) ""))
           (title-faces (elfeed-search--faces (elfeed-entry-tags entry)))
           (feed (elfeed-entry-feed entry))
           (feed-title
            (when feed
              (or (elfeed-meta feed :title) (elfeed-feed-title feed))))
           (tags (mapcar #'symbol-name (elfeed-entry-tags entry)))
           (tags-str (concat (mapconcat 'identity tags ",")))
           (title-width (- (window-width) elfeed-goodies/feed-source-column-width
                           elfeed-goodies/tag-column-width 4))

           (tag-column (elfeed-format-column
                        tags-str (elfeed-clamp (length tags-str)
                                               elfeed-goodies/tag-column-width
                                               elfeed-goodies/tag-column-width)
                        :left))
           (feed-column (elfeed-format-column
                         feed-title (elfeed-clamp
                         ↪  elfeed-goodies/feed-source-column-width

                                                 ↪  elfeed-goodies/feed-source-column-width
```

```
                                                    ↪ elfeed-goodies/feed-source-column-width)
                        :left)))

    (insert (propertize feed-column 'face 'elfeed-search-feed-face) " ")
    (insert (propertize tag-column 'face 'elfeed-search-tag-face) " ")
    (insert (propertize title 'face title-faces 'kbd-help title))
    (setq-local line-spacing 0.2)))

(defun +rss/elfeed-show-refresh--better-style ()
  "Update the buffer to match the selected entry, using a mail-style."
  (interactive)
  (let* ((inhibit-read-only t)
         (title (elfeed-entry-title elfeed-show-entry))
         (date (seconds-to-time (elfeed-entry-date elfeed-show-entry)))
         (author (elfeed-meta elfeed-show-entry :author))
         (link (elfeed-entry-link elfeed-show-entry))
         (tags (elfeed-entry-tags elfeed-show-entry))
         (tagsstr (mapconcat #'symbol-name tags ", "))
         (nicedate (format-time-string "%a, %e %b %Y %T %Z" date))
         (content (elfeed-deref (elfeed-entry-content elfeed-show-entry)))
         (type (elfeed-entry-content-type elfeed-show-entry))
         (feed (elfeed-entry-feed elfeed-show-entry))
         (feed-title (elfeed-feed-title feed))
         (base (and feed (elfeed-compute-base (elfeed-feed-url feed)))))
    (erase-buffer)
    (insert "\n")
    (insert (format "%s\n\n" (propertize title 'face 'elfeed-show-title-face)))
    (insert (format "%s\t" (propertize feed-title 'face 'elfeed-search-feed-face)))
    (when (and author elfeed-show-entry-author)
      (insert (format "%s\n" (propertize author 'face 'elfeed-show-author-face))))
    (insert (format "%s\n\n" (propertize nicedate 'face 'elfeed-log-date-face)))
    (when tags
      (insert (format "%s\n"
                      (propertize tagsstr 'face 'elfeed-search-tag-face))))
    ;; (insert (propertize "Link: " 'face 'message-header-name))
    ;; (elfeed-insert-link link link)
    ;; (insert "\n")
    (cl-loop for enclosure in (elfeed-entry-enclosures elfeed-show-entry)
             do (insert (propertize "Enclosure: " 'face 'message-header-name))
             do (elfeed-insert-link (car enclosure))
             do (insert "\n"))
    (insert "\n")
    (if content
        (if (eq type 'html)
            (elfeed-insert-html content base)
          (insert content))
      (insert (propertize "(empty)\n" 'face 'italic)))
```

```
      (goto-char (point-min))))

  )
```

4.3.4 Functionality enhancements

```
(after! elfeed-show
  (require 'url)

  (defvar elfeed-pdf-dir
    (expand-file-name "pdfs/"
                      (file-name-directory (directory-file-name
                      ↪  elfeed-enclosure-default-dir))))

  (defvar elfeed-link-pdfs
    '(("https://www.jstatsoft.org/index.php/jss/article/view/v0\\([^/]+\\)" .
    ↪  "https://www.jstatsoft.org/index.php/jss/article/view/v0\\1/v\\1.pdf")
      ("http://arxiv.org/abs/\\([^/]+\\)" . "https://arxiv.org/pdf/\\1.pdf"))
    "List of alists of the form (REGEX-FOR-LINK . FORM-FOR-PDF)")

  (defun elfeed-show-pdf (entry)
    (interactive
     (list (or elfeed-show-entry (elfeed-search-selected :ignore-region))))
    (let ((link (elfeed-entry-link entry))
          (feed-name (plist-get (elfeed-feed-meta (elfeed-entry-feed entry)) :title))
          (title (elfeed-entry-title entry))
          (file-view-function
           (lambda (f)
             (when elfeed-show-entry
               (elfeed-kill-buffer))
             (pop-to-buffer (find-file-noselect f))))
          pdf)

      (let ((file (expand-file-name
                   (concat (subst-char-in-string ?/ ?, title) ".pdf")
                   (expand-file-name (subst-char-in-string ?/ ?, feed-name)
                                     elfeed-pdf-dir))))
        (if (file-exists-p file)
            (funcall file-view-function file)
          (dolist (link-pdf elfeed-link-pdfs)
            (when (and (string-match-p (car link-pdf) link)
                       (not pdf))
              (setq pdf (replace-regexp-in-string (car link-pdf) (cdr link-pdf)
              ↪  link))))
          (if (not pdf)
```

```
            (message "No associated PDF for entry")
          (message "Fetching %s" pdf)
          (unless (file-exists-p (file-name-directory file))
            (make-directory (file-name-directory file) t))
          (url-copy-file pdf file)
          (funcall file-view-function file))))))

)
```

4.4 Dictionary

Doom already loads `define-word`, and provides it's own definition service using wordnut. However, using an offline dictionary possess a few compelling advantages, namely:

- speed
- integration of multiple dictionaries

GoldenDict seems like the best option currently available, but lacks a CLI. Hence, we'll fall back to sdcv (a CLI version of StarDict) for now. To interface with this, we'll use a my `lexic` package.

```
Literate
Webster's Revised Unabridged Dictionary (1913)

Lit"er*ate, adjective [Latin litteratus, literatus. See Letter.]
   Instructed in learning, science, or literature; learned;
   lettered.

         The literate now chose their emperor, as the military
         chose theirs.                                  —Landor.
                          ▬▬▬▬▬ ■ ▬▬▬▬▬

Lit"er*ate, noun
   1. One educated, but not having taken a university degree;
      especially, such a person who is prepared to take holy
      orders. [Eng.]

   2. A literary man.

Etymology

literate adjective

"educated, instructed, having knowledge of letters," early 15c., from Latin
literatus/litteratus "educated, learned, who knows the letters;" formed in
imitation of Greek grammatikos from Latin littera/litera "alphabetic letter"
(see letter (noun 1)). By late 18c. especially "acquainted with literature." As
a noun, "one who can read and write," 1894.

Synonyms

adjective
Learned, lettered.
```

```
(package! lexic :recipe (:local-repo "lisp/lexic"))
```

Given that a request for a CLI is the most upvoted issue on GitHub for GoldenDict, it's likely we'll be able to switch from `sdcv` to that in the future.

Since GoldenDict supports StarDict files, I expect this will be a relatively painless switch.

We start off by loading `lexic`, then we'll integrate it into pre-existing definition functionality (like `+lookup/dictionary-definition`).

```
(use-package! lexic
  :commands lexic-search lexic-list-dictionary
  :config
  (map! :map lexic-mode-map
        :n "q" #'lexic-return-from-lexic
        :nv "RET" #'lexic-search-word-at-point
        :n "a" #'outline-show-all
        :n "h" (cmd! (outline-hide-sublevels 3))
```

```
        :n "o" #'lexic-toggle-entry
        :n "n" #'lexic-next-entry
        :n "N" (cmd! (lexic-next-entry t))
        :n "p" #'lexic-previous-entry
        :n "P" (cmd! (lexic-previous-entry t))
        :n "E" (cmd! (lexic-return-from-lexic) ; expand
                     (switch-to-buffer (lexic-get-buffer)))
        :n "M" (cmd! (lexic-return-from-lexic) ; minimise
                     (lexic-goto-lexic))
        :n "C-p" #'lexic-search-history-backwards
        :n "C-n" #'lexic-search-history-forwards
        :n "/" (cmd! (call-interactively #'lexic-search))))
```

Now let's use this instead of wordnet.

```
(defadvice! +lookup/dictionary-definition-lexic (identifier &optional arg)
  "Look up the definition of the word at point (or selection) using `lexic-search'."
  :override #'+lookup/dictionary-definition
  (interactive
   (list (or (doom-thing-at-point-or-region 'word)
             (read-string "Look up in dictionary: "))
         current-prefix-arg))
  (lexic-search identifier nil nil t))
```

Lastly, I want to make sure I have some dictionaries set up. I've put a tarball of dictionaries online which we can download if none seem to be present on the system.

```
DIC_FOLDER=${STARDICT_DATA_DIR:-${XDG_DATA_HOME:-$HOME/.local/share}/stardict}/dic
if [ ! -d "$DIC_FOLDER" ]; then
    TMP="$(mktemp -d /tmp/dict-XXX)"
    cd "$TMP"
    curl -A "Mozilla/4.0" -o "stardict.tar.gz"
    ↪  "https://tecosaur.com/resources/config/stardict.tar.gz"
    tar -xf "stardict.tar.gz"
    rm "stardict.tar.gz"
    mkdir -p "$DIC_FOLDER"
    mv * "$DIC_FOLDER"
fi
```

We can also add a `doctor` dictionary check.

```
(if (executable-find "sdcv")
    (let ((dict-root (concat (or (getenv "STARDICT_DATA_DIR")
                                 (concat (or "~/.local/share"
                                             (getenv "XDG_DATA_HOME"))
                                         "/stardict"))
                             "/dic"))
```

```
          (dicts '("webster" "synonyms" "etymology" "en-to-latin" "hitchcock"
          ↪  "elements")))
      (if (file-exists-p dict-root)
          (dolist (dict dicts)
            (unless (file-exists-p (file-name-concat dict-root dict))
              (warn! (format "Absent sdcv dictionary: %s." dict))))
        (warn! "Couldn't find any stcv dictionaries, lexic will not function")))
  (warn! "Couldn't find sdcv executable, lexic will be disabled"))
```

4.5 Mail

4.5.1 Fetching

The contenders for this seem to be:

- OfflineIMAP (ArchWiki page)
- isync/mbsync (ArchWiki page)

From perusing r/emacs the prevailing opinion seems to be that

- isync is faster
- isync works more reliably

So let's use that.

The config was straightforward, and is located at ~/.mbsyncrc. I'm currently successfully connecting to: Gmail, office365mail, and dovecot. I'm also shoving passwords in my authinfo.gpg and fetching them using `PassCmd`:

```
gpg2 -q --for-your-eyes-only --no-tty -d ~/.authinfo.gpg | awk '/machine IMAP_SERCER
↪  login EMAIL_ADDR/ {print $NF}'
```

We can run `mbsync -a` in a systemd service file or something, but we can do better than that. vsemyonoff/easymail seems like the sort of thing we want, but is written for `notmuch` unfortunately. We can still use it for inspiration though. Using goimapnotify we should be able to sync just after new mail. Unfortunately this means *yet another* config file :(

We install with

```
go get -u gitlab.com/shackra/goimapnotify
ln -s ~/.local/share/go/bin/goimapnotify ~/.local/bin/
```

Here's the general plan:

1. Use `goimapnotify` to monitor mailboxes This needs it's own set of configs, and `systemd` services, which is a pain. We remove this pain by writing a python script (found below) to setup these config files, and systemd services by parsing the ~/.mbsyncrc file.
2. On new mail, call `mbsync --pull --new ACCOUNT:BOX` We try to be as specific as possible, so `mbsync` returns as soon as possible, and we can *get those emails as soon as possible*.
3. Try to call `mu index --lazy-fetch`. This fails if mu4e is already open (due to a write lock on the database), so in that case we just `touch` a tmp file (`/tmp/mu_reindex_now`).
4. Separately, we set up Emacs to check for the existance of `/tmp/mu_reindex_now` once a second while mu4e is running, and (after deleting the file) call `mu4e-update-index`.

We can add a `doctor` check for these external dependencies.

```
(when (file-exists-p "~/.mail") ; We care about mail when the mail folder exists
  (unless (executable-find "mu")
    (error! "Couldn't find mail dependency mu."))
  (unless (executable-find "mbsync")
    (error! "Couldn't find mail dependency mbsync."))
  (unless (executable-find "msmtp")
    (error! "Couldn't find mail dependency msmtp."))
  (unless (executable-find "goimapnotify")
    (warn! "Couldn't find mail helper goimapnotify, mail syncs will be slower.")))
```

Let's start off by handling the elisp side of things

1. Rebuild mail index while using mu4e

```
(defvar mu4e-reindex-request-file "/tmp/mu_reindex_now"
  "Location of the reindex request, signaled by existance")
(defvar mu4e-reindex-request-min-seperation 5.0
  "Don't refresh again until this many second have elapsed.
Prevents a series of redisplays from being called (when set to an appropriate
↪  value)")

(defvar mu4e-reindex-request--file-watcher nil)
(defvar mu4e-reindex-request--file-just-deleted nil)
(defvar mu4e-reindex-request--last-time 0)

(defun mu4e-reindex-request--add-watcher ()
  (setq mu4e-reindex-request--file-just-deleted nil)
  (setq mu4e-reindex-request--file-watcher
```

```
        (file-notify-add-watch mu4e-reindex-request-file
                               '(change)
                               #'mu4e-file-reindex-request)))

(defadvice! mu4e-stop-watching-for-reindex-request ()
  :after #'mu4e--server-kill
  (if mu4e-reindex-request--file-watcher
      (file-notify-rm-watch mu4e-reindex-request--file-watcher)))

(defadvice! mu4e-watch-for-reindex-request ()
  :after #'mu4e--server-start
  (mu4e-stop-watching-for-reindex-request)
  (when (file-exists-p mu4e-reindex-request-file)
    (delete-file mu4e-reindex-request-file))
  (mu4e-reindex-request--add-watcher))

(defun mu4e-file-reindex-request (event)
  "Act based on the existance of `mu4e-reindex-request-file'"
  (if mu4e-reindex-request--file-just-deleted
      (mu4e-reindex-request--add-watcher)
    (when (equal (nth 1 event) 'created)
      (delete-file mu4e-reindex-request-file)
      (setq mu4e-reindex-request--file-just-deleted t)
      (mu4e-reindex-maybe t))))

(defun mu4e-reindex-maybe (&optional new-request)
  "Run `mu4e--server-index' if it's been more than
`mu4e-reindex-request-min-seperation'seconds since the last request,"
  (let ((time-since-last-request (- (float-time)
                                    mu4e-reindex-request--last-time)))
    (when new-request
      (setq mu4e-reindex-request--last-time (float-time)))
    (if (> time-since-last-request mu4e-reindex-request-min-seperation)
        (mu4e--server-index nil t)
      (when new-request
        (run-at-time (* 1.1 mu4e-reindex-request-min-seperation) nil
                     #'mu4e-reindex-maybe)))))
```

2. Config transcoding & service management

   As long as the `mbsyncrc` file exists, this is as easy as running

   ```
   ~/.config/doom/misc/mbsync-imapnotify.py
   ```

   Let's also add a `doctor` check for this.

   ```
   (when (and (executable-find "goimapnotify")
              (not (file-exists-p "~/.config/imapnotify")))
     (warn! "goimapnotify is installed but not configured."))
   ```

When run without flags this will perform the following actions

- Read, and parse ~/.mbsyncrc, specifically recognising the following properties
  - `IMAPAccount`
  - `Host`
  - `Port`
  - `User`
  - `Password`
  - `PassCmd`
  - `Patterns`
- Call `mbsync --list ACCOUNT`, and filter results according to `Patterns`
- Construct a imapnotify config for each account, with the following hooks

  onNewMail

  onNewMailPost
- Compare accounts list to previous accounts, enable/disable the relevant systemd services, called with the `--now` flag (start/stop services as well)

This script also supports the following flags

- `--status` to get the status of the relevant systemd services supports `active`, `failing`, and `disabled`
- `--enable` to enable all relevant systemd services
- `--disable` to disable all relevant systemd services

```
from pathlib import Path
import json
import re
import shutil
import subprocess
import sys
import fnmatch

mbsyncFile = Path("~/.mbsyncrc").expanduser()

imapnotifyConfigFolder = Path("~/.config/imapnotify/").expanduser()
imapnotifyConfigFolder.mkdir(exist_ok=True)
imapnotifyConfigFilename = "notify.conf"

imapnotifyDefault = {
    "host": "",
    "port": 993,
```

```
    "tls": True,
    "tlsOptions": {"rejectUnauthorized": True},
    "onNewMail": "",
    "onNewMailPost": "if mu index --lazy-check; then test -f /tmp/mu_reindex_now
    ↪  && rm /tmp/mu_reindex_now; else touch /tmp/mu_reindex_now; fi",
}


def stripQuotes(string):
    if string[0] == '"' and string[-1] == '"':
        return string[1:-1].replace('\\"', '"')


mbsyncInotifyMapping = {
    "Host": (str, "host"),
    "Port": (int, "port"),
    "User": (str, "username"),
    "Password": (str, "password"),
    "PassCmd": (stripQuotes, "passwordCmd"),
    "Patterns": (str, "_patterns"),
}

oldAccounts = [d.name for d in imapnotifyConfigFolder.iterdir() if d.is_dir()]

currentAccount = ""
currentAccountData = {}

successfulAdditions = []


def processLine(line):
    newAcc = re.match(r"^IMAPAccount ([^#]+)", line)

    linecontent = re.sub(r"(^|[^\\])#.*", "", line).split(" ", 1)
    if len(linecontent) != 2:
        return

    parameter, value = linecontent

    if parameter == "IMAPAccount":
        if currentAccountNumber > 0:
            finaliseAccount()
        newAccount(value)
    elif parameter in mbsyncInotifyMapping.keys():
        parser, key = mbsyncInotifyMapping[parameter]
        currentAccountData[key] = parser(value)
    elif parameter == "Channel":
        currentAccountData["onNewMail"] = f"mbsync --pull --new {value}:'%s'"
```

```
def newAccount(name):
    global currentAccountNumber
    global currentAccount
    global currentAccountData
    currentAccountNumber += 1
    currentAccount = name
    currentAccountData = {}
    print(f"\n\033[1;32m{currentAccountNumber}\033[0;32m - {name}\033[0;37m")


def accountToFoldername(name):
    return re.sub(r"[^A-Za-z0-9]", "", name)


def finaliseAccount():
    if currentAccountNumber == 0:
        return

    global currentAccountData
    try:
        currentAccountData["boxes"] = getMailBoxes(currentAccount)
    except subprocess.CalledProcessError as e:
        print(
            f"\033[1;31mError:\033[0;31m failed to fetch mailboxes (skipping): "
            + f"`{' '.join(e.cmd)}' returned code {e.returncode}\033[0;37m"
        )
        return
    except subprocess.TimeoutExpired as e:
        print(
            f"\033[1;31mError:\033[0;31m failed to fetch mailboxes (skipping): "
            + f"`{' '.join(e.cmd)}' timed out after {e.timeout:.2f}
            ↪  seconds\033[0;37m"
        )
        return

    if "_patterns" in currentAccountData:
        currentAccountData["boxes"] = applyPatternFilter(
            currentAccountData["_patterns"], currentAccountData["boxes"]
        )

    # strip not-to-be-exported data
    currentAccountData = {
        k: currentAccountData[k] for k in currentAccountData if k[0] != "_"
    }

    parametersSet = currentAccountData.keys()
```

```
    currentAccountData = {**imapnotifyDefault, **currentAccountData}
    for key, val in currentAccountData.items():
        valColor = "\033[0;33m" if key in parametersSet else "\033[0;37m"
        print(f"  \033[1;37m{key:<13} {valColor}{val}\033[0;37m")

    if (
            len(currentAccountData["boxes"]) > 15
            and "@gmail.com" in currentAccountData["username"]
    ):
        print(
            "  \033[1;31mWarning:\033[0;31m Gmail raises an error when more
            ↪  than"
            + "\033[1;31m15\033[0;31m simultanious connections are attempted."
            + "\n           You are attempting to monitor "
            + f"\033[1;31m{len(currentAccountData['boxes'])}\033[0;31m
            ↪  mailboxes.\033[0;37m"
        )

    configFile = (
        imapnotifyConfigFolder
        / accountToFoldername(currentAccount)
        / imapnotifyConfigFilename
    )
    configFile.parent.mkdir(exist_ok=True)

    json.dump(currentAccountData, open(configFile, "w"), indent=2)
    print(f" \033[0;35mConfig generated and saved to {configFile}\033[0;37m")

    global successfulAdditions
    successfulAdditions.append(accountToFoldername(currentAccount))


def getMailBoxes(account):
    boxes = subprocess.run(
        ["mbsync", "--list", account], check=True, stdout=subprocess.PIPE,
        ↪  timeout=10.0
    )
    return boxes.stdout.decode("utf-8").strip().split("\n")


def applyPatternFilter(pattern, mailboxes):
    patternRegexs = getPatternRegexes(pattern)
    return [m for m in mailboxes if testPatternRegexs(patternRegexs, m)]


def getPatternRegexes(pattern):
    def addGlob(b):
        blobs.append(b.replace('\\"', '"'))
```

```
        return ""

    blobs = []
    pattern = re.sub(r' ?"([^"]+)"', lambda m: addGlob(m.groups()[0]), pattern)
    blobs.extend(pattern.split(" "))
    blobs = [
        (-1, fnmatch.translate(b[1::])) if b[0] == "!" else (1,
        ↪  fnmatch.translate(b))
        for b in blobs
    ]
    return blobs


def testPatternRegexs(regexCond, case):
    for factor, regex in regexCond:
        if factor * bool(re.match(regex, case)) < 0:
            return False
    return True


def processSystemdServices():
    keptAccounts = [acc for acc in successfulAdditions if acc in oldAccounts]
    freshAccounts = [acc for acc in successfulAdditions if acc not in
    ↪  oldAccounts]
    staleAccounts = [acc for acc in oldAccounts if acc not in
    ↪  successfulAdditions]

    if keptAccounts:
        print(f"\033[1;34m{len(keptAccounts)}\033[0;34m kept
        ↪  accounts:\033[0;37m")
        restartAccountSystemdServices(keptAccounts)

    if freshAccounts:
        print(f"\033[1;32m{len(freshAccounts)}\033[0;32m new
        ↪  accounts:\033[0;37m")
        enableAccountSystemdServices(freshAccounts)
    else:
        print(f"\033[0;32mNo new accounts.\033[0;37m")

    notActuallyEnabledAccounts = [
        acc for acc in successfulAdditions if not
        ↪  getAccountServiceState(acc)["enabled"]
    ]
    if notActuallyEnabledAccounts:
        print(
            f"\033[1;32m{len(notActuallyEnabledAccounts)}\033[0;32m accounts
            ↪  need re-enabling:\033[0;37m"
        )
```

```
        enableAccountSystemdServices(notActuallyEnabledAccounts)

    if staleAccounts:
        print(f"\033[1;33m{len(staleAccounts)}\033[0;33m removed
        ↪  accounts:\033[0;37m")
        disableAccountSystemdServices(staleAccounts)
    else:
        print(f"\033[0;33mNo removed accounts.\033[0;37m")


def enableAccountSystemdServices(accounts):
    for account in accounts:
        print(f" \033[0;32m - \033[1;37m{account:<18}", end="\033[0;37m",
        ↪  flush=True)
        if setSystemdServiceState(
                "enable", f"goimapnotify@{accountToFoldername(account)}.service"
        ):
            print("\033[1;32m enabled")


def disableAccountSystemdServices(accounts):
    for account in accounts:
        print(f" \033[0;33m - \033[1;37m{account:<18}", end="\033[0;37m",
        ↪  flush=True)
        if setSystemdServiceState(
                "disable",
                ↪  f"goimapnotify@{accountToFoldername(account)}.service"
        ):
            print("\033[1;33m disabled")


def restartAccountSystemdServices(accounts):
    for account in accounts:
        print(f" \033[0;34m - \033[1;37m{account:<18}", end="\033[0;37m",
        ↪  flush=True)
        if setSystemdServiceState(
                "restart",
                ↪  f"goimapnotify@{accountToFoldername(account)}.service"
        ):
            print("\033[1;34m restarted")


def setSystemdServiceState(state, service):
    try:
        enabler = subprocess.run(
            ["systemctl", "--user", state, service, "--now"],
            check=True,
            stderr=subprocess.DEVNULL,
```

```
            timeout=5.0,
        )
        return True
    except subprocess.CalledProcessError as e:
        print(
            f" \033[1;31mfailed\033[0;31m to {state}, `{' '.join(e.cmd)}'"
            + f"returned code {e.returncode}\033[0;37m"
        )
    except subprocess.TimeoutExpired as e:
        print(f" \033[1;31mtimed out after {e.timeout:.2f} seconds\033[0;37m")
        return False


def getAccountServiceState(account):
    return {
        state: bool(
            1
            - subprocess.run(
                [
                    "systemctl",
                    "--user",
                    f"is-{state}",
                    "--quiet",
                    f"goimapnotify@{accountToFoldername(account)}.service",
                ],
                stderr=subprocess.DEVNULL,
            ).returncode
        )
        for state in ("enabled", "active", "failing")
    }


def getAccountServiceStates(accounts):
    for account in accounts:
        enabled, active, failing = getAccountServiceState(account).values()
        print(f"  - \033[1;37m{account:<18}\033[0;37m ", end="", flush=True)
        if not enabled:
            print("\033[1;33mdisabled\033[0;37m")
        elif active:
            print("\033[1;32mactive\033[0;37m")
        elif failing:
            print("\033[1;31mfailing\033[0;37m")
        else:
            print("\033[1;35min an unrecognised state\033[0;37m")


if len(sys.argv) > 1:
    if sys.argv[1]   in ["-e", "--enable"]:
```

```
        enableAccountSystemdServices(oldAccounts)
        exit()
    elif sys.argv[1] in ["-d", "--disable"]:
        disableAccountSystemdServices(oldAccounts)
        exit()
    elif sys.argv[1] in ["-r", "--restart"]:
        restartAccountSystemdServices(oldAccounts)
        exit()
    elif sys.argv[1] in ["-s", "--status"]:
        getAccountServiceStates(oldAccounts)
        exit()
    elif sys.argv[1] in ["-h", "--help"]:
        print("""\033[1;37mMbsync to IMAP Notify config generator.\033[0;37m

Usage: mbsync-imapnotify [options]

Options:
    -e, --enable       enable all services
    -d, --disable      disable all services
    -r, --restart      restart all services
    -s, --status       fetch the status for all services
    -h, --help         show this help
""", end='')
        exit()
    else:
        print(f"\033[0;31mFlag {sys.argv[1]} not recognised, try
        ↪  --help\033[0;37m")
        exit()


mbsyncData = open(mbsyncFile, "r").read()

currentAccountNumber = 0

totalAccounts = len(re.findall(r"^IMAPAccount", mbsyncData, re.M))


def main():
    print("\033[1;34m:: MbSync to Go IMAP notify config file creator
    ↪  ::\033[0;37m")

    shutil.rmtree(imapnotifyConfigFolder)
    imapnotifyConfigFolder.mkdir(exist_ok=False)
    print("\033[1;30mImap Notify config dir purged\033[0;37m")

    print(f"Identified \033[1;32m{totalAccounts}\033[0;32m accounts.\033[0;37m")

    for line in mbsyncData.split("\n"):
```

```
        processLine(line)

    finaliseAccount()

    print(
        f"\nConfig files generated for
        ↪  \033[1;36m{len(successfulAdditions)}\033[0;36m"
        + f" out of \033[1;36m{totalAccounts}\033[0;37m accounts.\n"
    )

    processSystemdServices()


if __name__ == "__main__":
    main()
```

3. Systemd

   We then have a service file to run `goimapnotify` on all of these generated config files. We'll use a template service file so we can enable a unit per-account.

```
[Unit]
Description=IMAP notifier using IDLE, golang version.
ConditionPathExists=%h/.config/imapnotify/%I/notify.conf
After=network.target
Wants=gpg-agent.service

[Service]
ExecStart=%h/.local/bin/goimapnotify -conf %h/.config/imapnotify/%I/notify.conf
Restart=always
RestartSec=30

[Install]
WantedBy=default.target
```

   Enabling the service is actually taken care of by that python script.

   From one or two small tests, this can bring the delay down to as low as five seconds, which I'm quite happy with.

   This works well for fetching new mail, but we also want to propagate other changes (e.g. marking mail as read), and make sure we're up to date at the start, so for that I'll do the 'normal' thing and run `mbsync -all` every so often — let's say five minutes.

   We can accomplish this via a systemd timer, and service file.

```
[Unit]
Description=call mbsync on all accounts every 5 minutes
ConditionPathExists=%h/.mbsyncrc
```

```
[Timer]
OnBootSec=5m
OnUnitInactiveSec=5m

[Install]
WantedBy=default.target
```

```
[Unit]
Description=mbsync service, sync all mail
Documentation=man:mbsync(1)
ConditionPathExists=%h/.mbsyncrc
Wants=gpg-agent.service

[Service]
Type=oneshot
ExecStart=/usr/bin/mbsync -c %h/.mbsyncrc --all

[Install]
WantedBy=mail.target
```

Enabling (and starting) this is as simple as

```
systemctl --user enable mbsync.timer --now
```

We can also add a `doctor` check for the timer state.

```
(when (executable-find "mbsync")
  (unless (string= "enabled\n" (shell-command-to-string "systemctl --user
  ↪  is-enabled mbsync.timer"))
    (warn! "The mbsync timer is not enabled.")))
```

4.5.2 Indexing/Searching

This is performed by Mu. This is a tool for finding emails stored in the Maildir format. According to the homepage, it's main features are

- Fast indexing
- Good searching
- Support for encrypted and signed messages
- Rich CLI tooling
- accent/case normalisation
- strong integration with email clients

Unfortunately `mu` is not currently packaged from me. Oh well, I guess I'm building it from source then. I needed to install these packages

- `gmime-devel`
- `xapian-core-devel`

```
cd ~/.local/lib/
git clone https://github.com/djcb/mu.git
cd ./mu
./autogen.sh
make
sudo make install
```

To check how my version compares to the latest published:

```
curl --silent "https://api.github.com/repos/djcb/mu/releases/latest" | grep
↪  '"tag_name":' | sed -E 's/.*"([^"]+)".*/\1/'
mu --version | head -n 1 | sed 's/.* version //'
```

4.5.3 Sending

SmtpMail seems to be the 'default' starting point, but that's not packaged for me. msmtp is however, so I'll give that a shot. Reading around a bit (googling "msmtp vs sendmail" for example) almost every comparison mentioned seems to suggest msmtp to be a better choice. I have seen the following points raised

- `sendmail` has several vulnerabilities
- `sendmail` is tedious to configure
- `ssmtp` is no longer maintained
- `msmtp` is a maintained alternative to `ssmtp`
- `msmtp` is easier to configure

The config file is ~/.config/msmtp/config.

1. System hackery

   Unfortunately, I seem to have run into a bug present in my packaged version, so we'll just install the latest from source.

   For full use of the `auth` options, I need `GNU SASL`, which isn't packaged for me. I don't think I want it, but in case I do, I'll need to do this.

```
export GSASL_VERSION=1.8.1
cd ~/.local/lib/
curl "ftp://ftp.gnu.org/gnu/gsasl/libgsasl-$GSASL_VERSION.tar.gz" | tar xz
curl "ftp://ftp.gnu.org/gnu/gsasl/gsasl-$GSASL_VERSION.tar.gz" | tar xz
cd "./libgsasl-$GSASL_VERSION"
./configure
make
sudo make install
cd ..
cd "./gsasl-$VERSION"
./configure
make
sudo make install
cd ..
```

Now actually compile `msmtp`.

```
cd ~/.local/lib/
git clone https://github.com/marlam/msmtp-mirror.git ./msmtp
cd ./msmtp
libtoolize --force
aclocal
autoheader
automake --force-missing --add-missing
autoconf
# if using GSASL
# PKG_CONFIG_PATH=/usr/local/lib/pkgconfig ./configure --with-libgsasl
./configure
make
sudo make install
```

If using `GSASL` (from earlier) we need to make ensure that the dynamic library in in the library path. We can do by adding an executable with the same name earlier on in my `$PATH`.

```
LD_LIBRARY_PATH=/usr/local/lib exec /usr/local/bin/msmtp "$@"
```

4.5.4 Mu4e

Webmail clients are nice and all, but I still don't believe that SPAs in my browser can replaced desktop apps ... sorry Gmail. I'm also liking google less and less.

Mailspring is a decent desktop client, quite lightweight for electron (apparently the backend is in `C`, which probably helps), however I miss Emacs stuff.

While `Notmuch` seems very promising, and I've heard good things about it, it doesn't seem to make any changes to the emails themselves. All data is stored in Notmuch's database. While this is a very interesting model, occasionally I need to pull up an email on say my phone, and so not I want the tagging/folders etc. to be applied to the mail itself — not stored in a database.

On the other hand `Mu4e` is also talked about a lot in positive terms, and seems to possess a similarly strong feature set — and modifies the mail itself (I.e. information is accessible without the database). `Mu4e` also seems to have a large user base, which tends to correlate with better support and attention.

If I install mu4e from source, I need to add the `/usr/local/` loadpath so Mu4e has a chance of loading. Alternatively, I may need to add the `/usr/share/` path.

```
(cond
 ((cl-some (lambda (path) (string-match-p "mu4e" path)) load-path) nil)
 ((file-directory-p "/usr/local/share/emacs/site-lisp/mu4e")
  (quote (add-to-list 'load-path "/usr/local/share/emacs/site-lisp/mu4e")))
 ((file-directory-p "/usr/share/emacs/site-lisp/mu4e")
  (quote (add-to-list 'load-path "/usr/share/emacs/site-lisp/mu4e"))))
```

Let's also just shove all the Elisp code here in an `(after! ...)` block.

```
<<mu4e-conf>>
```

1. Viewing Mail There seem to be some advantages with using Gnus' article view (such as inline images), and judging from djcb/mu!1442 (comment) this seems to be the 'way of the future' for mu4e.

   There are some nerd-icons font related issues, so we need to redefine the fancy chars, and make sure they get the correct width.

   To account for the increase width of each flag character, and make perform a few more visual tweaks, we'll tweak the headers a bit

   ```
   (setq mu4e-headers-fields
         '((:flags . 6)
           (:account-stripe . 2)
           (:from-or-to . 25)
           (:folder . 10)
           (:recipnum . 2)
           (:subject . 80)
           (:human-date . 8))
         +mu4e-min-header-frame-width 142
         mu4e-headers-date-format "%d/%m/%y"
         mu4e-headers-time-format " %H:%M"
         mu4e-headers-results-limit 1000
   ```

```
      mu4e-index-cleanup t)

(add-to-list 'mu4e-bookmarks
             '(:name "Yesterday's messages" :query "date:2d..1d" :key ?y) t)

(defvar +mu4e-header--folder-colors nil)
(appendq! mu4e-header-info-custom
          '((:folder .
             (:name "Folder" :shortname "Folder" :help "Lowest level folder"
             ↪  :function
              (lambda (msg)
                (+mu4e-colorize-str
                 (replace-regexp-in-string "\\`.*/" "" (mu4e-message-field msg
                 ↪  :maildir))
                 '+mu4e-header--folder-colors))))))
```

Among the flags mu4e displays is the "personal address" flag, for messages sent *to* me (as opposed to mailing-list-y emails where I am not an explicit recipient). Unfortunately, this doesn't play well with my wildcard email addresses, so let's fix this with advise.

```
(defadvice! +mu4e-personal-address-p--*-a (orig-fn addr)
  :around #'mu4e-personal-address-p
  (or (and (stringp addr)
           (string-match-p "@\\([a-z]+\\.\\)?tecosaur\\.net$" addr))
      (funcall orig-fn addr)))
```

We'll also use a nicer alert icon

```
(setq mu4e-alert-icon "/usr/share/icons/Papirus/64x64/apps/evolution.svg")
```

And save ourselves from the awful `mu4e-thread-fold-face`.

```
(custom-set-faces!
  '(mu4e-thread-fold-face :inherit default))
```

2. Sending Mail Let's send emails too.

```
(setq sendmail-program "/usr/bin/msmtp"
      send-mail-function #'smtpmail-send-it
      message-sendmail-f-is-evil t
      message-sendmail-extra-arguments '("--read-envelope-from"); ,
      ↪  "--read-recipients")
      message-send-mail-function #'message-send-mail-with-sendmail)
```

It's also nice to avoid accidentally sending emails with the wrong account. If we can send from the address in the `To` field, let's do that. Opening a prompt otherwise also seems sensible.

We can register Emacs as a potential email client with a desktop file. We could put an

`emacsclient ...` entry in the `Exec` field, but I've found this a bit dodgy. Instead let's package the `emacslient` behaviour in a little executable `~/.local/bin/emacsmail`.

```
emacsclient -create-frame --alternate-editor='' --no-wait --eval \
"(progn (x-focus-frame nil) (mu4e-compose-from-mailto \"$1\" t))"
```

Now we can just call that in a desktop file.

```
[Desktop Entry]
Name=Mu4e
GenericName=Compose a new message with Mu4e in Emacs
Comment=Open mu4e compose window
MimeType=x-scheme-handler/mailto;
Exec=emacsmail %u
Icon=emacs
Type=Application
Terminal=false
Categories=Network;Email;
StartupWMClass=Emacs
```

To register this, just call

```
update-desktop-database ~/.local/share/applications
```

We can see if this is necessary with a `doctor` check.

```
(when (and (executable-find "mu")
           (not (string= (shell-command-to-string "xdg-mime query default
           ↪  x-scheme-handler/mailto")
                         "emacsmail.desktop\n")))
  (warn! "Emacs is not registered as a mailto handler."))
```

We also want to define `mu4e-compose-from-mailto`.

```
(defun mu4e-compose-from-mailto (mailto-string &optional quit-frame-after)
  (require 'mu4e)
  (unless mu4e--server-props (mu4e t) (sleep-for 0.1))
  (let* ((mailto (message-parse-mailto-url mailto-string))
         (to (cadr (assoc "to" mailto)))
         (subject (or (cadr (assoc "subject" mailto)) ""))
         (body (cadr (assoc "body" mailto)))
         (headers (-filter (lambda (spec) (not (-contains-p '("to" "subject"
         ↪  "body") (car spec)))) mailto)))
    (when-let ((mu4e-main (get-buffer mu4e-main-buffer-name)))
      (switch-to-buffer mu4e-main))
    (mu4e~compose-mail to subject headers)
    (when body
      (goto-char (point-min))
      (if (eq major-mode 'org-msg-edit-mode)
```

```
          (org-msg-goto-body)
        (mu4e-compose-goto-bottom))
      (insert body))
    (goto-char (point-min))
    (cond ((null to) (search-forward "To: "))
          ((string= "" subject) (search-forward "Subject: "))
          (t (if (eq major-mode 'org-msg-edit-mode)
                 (org-msg-goto-body)
               (mu4e-compose-goto-bottom))))
    (font-lock-ensure)
    (when evil-normal-state-minor-mode
      (evil-append 1))
    (when quit-frame-after
      (add-hook 'kill-buffer-hook
                `(lambda ()
                   (when (eq (selected-frame) ,(selected-frame))
                     (delete-frame)))))))
```

It would also be nice to change the name pre-filled in `From:` when drafting.

```
(defvar mu4e-from-name "Timothy"
  "Name used in \"From:\" template.")
(defadvice! mu4e~draft-from-construct-renamed (orig-fn)
  "Wrap `mu4e~draft-from-construct-renamed' to change the name."
  :around #'mu4e~draft-from-construct
  (let ((user-full-name mu4e-from-name))
    (funcall orig-fn)))
```

We can also use this a signature,

```
(setq message-signature mu4e-from-name)
```

I've got a few extra addresses I'd like `+mu4e-set-from-address-h` to be aware of.

```
(defun +mu4e-update-personal-addresses ()
  (let ((primary-address
         (car (cl-remove-if-not
               (lambda (a) (eq (mod (apply #'* (cl-coerce a 'list)) 600) 0))
               (mu4e-personal-addresses)))))
    (setq +mu4e-personal-addresses
          (and primary-address
               (append (mu4e-personal-addresses)
                       (mapcar
                        (lambda (subalias)
                          (concat subalias "@"
                                  (subst-char-in-string ?@ ?. primary-address)))
                        '("orgmode"))
                       (mapcar
```

```
                        (lambda (alias)
                          (replace-regexp-in-string
                           "\\`\\(.*\\)@" alias primary-address t t 1))
                        '("contact" "timothy")))))))

(add-transient-hook! 'mu4e-compose-pre-hook
  (+mu4e-update-personal-addresses))
```

We also want to use any `@tecosaur.net` address as an automatic from address.

```
(defadvice! +mu4e-set-from-adress-h-personal-a (orig-fn)
  :around #'+mu4e-set-from-address-h
  (let* ((msg-addrs
          (and mu4e-compose-parent-message
               (delq nil
                     (mapcar
                      (lambda (adr) (plist-get adr :email))
                      (append (mu4e-message-field mu4e-compose-parent-message
                      ↪  :to)
                              (mu4e-message-field mu4e-compose-parent-message
                              ↪  :cc)
                              (mu4e-message-field mu4e-compose-parent-message
                              ↪  :from))))))
         (personal-addrs
          (if (or mu4e-contexts +mu4e-personal-addresses)
              (and (> (length +mu4e-personal-addresses) 1)
                   +mu4e-personal-addresses)
            (mu4e-personal-addresses)))
         (personal-domain-addr
          (cl-some
           (lambda (email)
             (and (string-match-p "@\\(?:tec\\.\\)?tecosaur\\.net>?$"
                                  email)
                  email))
           msg-addrs)))
    (if (and personal-domain-addr
             (not (cl-intersection msg-addrs personal-addrs :test #'equal)))
        (setq user-mail-address personal-domain-addr)
      (funcall orig-fn))))
```

Speaking of, it would be good to put emails sent from `@tecosaur.net` in the account-specific sent directory, not the catch-all.

```
(defun +mu4e-account-sent-folder (&optional msg)
  (let ((from (if msg
                  (plist-get (car (plist-get msg :from)) :email)
                (save-restriction
                  (mail-narrow-to-head)
```

```
                  (mail-fetch-field "from")))))
    (if (and from (string-match-p "@tecosaur\\.net>?\\'" from))
        "/tecosaur-net/Sent"
      "/sent")))
(setq mu4e-sent-folder #'+mu4e-account-sent-folder)
```

When composing an email, I think it would make more sense to start off in `insert` mode than `normal` mode, which can be accomplished via a compose hook.

```
(defun +mu4e-evil-enter-insert-mode ()
  (when (eq (bound-and-true-p evil-state) 'normal)
    (call-interactively #'evil-append)))

(add-hook 'mu4e-compose-mode-hook #'+mu4e-evil-enter-insert-mode 90)
```

3. Working with the Org mailing list

   a) Adding `X-Woof` headers

   I'm fairly active on the Org mailing list (ML). The Org ML has a linked bug/patch tracker, https://updates.orgmode.org/ managed by Woof. However, I feel like I spend too much time looking up what the appropriate headers are for updating the status of bugs and patches. What I need, is some sort of convenient tool. Let's write one.

   First, a function that asks what I want to do and returns the appropriate `X-Woof` header.

```
(defun +mu4e-get-woof-header ()
  (pcase (read-char
          (format "\
%s
  %s Declare %s Applied %s Aborted
%s
  %s Confirm %s Fixed
%s
  %s Request %s Resolved

%s remove X-Woof header"
                  (propertize "Patch" 'face 'outline-3)
                  (propertize "p" 'face '(bold consult-key))
                  (propertize "a" 'face '(bold consult-key))
                  (propertize "c" 'face '(bold consult-key))
                  (propertize "Bug" 'face 'outline-3)
                  (propertize "b" 'face '(bold consult-key))
                  (propertize "f" 'face '(bold consult-key))
                  (propertize "Help" 'face 'outline-3)
                  (propertize "h" 'face '(bold consult-key))
                  (propertize "r" 'face '(bold consult-key))
```

```
                  (propertize "x" 'face '(bold error))))
    (?p "X-Woof-Patch: confirmed")
    (?a "X-Woof-Patch: applied")
    (?c "X-Woof-Patch: cancelled")
    (?b "X-Woof-Bug: confirmed")
    (?f "X-Woof-Bug: fixed")
    (?h "X-Woof-Help: confirmed")
    (?r "X-Woof-Help: cancelled")
    (?x 'delete)))
```

Now we just need a function which will add such a header to a buffer

```
(defun +mu4e-insert-woof-header ()
  "Insert an X-Woof header into the current message."
  (interactive)
  (when-let ((header (+mu4e-get-woof-header)))
    (save-excursion
      (goto-char (point-min))
      (search-forward "--text follows this line--")
      (unless (eq header 'delete)
        (beginning-of-line)
        (insert header "\n")
        (forward-line -1))
      (when (re-search-backward "^X-Woof-" nil t)
        (kill-whole-line)))))

(map! :map mu4e-compose-mode-map
      :localleader
      :desc "Insert X-Woof Header" "w" #'+mu4e-insert-woof-header)

(map! :map org-msg-edit-mode-map
      :after org-msg
      :localleader
      :desc "Insert X-Woof Header" "w" #'+mu4e-insert-woof-header)
```

Lovely! That should make adding these headers a breeze.

b) Patch workflow

Testing patches from the ML is currently more hassle than it needs to be. Let's change that.

```
(after! mu4e
  (defvar +org-ml-target-dir
    (expand-file-name "lisp/org/" doom-user-dir))
  (defvar +org-ml-max-age 600
    "Maximum permissible age in seconds.")
  (defvar +org-ml--cache-timestamp 0)
  (defvar +org-ml--cache nil)
```

```
  (define-minor-mode +org-ml-patchy-mood-mode
    "Apply patches to Org in bulk."
    :global t
    (let ((action (cons "apply patch to org" #'+org-ml-apply-patch)))
      (if +org-ml-patchy-mood-mode
          (add-to-list 'mu4e-view-actions action)
        (setq mu4e-view-actions (delete action mu4e-view-actions)))))

  (defun +org-ml-apply-patch (msg)
    "Apply the patch in the current message to Org."
    (interactive)
    (unless msg (setq msg (mu4e-message-at-point)))
    (with-current-buffer (get-buffer-create "*Shell: Org apply patches*")
      (erase-buffer)
      (let* ((default-directory +org-ml-target-dir)
             (exit-code (call-process "git" nil t nil "am"
             ↪  (mu4e-message-field msg :path))))
        (magit-refresh)
        (when (not (= 0 exit-code))
          (+popup/buffer)))))

  (defun +org-ml-current-patches ()
    "Get the currently open patches, as a list of alists.
Entries of the form (subject . id)."
    (delq nil
          (mapcar
           (lambda (entry)
             (unless (plist-get entry :fixed)
               (cons
                (format "%-8s  %s"
                        (propertize
                         (replace-regexp-in-string "T.*" ""
                                                   (plist-get entry :date))
                         'face 'font-lock-doc-face)
                        (propertize
                         (replace-regexp-in-string "\\[PATCH\\] ?" ""
                                                   (plist-get entry
                                                   ↪  :summary))
                         'face 'font-lock-keyword-face))
                (plist-get entry :id))))
           (with-current-buffer (url-retrieve-synchronously
           ↪  "https://updates.orgmode.org/data/patches")
             (goto-char url-http-end-of-headers)
             (json-parse-buffer :object-type 'plist)))))

  (defun +org-ml-select-patch-thread ()
    "Find and apply a proposed Org patch."
```

```
    (interactive)
    (let* ((current-workspace (+workspace-current))
           (patches (progn
                      (when (or (not +org-ml--cache)
                                (> (- (float-time)
                                ↪  +org-ml--cache-timestamp)
                                   +org-ml-max-age))
                        (setq +org-ml--cache (+org-ml-current-patches)
                              +org-ml--cache-timestamp (float-time)))
                      +org-ml--cache))
           (msg-id (cdr (assoc (completing-read
                                "Thread: " (mapcar #'car patches))
                               patches))))
      (+workspace-switch +mu4e-workspace-name)
      (mu4e-view-message-with-message-id msg-id)
      (unless +org-ml-patchy-mood-mode
        (add-to-list 'mu4e-view-actions
                     (cons "apply patch to org"
                     ↪  #'+org-ml-transient-mu4e-action)))))

  (defun +org-ml-transient-mu4e-action (msg)
    (setq mu4e-view-actions
          (delete (cons "apply patch to org"
          ↪  #'+org-ml-transient-mu4e-action)
                  mu4e-view-actions))
    (+workspace/other)
    (magit-status +org-ml-target-dir)
    (+org-ml-apply-patch msg)))
```

c) Mail list archive links

The other thing which it's good to be easily able to do is grab a link to the current message on https://list.orgmode.org.

```
(after! mu4e
  (defun +mu4e-ml-message-link (msg)
    "Copy the link to MSG on the mailing list archives."
    (let* ((list-addr (or (mu4e-message-field msg :list)
                          (thread-last (append (mu4e-message-field-raw msg
                          ↪  :list-post)
                                               (mu4e-message-field msg :to)
                                               (mu4e-message-field msg
                                               ↪  :cc))
                                       (mapcar (lambda (e) (plist-get e
                                       ↪  :email)))
                                       (mapcar (lambda (addr)
```

```
                                                (when (string-match-p
                                                ↪  "emacs.*@gnu\\.org$"
                                                ↪  addr)

                                                  ↪  (replace-regexp-in-string
                                                  ↪  "@" "." addr))))
                                        (delq nil)
                                        (car))))
          (msg-url
           (pcase list-addr
             ("emacs-orgmode.gnu.org"
              (format "https://list.orgmode.org/%s" (mu4e-message-field
              ↪  msg :message-id)))
             (_ (user-error "Mailing list %s not supported" list-addr)))))
     (gui-select-text msg-url)
     (message "Link %s copied to clipboard"
              (propertize msg-url 'face '((:weight normal :underline nil)
              ↪  link)))
     msg-url))

  (add-to-list 'mu4e-view-actions (cons "link to message ML"
  ↪  #'+mu4e-ml-message-link) t))
```

In a similar manner, when clicking on such a link (say when someone uses a link to the archive to refer to an earlier email) I'd much rather look at it in mu4e.

```
(defun +browse-url-orgmode-ml (url &optional _)
  "Open an orgmode list url using notmuch."
  (let ((id (and (or (string-match
  ↪  "^https?://orgmode\\.org/list/\\([^/]+\\)" url)
                     (string-match
                     ↪  "^https?://list\\.orgmode\\.org/\\([^/]+\\)" url))
                 (match-string 1 url))))
    (mu4e-view-message-with-message-id id)))

(add-to-list 'browse-url-handlers (cons "^https?://orgmode\\.org/list"
↪  #'+browse-url-orgmode-ml))
(add-to-list 'browse-url-handlers (cons "^https?://list\\.orgmode\\.org/"
↪  #'+browse-url-orgmode-ml))
```

d) Setup when composing a new email

Thanks to having a dedicated address for my interactions with the Org ML, and Doom's `+mu4e-set-from-address-h`, we can tell at the end of compose setup whether I'm composing an email to the Org ML and then do a little setup for convenience, namely:

- Pre-fill the To address

- Ensure that `org-msg` is set up to send plaintext only
- Set `default-directory` to my local Org repository (where patch files are generated)
- Move `(point)` to the `Subject:` line
- Use a special Org-ML-specific signature

```
(defun +mu4e-compose-org-ml-setup ()
  (when (string-match-p "\\`orgmode@" user-mail-address)
    (goto-char (point-min))
    (save-restriction
      (mail-narrow-to-head)
      (when (string-empty-p (mail-fetch-field "to"))
        (re-search-forward "^To: .*$")
        (replace-match "To: emacs-orgmode@gnu.org")
        (advice-add 'message-goto-to :after
        ↪  #'+mu4e-goto-subject-not-to-once)))
    (when (and org-msg-mode
               (re-search-forward "^:alternatives: (\\(utf-8 html\\))" nil
               ↪  t))
      (replace-match "utf-8" t t nil 1))
    (if org-msg-mode
        (let ((final-elem (org-element-at-point (point-max))))
          (when (equal (org-element-property :type final-elem) "signature")
            (goto-char (org-element-property :contents-begin final-elem))
            (delete-region (org-element-property :contents-begin
            ↪  final-elem)
                           (org-element-property :contents-end final-elem))
            (setq-local org-msg-signature
                        (format
                        ↪  "\n\n#+begin_signature\n%s\n#+end_signature"
                             (cdr +mu4e-org-ml-signature)))
            (insert (cdr +mu4e-org-ml-signature) "\n")))
      (goto-char (point-max))
      (insert (car +mu4e-org-ml-signature)))
    (setq default-directory
          (file-name-concat doom-user-dir "lisp/org/"))))

(defun +mu4e-goto-subject-not-to-once ()
  (message-goto-subject)
  (advice-remove 'message-goto-to #'+mu4e-goto-subject-not-to-once))
```

Now let's set up that signature.

```
(defvar +mu4e-org-ml-signature
  (cons
   "All the best,
Timothy
```

```
-- \
Timothy (‘tecosaur’/‘TEC’), Org mode contributor.
Learn more about Org mode at <https://orgmode.org/>.
Support Org development at <https://liberapay.com/org-mode>,
or support my work at <https://liberapay.com/tec>.
"
   "All the best,\\\\
@@html:<b>@@Timothy@@html:</b>@@

-\u200b- \\\\
Timothy (‘tecosaur’/‘TEC’), Org mode contributor.\\\\
Learn more about Org mode at https://orgmode.org/.\\\\
Support Org development at https://liberapay.com/org-mode,\\\\
or support my work at https://liberapay.com/tec.")
  "Plain and Org version of the org-ml specific signature.")
```

Now to make this take effect, we can just add it a bit later on in `mu4e-compose-mode-hook` (after `org-msg-post-setup`) by setting a hook depth of 1.

```
(add-hook 'mu4e-compose-mode-hook #'+mu4e-compose-org-ml-setup 1)
```

4.5.5 Org Msg

Doom does a fantastic stuff with the defaults with this, so we only make a few minor tweaks. First, some stylistic things:

```
(setq org-msg-greeting-fmt "\nHi%s,\n\n"
      org-msg-signature "\n\n#+begin_signature\nAll the
      ↪  best,\\\\\n@@html:<b>@@Timothy@@html:</b>@@\n#+end_signature")
```

We also want to set the accent colour used in the Doom `mu4e` module's construction of the default org-msg style.

```
(setq +org-msg-accent-color "#1a5fb4")
```

Now, it would be nice to easily jump to and between the ends of the message body, so let's make a function for this.

```
(defun +org-msg-goto-body (&optional end)
  "Go to either the beginning or the end of the body.
END can be the symbol top, bottom, or nil to toggle."
  (interactive)
  (let ((initial-pos (point)))
    (org-msg-goto-body)
    (when (or (eq end 'top)
```

```
              (and (or (memq initial-pos ; Already at bottom
                             (list (point) (1- (point))))
                       (<= initial-pos ; Above message body
                           (save-excursion
                             (message-goto-body)
                             (point))))
                   (not (eq end 'bottom))))
      (message-goto-body)
      (re-search-forward
       (format (regexp-quote org-msg-greeting-fmt) ; %s is unaffected.
               (concat "\\(?: " (regexp-quote (org-msg-get-to-name)) "\\)?"))))))
```

We can replace the evil binding of `mu4e-compose-goto-bottom` with this function.

```
(map! :map org-msg-edit-mode-map
      :after org-msg
      :n "G" #'+org-msg-goto-body)
```

It would also be good to call this when replying to a message. This has to be implemented as advice as the compose hooks are run before `mu4e~compose-handler` moves the point with `message-goto-<location>`.

```
(defun +org-msg-goto-body-when-replying (compose-type &rest _)
  "Call `+org-msg-goto-body' when the current message is a reply."
  (when (and org-msg-edit-mode (eq compose-type 'reply))
    (+org-msg-goto-body)))

(advice-add 'mu4e~compose-handler :after #'+org-msg-goto-body-when-replying)
```

Chapter 5
Language configuration

5.1 General

5.1.1 File Templates

For some file types, we overwrite defaults in the snippets directory, others need to have a template assigned.

```
(set-file-template! "\\.tex$" :trigger "__" :mode 'latex-mode)
(set-file-template! "\\.org$" :trigger "__" :mode 'org-mode)
(set-file-template! "/LICEN[CS]E$" :trigger '+file-templates/insert-license)
```

5.2 Plaintext

5.2.1 Ansi colours

It's nice to see ANSI colour codes displayed, however we don't want to disrupt ANSI codes in Org src blocks.

```
(after! text-mode
  (add-hook! 'text-mode-hook
    (unless (derived-mode-p 'org-mode)
      ;; Apply ANSI color codes
      (with-silent-modifications
        (ansi-color-apply-on-region (point-min) (point-max) t)))))
```

5.2.2 Margin without line numbers

Display-wise, somehow I don't mind code buffers without any margin on the left, but it feels a bit off with text buffers once the padding provided by line numbers is stripped away.

```
(defvar +text-mode-left-margin-width 1
  "The `left-margin-width' to be used in `text-mode' buffers.")

(defun +setup-text-mode-left-margin ()
```

```
  (when (and (derived-mode-p 'text-mode)
             (not (and (bound-and-true-p visual-fill-column-mode)
                       visual-fill-column-center-text))
             (eq (current-buffer) ; Check current buffer is active.
                 (window-buffer (frame-selected-window))))
    (setq left-margin-width (if display-line-numbers
                                0 +text-mode-left-margin-width))
    (set-window-buffer (get-buffer-window (current-buffer))
                       (current-buffer))))
```

Now we just need to hook this up to all the events which could either indicate a change in the conditions or require the setup to be re-applied.

```
(add-hook 'window-configuration-change-hook #'+setup-text-mode-left-margin)
(add-hook 'display-line-numbers-mode-hook #'+setup-text-mode-left-margin)
(add-hook 'text-mode-hook #'+setup-text-mode-left-margin)
```

There's one little niggle with Doom, as `doom/toggle-line-numbers` doesn't run `display-line-numbers-mode-ho` so some advice is needed.

```
(defadvice! +doom/toggle-line-numbers--call-hook-a ()
  :after #'doom/toggle-line-numbers
  (run-hooks 'display-line-numbers-mode-hook))
```

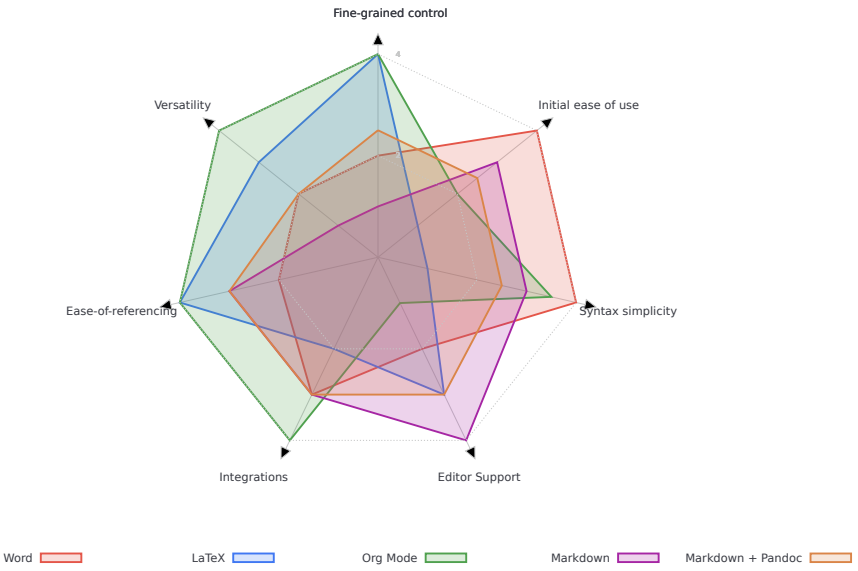
Lastly, I think I actually like this enough that I'll go ahead and remove line numbers in text mode.

```
(remove-hook 'text-mode-hook #'display-line-numbers-mode)
```

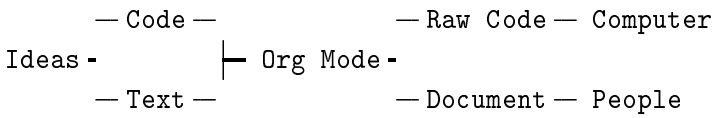
5.3 Org

I really like org mode, I've given some thought to why, and below is the result.

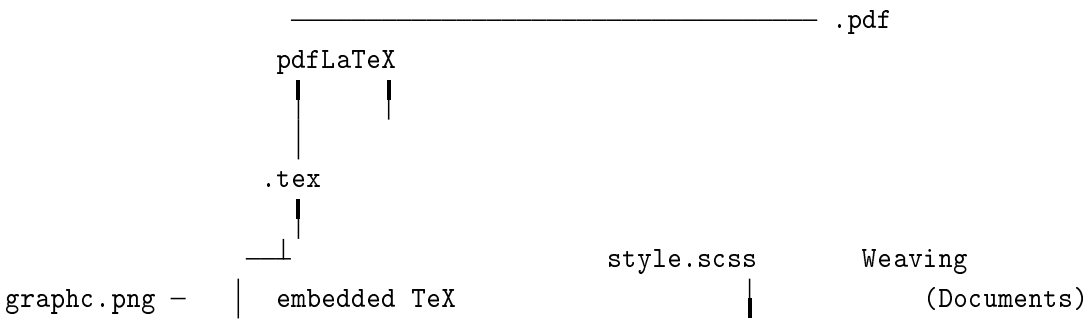
Format	Fine-grained control	Initial ease of use	Syntax simplicity	Editor Support	Integrations	Ease-of-referencing	Versatility
Word	2	4	4	2	3	2	2
LaTeX	4	1	1	3	2	4	3
Org Mode	4	2	3.5	1	4	4	4
Markdown	1	3	3	4	3	3	1
Markdown + Pandoc	2.5	2.5	2.5	3	3	3	2

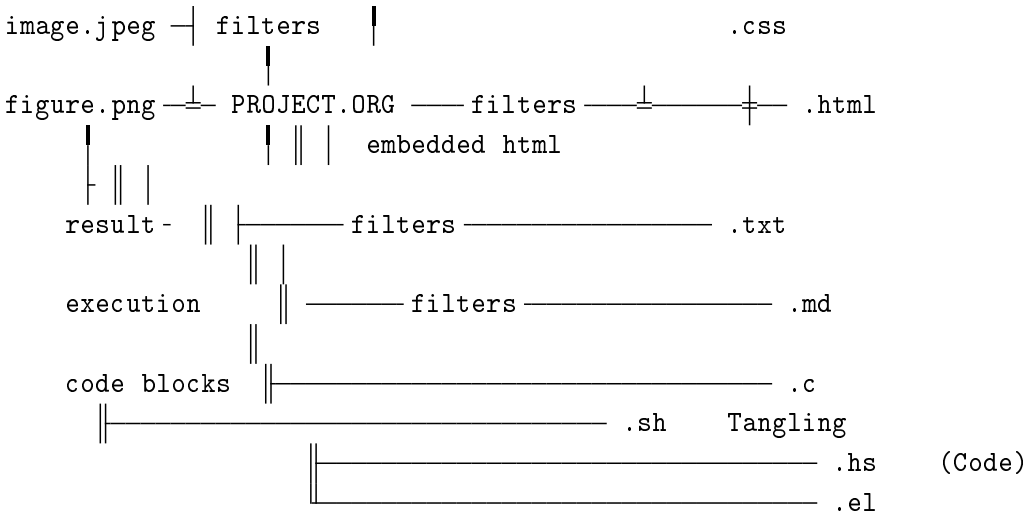


Beyond the elegance in the markup language, tremendously rich integrations with Emacs allow for some fantastic features, such as what seems to be the best support for literate programming of any currently available technology.



An `.org` file can contain blocks of code (with noweb templating support), which can be tangled to dedicated source code files, and woven into a document (report, documentation, presentation, etc.) through various (*extensible*) methods. These source blocks may even create images or other content to be included in the document, or generate source code.





5.3.1 System config

1. Mime types

   Org mode isn't recognised as it's own mime type by default, but that can easily be changed with the following file. For system-wide changes try `/usr/share/mime/packages/org.xml`.

   ```
   <mime-info xmlns='http://www.freedesktop.org/standards/shared-mime-info'>
     <mime-type type="text/org">
       <comment>Emacs Org-mode File</comment>
       <glob pattern="*.org"/>
       <alias type="text/org"/>
     </mime-type>
   </mime-info>
   ```

   What's nice is that Papirus now has an icon for `text/org`. One simply needs to refresh their mime database

   ```
   update-mime-database ~/.local/share/mime
   ```

   Then set Emacs as the default editor

   ```
   xdg-mime default emacs.desktop text/org
   ```

   Once again, we will add `doctor` checks around this.

   ```
   (if (string= (shell-command-to-string "xdg-mime query default text/org") "")
     (warn! "text/org is not a registered mime type.")
   ```

```
  (unless (string= (shell-command-to-string "xdg-mime query default text/org")
  ↪  "emacs-client.desktop\n")
    (warn! "Emacs(client) is not set up as the text/org handler.")))
```

2. Git diffs

   Protesilaos wrote a very helpful article in which he explains how to change the git diff chunk heading to something more useful than just the immediate line above the hunk — like the parent heading.

   This can be achieved by first adding a new diff mode to git in `~/.config/git/attributes`

```
*.org   diff=org
```

   Then adding a regex for it to `~/.config/git/config`

```
[diff "org"]
  xfuncname = "^(\\*+ +.*)$"
```

5.3.2 Packages

1. Org itself

   There are actually three possible package statements I may want to use for Org.

   If I'm on a machine where I can push changes, I want to be able to develop Org. I can check this by checking the content of the SSH key `~/.ssh/id_ed25519.pub`.

   a) If this key exists and there isn't a repo at `$doom-user-dir/lisp/org` with the right remote, we should install it as such.

   b) If the key exists and repo are both set up, the package should just be ignored.

   c) If the key does not exist, the Org's `HEAD` should just be used

   To account for this situation properly, we need a short script to determine the correct package statement needed.

```
(or (require 'doom (expand-file-name "lisp/doom.el"
                                     (or (bound-and-true-p doom-emacs-dir)
                                         user-emacs-directory)))
    (setq doom-local-dir
          (expand-file-name ".local/" (or (bound-and-true-p doom-emacs-dir)
                                          user-emacs-directory))))
(let ((dev-key-p (and (file-exists-p "~/.ssh/id_ed25519.pub")
                      (= 0 (shell-command "cat ~/.ssh/id_ed25519.pub | grep -q
                      ↪  AAAAC3NzaC1lZDI1NTE5AAAAIOZZqcJOLdN+QFHKyW8ST2zz750+8TdvO9IT5geXpQVt")))))
```

```
      (recipe-common '(:files (:defaults "etc")
                       :build t
                       :pre-build
                       (with-temp-file "lisp/org-version.el"
                         (require 'lisp-mnt)
                         (let ((version ;; (lm-version "lisp/org.el")
                                (with-temp-buffer
                                  (insert-file-contents "lisp/org.el")
                                  (lm-header "version")))
                               (git-version (string-trim
                                             (with-temp-buffer
                                               (call-process "git" nil t nil
                                                             "rev-parse"
                                                             ↪ "--short"
                                                             ↪ "HEAD")
                                               (buffer-string)))))
                           (insert (format "(defun org-release () \"The release
                           ↪ version of Org.\" %S)\n"
                                           version)
                                   (format "(defun org-git-version () \"The
                                   ↪ truncate git commit hash of Org mode.\"
                                   ↪ %S)\n"
                                           git-version)
                                   "(provide 'org-version)\n"))))))
  (with-temp-buffer
    (insert
     (pp `(package! org
           :recipe (,@(if dev-key-p
                          (list :host nil :repo
                          ↪ "tec@git.savannah.gnu.org:/srv/git/emacs/org-mode.git"
                          ↪ :local-repo "lisp/org"
                            :fork (list :host nil :repo
                            ↪ "git@ssh.tecosaur.net:tec/org-mode.git"
                            ↪ :branch "dev" :remote "tecosaur"))
                        (list :host nil :repo
                        ↪ "https://code.tecosaur.net/mirrors/org-mode.git"
                        ↪ :remote "mirror"
                          :fork (list :host nil :repo
                          ↪ "https://code.tecosaur.net/tec/org-mode.git"
                          ↪ :branch "dev" :remote "tecosaur")))
                    ,@recipe-common)
           :pin nil)))
    (untabify (point-min) (point-max))
    (buffer-string)))
```

```
<<org-pkg-statement()>>
(unpin! org) ; there be bugs
(package! org-contrib
```

```
;; The `sr.ht' repo has been a bit flaky as of late.
:recipe (:host github :repo "emacsmirror/org-contrib"
         :files ("lisp/*.el"))
:pin "8d14a600a2069ffc494edfc9a12b8e5fc8840bf1")
```

2. Visuals

   a) Org Modern

   Fontifying `org-mode` buffers to be as pretty as possible is of paramount importance, and Minad's lovely `org-modern` goes a long way in this regard.

```
(package! org-modern :pin "a58534475b4312b0920aa9d3824272470c8e3500")
```

   . . . with a touch of configuration. . .

```
(use-package! org-modern
  :hook (org-mode . org-modern-mode)
  :config
  (setq org-modern-star '("" "" "" "" "" "" "" "")
        org-modern-table-vertical 1
        org-modern-table-horizontal 0.2
        org-modern-list '((43 . "")
                          (45 . "-")
                          (42 . "•"))
        org-modern-todo-faces
        '(("TODO" :inverse-video t :inherit org-todo)
          ("PROJ" :inverse-video t :inherit +org-todo-project)
          ("STRT" :inverse-video t :inherit +org-todo-active)
          ("[-]"  :inverse-video t :inherit +org-todo-active)
          ("HOLD" :inverse-video t :inherit +org-todo-onhold)
          ("WAIT" :inverse-video t :inherit +org-todo-onhold)
          ("[?]"  :inverse-video t :inherit +org-todo-onhold)
          ("KILL" :inverse-video t :inherit +org-todo-cancel)
          ("NO"   :inverse-video t :inherit +org-todo-cancel))
        org-modern-footnote
        (cons nil (cadr org-script-display))
        org-modern-block-fringe nil
        org-modern-block-name
        '((t . t)
          ("src" "»" "«")
          ("example" "»-" "-«")
          ("quote" "" "")
          ("export" "⏩" "⏪"))
        org-modern-progress nil
        org-modern-priority nil
        org-modern-horizontal-rule (make-string 36 ?─)
        org-modern-keyword
        '((t . t)
```

```
          ("title" . "")
          ("subtitle" . "")
          ("author" . "")
          ("email" . "")
          ("date" . "")
          ("property" . "")
          ("options" . #("" 0 1 (display (height 0.75))))
          ("startup" . "")
          ("macro" . "")
          ("bind" . "")
          ("bibliography" . "")
          ("print_bibliography" . "")
          ("cite_export" . "")
          ("print_glossary" . "")
          ("glossary_sources" . "")
          ("include" . "")
          ("setupfile" . "")
          ("html_head" . "")
          ("html" . "")
          ("latex_class" . "")
          ("latex_class_options" . "")
          ("latex_header" . "")
          ("latex_header_extra" . "")
          ("latex" . "")
          ("beamer_theme" . "")
          ("beamer_color_theme" . "")
          ("beamer_font_theme" . "")
          ("beamer_header" . "")
          ("beamer" . "")
          ("attr_latex" . "")
          ("attr_html" . "")
          ("attr_org" . "")
          ("call" . "")
          ("name" . "")
          ("header" . ">")
          ("caption" . "")
          ("results" . "")))
  (custom-set-faces! '(org-modern-statistics :inherit
  ↪  org-checkbox-statistics-todo)))
```

Since `org-modern`'s tag face supplants Org's tag face, we need to adjust the spell-check face ignore list

```
(after! spell-fu
  (cl-pushnew 'org-modern-tag (alist-get 'org-mode
  ↪  +spell-excluded-faces-alist)))
```

b) Emphasis markers

While `org-hide-emphasis-markers` is very nice, it can sometimes make edits which occur at the border a bit more fiddley. We can improve this situation without sacrificing visual amenities with the `org-appear` package.

```
(package! org-appear :recipe (:host github :repo "awth13/org-appear")
  :pin "32ee50f8fdfa449bbc235617549c1bccb503cb09")
```

```
(use-package! org-appear
  :hook (org-mode . org-appear-mode)
  :config
  (setq org-appear-autoemphasis t
        org-appear-autosubmarkers t
        org-appear-autolinks nil)
  ;; for proper first-time setup, `org-appear--set-elements'
  ;; needs to be run after other hooks have acted.
  (run-at-time nil nil #'org-appear--set-elements))
```

c) Heading structure

Speaking of headlines, a nice package for viewing and managing the heading structure has come to my attention.

```
(package! org-ol-tree :recipe (:host github :repo "Townk/org-ol-tree")
  :pin "207c748aa5fea8626be619e8c55bdb1c16118c25")
```

We'll bind this to `O` on the org-mode localleader, and manually apply a PR recognising the pgtk window system.

```
(use-package! org-ol-tree
  :commands org-ol-tree
  :config
  (setq org-ol-tree-ui-icon-set
        (if (and (display-graphic-p)
                 (fboundp 'all-the-icons-material))
            'all-the-icons
          'unicode))
  (org-ol-tree-ui--update-icon-set))

(map! :map org-mode-map
      :after org
      :localleader
      :desc "Outline" "O" #'org-ol-tree)
```

3. Extra functionality

a) Julia support

`ob-julia` is currently a bit borked, but there's an effort to improve this.

```
(package! ob-julia :recipe (:local-repo "lisp/ob-julia" :files ("*.el"
↪  "julia")))
```

```
(use-package! ob-julia
  :commands org-babel-execute:julia
  :config
  (setq org-babel-julia-command-arguments
        `("--sysimage"
          ,(when-let ((img "~/.local/lib/julia.so")
                      (exists? (file-exists-p img)))
             (expand-file-name img))
          "--threads"
          ,(number-to-string (- (doom-system-cpus) 2))
          "--banner=no")))
```

b) HTTP requests

I like the idea of being able to make HTTP requests with Babel.

```
(package! ob-http :pin "b1428ea2a63bcb510e7382a1bf5fe82b19c104a7")
```

```
(use-package! ob-http
  :commands org-babel-execute:http)
```

c) RSS feeds

I need this for blog publishing. It used to be bundled with Org, but now it's pretty much abandoned.

```
(package! ox-rss :pin "d2964eca3614f84db85b498d065862a1e341868d")
```

d) Transclusion

There's a really cool package in development to *transclude* Org document content.

```
(package! org-transclusion :recipe (:host github :repo
↪  "nobiot/org-transclusion")
  :pin "e9728b0b14b5c2e5d3b68af98f772ed99e136b48")
```

```
(use-package! org-transclusion
  :commands org-transclusion-mode
  :init
  (map! :after org :map org-mode-map
        "<f12>" #'org-transclusion-mode))
```

e) Heading graph

Came across this and . . . it's cool

```
(package! org-graph-view :recipe (:host github :repo
↪  "alphapapa/org-graph-view")
  :pin "172157aee1131ea59f0bd724a10abfdbccbd860e")
```

f) Cooking recipes

I **need** this in my life. It take a URL to a recipe from a common site, and inserts an org-ified version at point. Isn't that just great.

```
(package! org-chef :pin "1710b54441ed744dcdfb125d08fb88cfaf452f10")
```

Loading after org seems a bit premature. Let's just load it when we try to use it, either by command or in a capture template.

```
(use-package! org-chef
  :commands (org-chef-insert-recipe org-chef-get-recipe-from-url))
```

g) Importing with Pandoc

Sometimes I'm given non-org files, that's very sad. Luckily Pandoc offers a way to make that right again, and this package makes that even easier to do.

```
(package! org-pandoc-import :recipe
  (:local-repo "lisp/org-pandoc-import" :files ("*.el" "filters"
  ↪  "preprocessors")))
```

```
(use-package! org-pandoc-import
  :after org)
```

h) Glossaries and more

For glossary-type entries, there's a nice package for this I'm developing.

```
(package! org-glossary :recipe (:local-repo "lisp/org-glossary"))
```

Other than hooking this to `org-mode`, we also want to set a collection root and improve the LaTeX usage references with `cleveref`'s `\labelcpageref` command.

```
(use-package! org-glossary
  :hook (org-mode . org-glossary-mode)
  :config
  (setq org-glossary-collection-root "~/.config/doom/misc/glossaries/")
  (defun +org-glossary--latex-cdef (backend info term-entry form &optional
  ↪  ref-index plural-p capitalized-p extra-parameters)
    (org-glossary--export-template
     (if (plist-get term-entry :uses)
         "*%d*\\emsp{}%v\\ensp{}@@latex:\\labelcpageref{@@%b@@latex:}@@\n"
       "*%d*\\emsp{}%v\n")
```

```
    backend info term-entry ref-index
    plural-p capitalized-p extra-parameters))
 (org-glossary-set-export-spec
  'latex t
  :backref "gls-%K-use-%r"
  :backref-seperator ","
  :definition-structure #'+org-glossary--latex-cdef))
```

i) Document comparison

It's quite nice to compare Org files, and the richest way to compare content is probably `latexdiff`. There are a few annoying steps involved here, and so I've written a package to streamline the process.

```
(package! orgdiff :recipe (:local-repo "lisp/orgdiff"))
```

The only little annoyance is the fact that `latexdiff` uses `#FF0000` and `#0000FF` as the red/blue change indication colours. We can make this a bit nicer by post-processing the `latexdiff` result.

```
(use-package! orgdiff
  :defer t
  :config
  (defun +orgdiff-nicer-change-colours ()
    (goto-char (point-min))
    ;; Set red/blue based on whether chameleon is being used
    (if (search-forward "%% make document follow Emacs theme" nil t)
        (setq red  (substring (doom-blend 'red 'fg 0.8) 1)
              blue (substring (doom-blend 'blue 'teal 0.6) 1))
      (setq red  "c82829"
            blue "00618a"))
    (when (and (search-forward "%DIF PREAMBLE EXTENSION ADDED BY LATEXDIFF"
    ↪  nil t)
               (search-forward "\\RequirePackage{color}" nil t))
      (when (re-search-forward "definecolor{red}{rgb}{1,0,0}" (cdr
      ↪  (bounds-of-thing-at-point 'line)) t)
        (replace-match (format "definecolor{red}{HTML}{%s}" red)))
      (when (re-search-forward "definecolor{blue}{rgb}{0,0,1}" (cdr
      ↪  (bounds-of-thing-at-point 'line)) t)
        (replace-match (format "definecolor{blue}{HTML}{%s}" blue)))))
  (setq orgdiff-latexdiff-args '("--append-safecmd=acr,acrs"))
  (add-to-list 'orgdiff-latexdiff-postprocess-hooks
  ↪  #'+orgdiff-nicer-change-colours))
```

j) Org music

It's nice to be able to link to music

```
(package! org-music :recipe (:local-repo "lisp/org-music"))
```

```
(use-package! org-music
  :after org
  :config
  (setq org-music-mpris-player "Lollypop"
        org-music-track-search-method 'beets
        org-music-beets-db "~/Music/library.db"))
```

5.3.3 Behaviour

1. Tweaking defaults

```
(setq org-directory (expand-file-name "org" (xdg-data-home)) ; Let's put files
↪  here.
      org-agenda-files (list org-directory)                  ; Seems like the
      ↪  obvious place.
      org-use-property-inheritance t                         ; It's convenient
      ↪  to have properties inherited.
      org-log-done 'time                                     ; Having the time a
      ↪  item is done sounds convenient.
      org-list-allow-alphabetical t                          ; Have a. A. a) A)
      ↪  list bullets.
      org-catch-invisible-edits 'smart                       ; Try not to
      ↪  accidently do weird stuff in invisible regions.
      org-export-with-sub-superscripts '{}                   ; Don't treat lone
      ↪  _ / ^ as sub/superscripts, require _{} / ^{}.
      org-export-allow-bind-keywords t                       ; Bind keywords can
      ↪  be handy
      org-image-actual-width '(0.9))                         ; Make the
      ↪  in-buffer display closer to the exported result..
```

I also like the `:comments` header-argument, so let's make that a default.

```
(setq org-babel-default-header-args
      '((:session . "none")
        (:results . "replace")
        (:exports . "code")
        (:cache . "no")
        (:noweb . "no")
        (:hlines . "no")
        (:tangle . "no")
        (:comments . "link")))
```

By default, `visual-line-mode` is turned `on`, and `auto-fill-mode` `off` by a hook. However this messes with tables in Org-mode, and other plaintext files (e.g. markdown, LaTeX) so

I'll turn it off for this, and manually enable it for more specific modes as desired.

```
(remove-hook 'text-mode-hook #'visual-line-mode)
(add-hook 'text-mode-hook #'auto-fill-mode)
```

There also seem to be a few keybindings which use `hjkl`, but miss arrow key equivalents.

```
(map! :map evil-org-mode-map
      :after evil-org
      :n "g <up>" #'org-backward-heading-same-level
      :n "g <down>" #'org-forward-heading-same-level
      :n "g <left>" #'org-up-element
      :n "g <right>" #'org-down-element)
```

2. Extra functionality

   a) The utility of zero-width spaces

   Occasionally in Org you run into annoyances where you want to have two seperate blocks right together without a space. For example, to **emph**asise part of a word, or put a currency symbol immediately before an inline source block. There is a solution to this, it just sounds slightly hacky — zero width spaces. Because this is Emacs, we can make this feel much less hacky by making a minor addition to the Org key map 🙂.

   ```
   (map! :map org-mode-map
         :nie "M-SPC M-SPC" (cmd! (insert "\u200B")))
   ```

   We then want to stop the space from being included in exports, which is done here.

   b) List bullet sequence

   I think it makes sense to have list bullets change with depth

   ```
   (setq org-list-demote-modify-bullet '(("+" . "-") ("-" . "+") ("*" . "+")
   ↪  ("1." . "a.")))
   ```

   c) Easier file links

   While `org-insert-link` is all very well and good, a large portion of the time I want to insert a file, and so it would be good to have a way to skip straight to that and avoid the description prompt. Looking at `org-link-parameters`, we can see that the `"file"` link type uses the completion function `org-link-complete-file`, so let's use that to make a little file-link inserting function.

   ```
   (defun +org-insert-file-link ()
     "Insert a file link.  At the prompt, enter the filename."
     (interactive)
     (org-insert-link nil (org-link-complete-file)))
   ```

Now we'll just add that under the Org mode link localleader for convenience.

```
(map! :after org
      :map org-mode-map
      :localleader
      "l f" #'+org-insert-file-link)
```

d) Citation

Extending the `:tools biblio` *module.*

References in Org are fairly easy now, thanks to `org-cite`. The `:tools biblio` module gives a fairly decent basic setup, but it would be nice to take it a bit further. This mostly consists of tweaking settings, but there is one extra package I'll grab for prettier in-buffer citations.

```
(package! org-cite-csl-activate :recipe (:host github :repo
↪  "andras-simonyi/org-cite-csl-activate") :pin
↪  "ccadbdcdfd1b4cb0cea132324cc1912e0f1900b6")
```

In particular, by setting `org-cite-csl-activate-use-document-style`, we can have the in-buffer displayed citations be the same as the exported form. Isn't that lovely!

Unfortunately, there's currently a potential for undesirable buffer modifications, so we'll put all the activation code behind a function we can call when we want it.

```
(use-package! oc-csl-activate
  :after oc
  :config
  (setq org-cite-csl-activate-use-document-style t)
  (defun +org-cite-csl-activate/enable ()
    (interactive)
    (setq org-cite-activate-processor 'csl-activate)
    (add-hook! 'org-mode-hook '((lambda () (cursor-sensor-mode 1))
    ↪  org-cite-csl-activate-render-all))
    (defadvice! +org-cite-csl-activate-render-all-silent (orig-fn)
      :around #'org-cite-csl-activate-render-all
      (with-silent-modifications (funcall orig-fn)))
    (when (eq major-mode 'org-mode)
      (with-silent-modifications
        (save-excursion
          (goto-char (point-min))
          (org-cite-activate (point-max)))
        (org-cite-csl-activate-render-all)))
    (fmakunbound #'+org-cite-csl-activate/enable)))
```

Now that `oc-csl-activate` is set up, let's go ahead and customise some of the packages already loaded. For starters, we can make use of the my Zotero files with

`citar`, and make the symbols a bit prettier.

```
(after! citar
  (setq org-cite-global-bibliography
        (let ((libfile-search-names '("library.json" "Library.json"
        ↪  "library.bib" "Library.bib"))
              (libfile-dir "~/Zotero")
              paths)
          (dolist (libfile libfile-search-names)
            (when (and (not paths)
                       (file-exists-p (expand-file-name libfile
                       ↪  libfile-dir)))
              (setq paths (list (expand-file-name libfile libfile-dir)))))
          paths)
        citar-bibliography org-cite-global-bibliography
        citar-symbols
        `((file ,(nerd-icons-faicon "nf-fa-file_o" :face 'nerd-icons-green
        ↪  :v-adjust -0.1) . " ")
          (note ,(nerd-icons-octicon "nf-oct-note" :face 'nerd-icons-blue
          ↪  :v-adjust -0.3) . " ")
          (link ,(nerd-icons-octicon "nf-oct-link" :face 'nerd-icons-orange
          ↪  :v-adjust 0.01) . " "))))
```

We can also make the Zotero CSL styles available to use.

```
(after! oc-csl
  (setq org-cite-csl-styles-dir "~/Zotero/styles"))
```

Since CSL works so nicely everywhere, we might as well use it as the default citation export processor for everything.

```
(after! oc
  (setq org-cite-export-processors '((t csl))))
```

Then, for convenience we'll cap things off by putting the citation command under Org's localleader.

```
(map! :after org
      :map org-mode-map
      :localleader
      :desc "Insert citation" "@" #'org-cite-insert)
```

Lastly, just in case I come across any old citations of mine, I think it would be nice to have a function to convert `org-ref` citations to `org-cite` forms.

```
(after! oc
  (defun org-ref-to-org-cite ()
    "Attempt to convert org-ref citations to org-cite syntax."
```

```
    (interactive)
    (let* ((cite-conversions '(("cite" . "//b") ("Cite" . "//bc")
                               ("nocite" . "/n")
                               ("citep" . "") ("citep*" . "//f")
                               ("parencite" . "") ("Parencite" . "//c")
                               ("citeauthor" . "/a/f") ("citeauthor*" .
                               ↪  "/a")
                               ("citeyear" . "/na/b")
                               ("Citep" . "//c") ("Citealp" . "//bc")
                               ("Citeauthor" . "/a/cf") ("Citeauthor*" .
                               ↪  "/a/c")
                               ("autocite" . "") ("Autocite" . "//c")
                               ("notecite" . "/l/b") ("Notecite" . "/l/bc")
                               ("pnotecite" . "/l") ("Pnotecite" .
                               ↪  "/l/bc")))
           (cite-regexp (rx (regexp (regexp-opt (mapcar #'car
           ↪  cite-conversions) t))
                            ":" (group (+ (not (any "\n
                            ↪           ,.)]}")))))))
      (save-excursion
        (goto-char (point-min))
        (while (re-search-forward cite-regexp nil t)
          (message (format "[cite%s:@%s]"
                                   (cdr (assoc (match-string 1)
                                   ↪  cite-conversions))
                                   (match-string 2)))
          (replace-match (format "[cite%s:@%s]"
                                   (cdr (assoc (match-string 1)
                                   ↪  cite-conversions))
                                   (match-string 2)))))))
```

e) cdlatex environments

I prefer `auto-activating-snippets` to `cdlatex`, but do like `org-cdlatex-environment-indent` (bound to `C-c }`). I almost always want to edit them afterwards though, so let's make that happen by default.

```
(defadvice! +org-edit-latex-env-after-insert-a (&rest _)
  :after #'org-cdlatex-environment-indent
  (org-edit-latex-environment))
```

At some point in the future it could be good to investigate splitting org blocks. Likewise this looks good for symbols.

f) LSP support in `src` blocks

Now, by default, LSPs don't really function at all in `src` blocks.

```
(cl-defmacro lsp-org-babel-enable (lang)
  "Support LANG in org source code block."
  (setq centaur-lsp 'lsp-mode)
  (cl-check-type lang string)
  (let* ((edit-pre (intern (format "org-babel-edit-prep:%s" lang)))
         (intern-pre (intern (format "lsp--%s" (symbol-name edit-pre)))))
    `(progn
       (defun ,intern-pre (info)
         (let ((file-name (->> info caddr (alist-get :file))))
           (unless file-name
             (setq file-name (make-temp-file "babel-lsp-")))
           (setq buffer-file-name file-name)
           (lsp-deferred)))
       (put ',intern-pre 'function-documentation
            (format "Enable lsp-mode in the buffer of org source block
            ↪  (%s)."
                    (upcase ,lang)))
       (if (fboundp ',edit-pre)
           (advice-add ',edit-pre :after ',intern-pre)
         (progn
           (defun ,edit-pre (info)
             (,intern-pre info))
           (put ',edit-pre 'function-documentation
                (format "Prepare local buffer environment for org source
                ↪  block (%s)."
                        (upcase ,lang))))))))
(defvar org-babel-lang-list
  '("go" "python" "ipython" "bash" "sh"))
(dolist (lang org-babel-lang-list)
  (eval `(lsp-org-babel-enable ,lang)))
```

g) View exported file

`'localeader v` has no pre-existing binding, so I may as well use it with the same functionality as in LaTeX. Let's try viewing possible output files with this.

```
(map! :map org-mode-map
      :localleader
      :desc "View exported file" "v" #'org-view-output-file)

(defun org-view-output-file (&optional org-file-path)
  "Visit buffer open on the first output file (if any) found, using
  ↪  `org-view-output-file-extensions'"
  (interactive)
  (let* ((org-file-path (or org-file-path (buffer-file-name) ""))
         (dir (file-name-directory org-file-path))
         (basename (file-name-base org-file-path))
         (output-file nil))
```

```
    (dolist (ext org-view-output-file-extensions)
      (unless output-file
        (when (file-exists-p
               (concat dir basename "." ext))
          (setq output-file (concat dir basename "." ext)))))
    (if output-file
        (if (member (file-name-extension output-file)
        ↪  org-view-external-file-extensions)
            (browse-url-xdg-open output-file)
          (pop-to-buffer (or (find-buffer-visiting output-file)
                             (find-file-noselect output-file))))
      (message "No exported file found")))

(defvar org-view-output-file-extensions '("pdf" "md" "rst" "txt" "tex"
↪  "html")
  "Search for output files with these extensions, in order, viewing the
  ↪  first that matches")
(defvar org-view-external-file-extensions '("html")
  "File formats that should be opened externally.")
```

3. Super agenda

   The agenda is nice, but a souped up version is nicer.

```
(package! org-super-agenda :pin "fb20ad9c8a9705aa05d40751682beae2d094e0fe")
```

```
(use-package! org-super-agenda
  :commands org-super-agenda-mode)
```

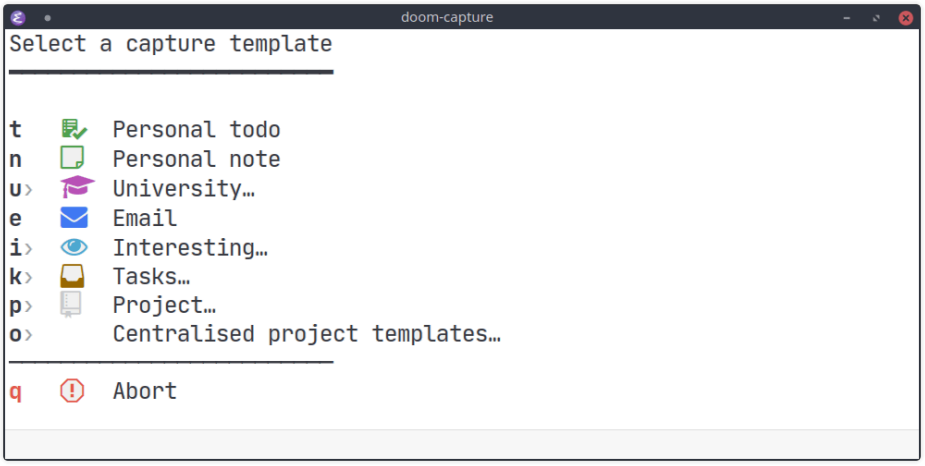
```
(after! org-agenda
  (let ((inhibit-message t))
    (org-super-agenda-mode)))

(setq org-agenda-skip-scheduled-if-done t
      org-agenda-skip-deadline-if-done t
      org-agenda-include-deadlines t
      org-agenda-block-separator nil
      org-agenda-tags-column 100 ;; from testing this seems to be a good value
      org-agenda-compact-blocks t)

(setq org-agenda-custom-commands
      '(("o" "Overview"
         ((agenda "" ((org-agenda-span 'day)
                      (org-super-agenda-groups
                       '((:name "Today"
                          :time-grid t
                          :date today
                          :todo "TODAY"
```

```
                    :scheduled today
                    :order 1)))))
        (alltodo "" ((org-agenda-overriding-header "")
                     (org-super-agenda-groups
                      '((:name "Next to do"
                         :todo "NEXT"
                         :order 1)
                        (:name "Important"
                         :tag "Important"
                         :priority "A"
                         :order 6)
                        (:name "Due Today"
                         :deadline today
                         :order 2)
                        (:name "Due Soon"
                         :deadline future
                         :order 8)
                        (:name "Overdue"
                         :deadline past
                         :face error
                         :order 7)
                        (:name "Assignments"
                         :tag "Assignment"
                         :order 10)
                        (:name "Issues"
                         :tag "Issue"
                         :order 12)
                        (:name "Emacs"
                         :tag "Emacs"
                         :order 13)
                        (:name "Projects"
                         :tag "Project"
                         :order 14)
                        (:name "Research"
                         :tag "Research"
                         :order 15)
                        (:name "To read"
                         :tag "Read"
                         :order 30)
                        (:name "Waiting"
                         :todo "WAITING"
                         :order 20)
                        (:name "University"
                         :tag "uni"
                         :order 32)
                        (:name "Trivial"
                         :priority<= "E"
                         :tag ("Trivial" "Unimportant")
```

```
                                :todo ("SOMEDAY" )
                                :order 90)
                               (:discard (:tag ("Chore" "Routine" "Daily")))))))))))
```

4. Capture

   Let's setup some org-capture templates, and make them visually nice to access.



`doct` (Declarative Org Capture Templates) seems to be a nicer way to set up org-capture.

```
(package! doct
  :recipe (:host github :repo "progfolio/doct")
  :pin "5cab660dab653ad88c07b0493360252f6ed1d898")
```

```
(use-package! doct
  :commands doct)
```

```
(after! org-capture
  <<prettify-capture>>

  (defun +doct-icon-declaration-to-icon (declaration)
    "Convert :icon declaration to icon"
    (let ((name (pop declaration))
          (set  (intern (concat "nerd-icons-" (plist-get declaration :set))))
          (face (intern (concat "nerd-icons-" (plist-get declaration :color))))
          (v-adjust (or (plist-get declaration :v-adjust) 0.01)))
      (apply set `(,name :face ,face :v-adjust ,v-adjust))))

  (defun +doct-iconify-capture-templates (groups)
    "Add declaration's :icon to each template group in GROUPS."
    (let ((templates (doct-flatten-lists-in groups)))
      (setq doct-templates (mapcar (lambda (template)
```

```
                                    (when-let* ((props (nthcdr (if (= (length
                                    ↪  template) 4) 2 5) template))
                                                (spec (plist-get (plist-get
                                                ↪  props :doct) :icon)))
                                      (setf (nth 1 template) (concat
                                      ↪  (+doct-icon-declaration-to-icon spec)
                                                                     "\t"
                                                                     (nth 1
                                                                     ↪  template))))
                                    template)
                                  templates))))

(setq doct-after-conversion-functions '(+doct-iconify-capture-templates))

(defvar +org-capture-recipies  "~/Desktop/TEC/Organisation/recipies.org")

(defun set-org-capture-templates ()
  (setq org-capture-templates
        (doct `(("Personal todo" :keys "t"
                 :icon ("nf-oct-checklist" :set "octicon" :color "green")
                 :file +org-capture-todo-file
                 :prepend t
                 :headline "Inbox"
                 :type entry
                 :template ("* TODO %?"
                            "%i %a"))
                ("Personal note" :keys "n"
                 :icon ("nf-fa-sticky_note_o" :set "faicon" :color "green")
                 :file +org-capture-todo-file
                 :prepend t
                 :headline "Inbox"
                 :type entry
                 :template ("* %?"
                            "%i %a"))
                ("Email" :keys "e"
                 :icon ("nf-fa-envelope" :set "faicon" :color "blue")
                 :file +org-capture-todo-file
                 :prepend t
                 :headline "Inbox"
                 :type entry
                 :template ("* TODO %^{type|reply to|contact} %\\3 %? :email:"
                            "Send an email %^{urgancy|soon|ASAP|anon|at some
                            ↪  point|eventually} to %^{recipiant}"
                            "about %^{topic}"
                            "%U %i %a"))
                ("Interesting" :keys "i"
                 :icon ("nf-fa-eye" :set "faicon" :color "lcyan")
                 :file +org-capture-todo-file
```

```
                :prepend t
                :headline "Interesting"
                :type entry
                :template ("* [ ] %{desc}%? :%{i-type}:"
                           "%i %a")
                :children (("Webpage" :keys "w"
                            :icon ("nf-fa-globe" :set "faicon" :color
                            ↪ "green")
                            :desc "%(org-cliplink-capture) "
                            :i-type "read:web")
                           ("Article" :keys "a"
                            :icon ("nf-fa-file_text_o" :set "faicon" :color
                            ↪ "yellow")
                            :desc ""
                            :i-type "read:reaserch")
                           ("\tRecipie" :keys "r"
                            :icon ("nf-fa-spoon" :set "faicon" :color
                            ↪ "dorange")
                            :file +org-capture-recipies
                            :headline "Unsorted"
                            :template "%(org-chef-get-recipe-from-url)")
                           ("Information" :keys "i"
                            :icon ("nf-fa-info_circle" :set "faicon" :color
                            ↪ "blue")
                            :desc ""
                            :i-type "read:info")
                           ("Idea" :keys "I"
                            :icon ("nf-md-chart_bubble" :set "mdicon" :color
                            ↪ "silver")
                            :desc ""
                            :i-type "idea")))
               ("Tasks" :keys "k"
                :icon ("nf-oct-inbox" :set "octicon" :color "yellow")
                :file +org-capture-todo-file
                :prepend t
                :headline "Tasks"
                :type entry
                :template ("* TODO %? %^G%{extra}"
                           "%i %a")
                :children (("General Task" :keys "k"
                            :icon ("nf-oct-inbox" :set "octicon" :color
                            ↪ "yellow")
                            :extra "")
                           ("Task with deadline" :keys "d"
                            :icon ("nf-md-timer" :set "mdicon" :color
                            ↪ "orange" :v-adjust -0.1)
                            :extra "\nDEADLINE: %^{Deadline:}t")
                           ("Scheduled Task" :keys "s"
```

```
                    :icon ("nf-oct-calendar" :set "octicon" :color
                    ↪  "orange")
                    :extra "\nSCHEDULED: %^{Start time:}t")))
                ("Project" :keys "p"
                 :icon ("nf-oct-repo" :set "octicon" :color "silver")
                 :prepend t
                 :type entry
                 :headline "Inbox"
                 :template ("* %{time-or-todo} %?"
                            "%i"
                            "%a")
                 :file ""
                 :custom (:time-or-todo "")
                 :children (("Project-local todo" :keys "t"
                             :icon ("nf-oct-checklist" :set "octicon" :color
                             ↪  "green")
                             :time-or-todo "TODO"
                             :file +org-capture-project-todo-file)
                            ("Project-local note" :keys "n"
                             :icon ("nf-fa-sticky_note" :set "faicon" :color
                             ↪  "yellow")
                             :time-or-todo "%U"
                             :file +org-capture-project-notes-file)
                            ("Project-local changelog" :keys "c"
                             :icon ("nf-fa-list" :set "faicon" :color "blue")
                             :time-or-todo "%U"
                             :heading "Unreleased"
                             :file +org-capture-project-changelog-file)))
                ("\tCentralised project templates"
                 :keys "o"
                 :type entry
                 :prepend t
                 :template ("* %{time-or-todo} %?"
                            "%i"
                            "%a")
                 :children (("Project todo"
                             :keys "t"
                             :prepend nil
                             :time-or-todo "TODO"
                             :heading "Tasks"
                             :file +org-capture-central-project-todo-file)
                            ("Project note"
                             :keys "n"
                             :time-or-todo "%U"
                             :heading "Notes"
                             :file +org-capture-central-project-notes-file)
                            ("Project changelog"
                             :keys "c"
```

```
                              :time-or-todo "%U"
                              :heading "Unreleased"
                              :file
                              ↪  +org-capture-central-project-changelog-file)))))))

  (set-org-capture-templates)
  (unless (display-graphic-p)
    (add-hook 'server-after-make-frame-hook
              (defun org-capture-reinitialise-hook ()
                (when (display-graphic-p)
                  (set-org-capture-templates)
                  (remove-hook 'server-after-make-frame-hook
                               #'org-capture-reinitialise-hook))))))
```

It would also be nice to improve how the capture dialogue looks

```
(defun org-capture-select-template-prettier (&optional keys)
  "Select a capture template, in a prettier way than default
Lisp programs can force the template by setting KEYS to a string."
  (let ((org-capture-templates
         (or (org-contextualize-keys
              (org-capture-upgrade-templates org-capture-templates)
              org-capture-templates-contexts)
             '(("t" "Task" entry (file+headline "" "Tasks")
                "* TODO %?\n  %u\n  %a")))))
    (if keys
        (or (assoc keys org-capture-templates)
            (error "No capture template referred to by \"%s\" keys" keys))
      (org-mks org-capture-templates
               "Select a capture template\n━━━━━━━━━━━━━━━━━━━━━━━━━"
               "Template key: "
               `(("q" ,(concat (nerd-icons-octicon "nf-oct-stop" :face
               ↪  'nerd-icons-red :v-adjust 0.01) "\tAbort")))))))
(advice-add 'org-capture-select-template :override
↪  #'org-capture-select-template-prettier)

(defun org-mks-pretty (table title &optional prompt specials)
  "Select a member of an alist with multiple keys. Prettified.

TABLE is the alist which should contain entries where the car is a string.
There should be two types of entries.

1. prefix descriptions like (\"a\" \"Description\")
   This indicates that `a' is a prefix key for multi-letter selection, and
   that there are entries following with keys like \"ab\", \"ax\"...

2. Select-able members must have more than two elements, with the first
   being the string of keys that lead to selecting it, and the second a
```

```
   short description string of the item.

The command will then make a temporary buffer listing all entries
that can be selected with a single key, and all the single key
prefixes.  When you press the key for a single-letter entry, it is selected.
When you press a prefix key, the commands (and maybe further prefixes)
under this key will be shown and offered for selection.

TITLE will be placed over the selection in the temporary buffer,
PROMPT will be used when prompting for a key.  SPECIALS is an
alist with (\"key\" \"description\") entries.  When one of these
is selected, only the bare key is returned."
  (save-window-excursion
    (let ((inhibit-quit t)
          (buffer (org-switch-to-buffer-other-window "*Org Select*"))
          (prompt (or prompt "Select: "))
          case-fold-search
          current)
      (unwind-protect
          (catch 'exit
            (while t
              (setq-local evil-normal-state-cursor (list nil))
              (erase-buffer)
              (insert title "\n\n")
              (let ((des-keys nil)
                    (allowed-keys '("\C-g"))
                    (tab-alternatives '("\s" "\t" "\r"))
                    (cursor-type nil))
                ;; Populate allowed keys and descriptions keys
                ;; available with CURRENT selector.
                (let ((re (format "\\`%s\\(.\\)\\'"
                                  (if current (regexp-quote current) "")))
                      (prefix (if current (concat current " ") "")))
                  (dolist (entry table)
                    (pcase entry
                      ;; Description.
                      (`(,(and key (pred (string-match re))) ,desc)
                       (let ((k (match-string 1 key)))
                         (push k des-keys)
                         ;; Keys ending in tab, space or RET are equivalent.
                         (if (member k tab-alternatives)
                             (push "\t" allowed-keys)
                           (push k allowed-keys))
                         (insert (propertize prefix 'face
                         ↪  'font-lock-comment-face) (propertize k 'face 'bold)
                         ↪  (propertize ">" 'face 'font-lock-comment-face) "  "
                         ↪  desc "..." "\n")))
                      ;; Usable entry.
```

```
                    (`(,(and key (pred (string-match re))) ,desc . ,_)
                     (let ((k (match-string 1 key)))
                       (insert (propertize prefix 'face
                       ↪  'font-lock-comment-face) (propertize k 'face 'bold)
                       ↪  "   " desc "\n")
                       (push k allowed-keys)))
                    (_ nil))))
              ;; Insert special entries, if any.
              (when specials
                (insert "————————————————————————\n")
                (pcase-dolist (`(,key ,description) specials)
                  (insert (format "%s   %s\n" (propertize key 'face '(bold
                  ↪  nerd-icons-red)) description))
                  (push key allowed-keys)))
              ;; Display UI and let user select an entry or
              ;; a sub-level prefix.
              (goto-char (point-min))
              (unless (pos-visible-in-window-p (point-max))
                (org-fit-window-to-buffer))
              (let ((pressed (org--mks-read-key allowed-keys
                                                prompt
                                                (not (pos-visible-in-window-p
                                                ↪  (1- (point-max)))))))
                (setq current (concat current pressed))
                (cond
                 ((equal pressed "\C-g") (user-error "Abort"))
                 ;; Selection is a prefix: open a new menu.
                 ((member pressed des-keys))
                 ;; Selection matches an association: return it.
                 ((let ((entry (assoc current table)))
                    (and entry (throw 'exit entry))))
                 ;; Selection matches a special entry: return the
                 ;; selection prefix.
                 ((assoc current specials) (throw 'exit current))
                 (t (error "No entry available")))))))
      (when buffer (kill-buffer buffer))))))
(advice-add 'org-mks :override #'org-mks-pretty)
```

The org-capture bin is rather nice, but I'd be nicer with a smaller frame, and no modeline.

```
(setf (alist-get 'height +org-capture-frame-parameters) 15)
;; (alist-get 'name +org-capture-frame-parameters) " Capture") ;; ATM hardcoded
↪  in other places, so changing breaks stuff
(setq +org-capture-fn
      (lambda ()
        (interactive)
        (set-window-parameter nil 'mode-line-format 'none)
        (org-capture)))
```

5. Roam

   a) Basic settings

   I'll just set this to be within `Organisation` folder for now, in the future it could be worth seeing if I could hook this up to a Nextcloud instance.

```
(setq org-roam-directory "~/Desktop/TEC/Organisation/Roam/")
```

   That said, if the directory doesn't exist we likely don't want to be using roam. Since we don't want to trigger errors (which will happen as soon as roam tries to initialise), let's not load roam.

```
(package! org-roam :disable t)
```

   b) Modeline file name

   All those numbers! It's messy. Let's adjust this in a similar way that I have in the Window title.

```
(defadvice! doom-modeline--buffer-file-name-roam-aware-a (orig-fun)
  :around #'doom-modeline-buffer-file-name ; takes no args
  (if (string-match-p (regexp-quote org-roam-directory) (or
  ↪  buffer-file-name ""))
      (replace-regexp-in-string

       ↪  "\\(?:^\\|.*/\\)\\([0-9]\\{4\\}\\)\\([0-9]\\{2\\}\\)\\([0-9]\\{2\\}\\)[0-9]*-"
       "(\\1-\\2-\\3) "
       (subst-char-in-string ?_ ?  buffer-file-name))
    (funcall orig-fun)))
```

   c) Graph view

   Org-roam is nice by itself, but there are so *extra* nice packages which integrate with it.

```
(package! org-roam-ui :recipe (:host github :repo "org-roam/org-roam-ui"
↪  :files ("*.el" "out")) :pin "5ac74960231db0bf7783c2ba7a19a60f582e91ab")
(package! websocket :pin "40c208eaab99999d7c1e4bea883648da24c03be3") ;
↪  dependency of `org-roam-ui'
```

```
(use-package! websocket
  :after org-roam)

(use-package! org-roam-ui
  :after org-roam
  :commands org-roam-ui-open
  :hook (org-roam . org-roam-ui-mode)
  :config
```

```
(require 'org-roam) ; in case autoloaded
(defun org-roam-ui-open ()
  "Ensure the server is active, then open the roam graph."
  (interactive)
  (unless org-roam-ui-mode (org-roam-ui-mode 1))
  (browse-url-xdg-open (format "http://localhost:%d" org-roam-ui-port))))
```

6. Nicer `org-return`

   Once again, from unpackaged.el

```
(defun unpackaged/org-element-descendant-of (type element)
  "Return non-nil if ELEMENT is a descendant of TYPE.
TYPE should be an element type, like `item' or `paragraph'.
ELEMENT should be a list like that returned by `org-element-context'."
  ;; MAYBE: Use `org-element-lineage'.
  (when-let* ((parent (org-element-property :parent element)))
    (or (eq type (car parent))
        (unpackaged/org-element-descendant-of type parent))))

;;;###autoload
(defun unpackaged/org-return-dwim (&optional default)
  "A helpful replacement for `org-return-indent'.  With prefix, call
  ↪  `org-return-indent'.

On headings, move point to position after entry content.  In
lists, insert a new item or end the list, with checkbox if
appropriate.  In tables, insert a new row or end the table."
  ;; Inspired by John Kitchin:
  ↪  http://kitchingroup.cheme.cmu.edu/blog/2017/04/09/A-better-return-in-org-mode/
  (interactive "P")
  (if default
      (org-return t)
    (cond
     ;; Act depending on context around point.

     ;; NOTE: I prefer RET to not follow links, but by uncommenting this block,
     ↪  links will be
     ;; followed.

     ;; ((eq 'link (car (org-element-context)))
     ;;  ;; Link: Open it.
     ;;  (org-open-at-point-global))

     ((org-at-heading-p)
      ;; Heading: Move to position after entry content.
      ;; NOTE: This is probably the most interesting feature of this function.
      (let ((heading-start (org-entry-beginning-position)))
```

```
    (goto-char (org-entry-end-position))
    (cond ((and (org-at-heading-p)
                (= heading-start (org-entry-beginning-position)))
           ;; Entry ends on its heading; add newline after
           (end-of-line)
           (insert "\n\n"))
          (t
           ;; Entry ends after its heading; back up
           (forward-line -1)
           (end-of-line)
           (when (org-at-heading-p)
             ;; At the same heading
             (forward-line)
             (insert "\n")
             (forward-line -1))
           (while (not (looking-back "\\(?:[[:blank:]]?\n\\)\\{3\\}" nil))
             (insert "\n"))
           (forward-line -1)))))

  ((org-at-item-checkbox-p)
   ;; Checkbox: Insert new item with checkbox.
   (org-insert-todo-heading nil))

  ((org-in-item-p)
   ;; Plain list.  Yes, this gets a little complicated...
   (let ((context (org-element-context)))
     (if (or (eq 'plain-list (car context))  ; First item in list
             (and (eq 'item (car context))
                  (not (eq (org-element-property :contents-begin context)
                           (org-element-property :contents-end context))))
             (unpackaged/org-element-descendant-of 'item context))  ; Element
             ↪  in list item, e.g. a link
         ;; Non-empty item: Add new item.
         (org-insert-item)
       ;; Empty item: Close the list.
       ;; TODO: Do this with org functions rather than operating on the text.
       ↪  Can't seem to find the right function.
       (delete-region (line-beginning-position) (line-end-position))
       (insert "\n"))))

  ((when (fboundp 'org-inlinetask-in-task-p)
     (org-inlinetask-in-task-p))
   ;; Inline task: Don't insert a new heading.
   (org-return t))

  ((org-at-table-p)
   (cond ((save-excursion
            (beginning-of-line)
```

```
                ;; See `org-table-next-field'.
                (cl-loop with end = (line-end-position)
                         for cell = (org-element-table-cell-parser)
                         always (equal (org-element-property :contents-begin
                         ↪ cell)
                                       (org-element-property :contents-end cell))
                         while (re-search-forward "|" end t)))
               ;; Empty row: end the table.
               (delete-region (line-beginning-position) (line-end-position))
               (org-return t))
              (t
               ;; Non-empty row: call `org-return-indent'.
               (org-return t))))
      (t
       ;; All other cases: call `org-return-indent'.
       (org-return t)))))

(map!
 :after evil-org
 :map evil-org-mode-map
 :i [return] #'unpackaged/org-return-dwim)
```

7. Snippet Helpers

   I often want to set `src-block` headers, and it's a pain to

   - type them out
   - remember what the accepted values are
   - oh, and specifying the same language again and again

   We can solve this in three steps

   - having one-letter snippets, conditioned on `(point)` being within a src header
   - creating a nice prompt showing accepted values and the current default
   - pre-filling the `src-block` language with the last language used

   For header args, the keys I'll use are

   - `r` for `:results`
   - `e` for `:exports`
   - `v` for `:eval`
   - `s` for `:session`
   - `d` for `:dir`

```
(defun +yas/org-src-header-p ()
  "Determine whether `point' is within a src-block header or header-args."
  (pcase (org-element-type (org-element-context))
    ('src-block (< (point) ; before code part of the src-block
                   (save-excursion (goto-char (org-element-property :begin
                   ↪  (org-element-context)))
                                   (forward-line 1)
                                   (point))))
    ('inline-src-block (< (point) ; before code part of the inline-src-block
                          (save-excursion (goto-char (org-element-property
                          ↪  :begin (org-element-context)))
                                          (search-forward "]{")
                                          (point))))
    ('keyword (string-match-p "^header-args" (org-element-property :value
    ↪  (org-element-context))))))
```

Now let's write a function we can reference in yasnippets to produce a nice interactive way to specify header args.

```
(defun +yas/org-prompt-header-arg (arg question values)
  "Prompt the user to set ARG header property to one of VALUES with QUESTION.
The default value is identified and indicated. If either default is selected,
or no selection is made: nil is returned."
  (let* ((src-block-p (not (looking-back "^#\\+property:[ \t]+header-args:.*"
  ↪  (line-beginning-position))))
         (default
           (or
            (cdr (assoc arg
                        (if src-block-p
                            (nth 2 (org-babel-get-src-block-info t))
                          (org-babel-merge-params
                           org-babel-default-header-args
                           (let ((lang-headers
                                  (intern (concat
                                  ↪  "org-babel-default-header-args:"
                                                  (+yas/org-src-lang)))))
                             (when (boundp lang-headers) (eval lang-headers
                             ↪  t)))))))
            ""))
         default-value)
    (setq values (mapcar
                  (lambda (value)
                    (if (string-match-p (regexp-quote value) default)
                        (setq default-value
                              (concat value " "
                                      (propertize "(default)" 'face
                                      ↪  'font-lock-doc-face)))
                      value))
```

```
                values))
    (let ((selection (consult--read values :prompt question :default
    ↪  default-value)))
      (unless (or (string-match-p "(default)$" selection)
                  (string= "" selection))
        selection))))
```

Finally, we fetch the language information for new source blocks.

Since we're getting this info, we might as well go a step further and also provide the ability to determine the most popular language in the buffer that doesn't have any `header-args` set for it (with `#+properties`).

```
(defun +yas/org-src-lang ()
  "Try to find the current language of the src/header at `point'.
Return nil otherwise."
  (let ((context (org-element-context)))
    (pcase (org-element-type context)
      ('src-block (org-element-property :language context))
      ('inline-src-block (org-element-property :language context))
      ('keyword (when (string-match "^header-args:\\([^ ]+\\)"
      ↪  (org-element-property :value context))
                  (match-string 1 (org-element-property :value context)))))))

(defun +yas/org-last-src-lang ()
  "Return the language of the last src-block, if it exists."
  (save-excursion
    (beginning-of-line)
    (when (re-search-backward "^[ \t]*#\\+begin_src" nil t)
      (org-element-property :language (org-element-context)))))

(defun +yas/org-most-common-no-property-lang ()
  "Find the lang with the most source blocks that has no global header-args,
  ↪  else nil."
  (let (src-langs header-langs)
    (save-excursion
      (goto-char (point-min))
      (while (re-search-forward "^[ \t]*#\\+begin_src" nil t)
        (push (+yas/org-src-lang) src-langs))
      (goto-char (point-min))
      (while (re-search-forward "^[ \t]*#\\+property: +header-args" nil t)
        (push (+yas/org-src-lang) header-langs)))

    (setq src-langs
          (mapcar #'car
                  ;; sort alist by frequency (desc.)
                  (sort
                   ;; generate alist with form (value . frequency)
```

```
                    (cl-loop for (n . m) in (seq-group-by #'identity src-langs)
                             collect (cons n (length m)))
                    (lambda (a b) (> (cdr a) (cdr b))))))

    (car (cl-set-difference src-langs header-langs :test #'string=))))
```

8. Translate capital keywords (old) to lower case (new)

   Everyone used to use `#+CAPITAL` keywords. Then people realised that `#+lowercase` is actually both marginally easier and visually nicer, so now the capital version is just used in the manual.

   > *Org is standardized on lower case. Uppercase is used in the manual as a poor man's bold, and supported for historical reasons.* — *Nicolas Goaziou on the Org ML*

   To avoid sometimes having to choose between the hassle out of updating old documents and using mixed syntax, I'll whip up a basic transcode-y function. It likely misses some edge cases, but should mostly work.

```
(defun org-syntax-convert-keyword-case-to-lower ()
  "Convert all #+KEYWORDS to #+keywords."
  (interactive)
  (save-excursion
    (goto-char (point-min))
    (let ((count 0)
          (case-fold-search nil))
      (while (re-search-forward "^[ \t]*#\\+[A-Z_]+" nil t)
        (unless (string-match-p "RESULTS" (match-string 0))
          (replace-match (downcase (match-string 0)) t)
          (setq count (1+ count))))
      (message "Replaced %d occurances" count))))
```

9. Extra links

   a) xkcd

      Because xkcd is cool, let's make it as easy and fun as possible to insert them. Saving seconds adds up after all! (but only so much)

```
(org-link-set-parameters "xkcd"
                         :image-data-fun #'+org-xkcd-image-fn
                         :follow #'+org-xkcd-open-fn
                         :export #'+org-xkcd-export
                         :complete #'+org-xkcd-complete)

(defun +org-xkcd-open-fn (link)
  (+org-xkcd-image-fn nil link nil))

(defun +org-xkcd-image-fn (protocol link description)
```

```
  "Get image data for xkcd num LINK"
  (let* ((xkcd-info (+xkcd-fetch-info (string-to-number link)))
         (img (plist-get xkcd-info :img))
         (alt (plist-get xkcd-info :alt)))
    (message alt)
    (+org-image-file-data-fn protocol (xkcd-download img (string-to-number
    ↪  link)) description)))

(defun +org-xkcd-export (num desc backend _com)
  "Convert xkcd to html/LaTeX form"
  (let* ((xkcd-info (+xkcd-fetch-info (string-to-number num)))
         (img (plist-get xkcd-info :img))
         (alt (plist-get xkcd-info :alt))
         (title (plist-get xkcd-info :title))
         (file (xkcd-download img (string-to-number num))))
    (cond ((org-export-derived-backend-p backend 'html)
           (format "<img class='invertible' src='%s' title=\"%s\"
           ↪  alt='%s'>" img (subst-char-in-string ?\" ?“ alt) title))
          ((org-export-derived-backend-p backend 'latex)
           (format "\\begin{figure}[!htb]
  \\centering
  \\includegraphics[scale=0.4]{%s}%s
\\end{figure}" file (if (equal desc (format "xkcd:%s" num)) ""
                        (format "\n  \\caption*{\\label{xkcd:%s} %s}"
                                num
                                (or desc
                                    (format "\\textbf{%s} %s" title alt))))))
          (t (format "https://xkcd.com/%s" num)))))

(defun +org-xkcd-complete (&optional arg)
  "Complete xkcd using `+xkcd-stored-info'"
  (format "xkcd:%d" (+xkcd-select)))
```

b) YouTube

The `[[yt:...]]` links preview nicely, but don't export nicely. Thankfully, we can fix that.

```
(org-link-set-parameters "yt" :export #'+org-export-yt)
(defun +org-export-yt (path desc backend _com)
  (cond ((org-export-derived-backend-p backend 'html)
         (format "<iframe width='440' \
height='335' \
src='https://www.youtube.com/embed/%s' \
frameborder='0' \
allowfullscreen>%s</iframe>" path (or "" desc)))
        ((org-export-derived-backend-p backend 'latex)
```

```
          (format "\\href{https://youtu.be/%s}{%s}" path (or desc
          ↪  "youtube")))
         (t (format "https://youtu.be/%s" path))))
```

10. Fix problematic hooks

    When one of the `org-mode-hook` functions errors, it halts the hook execution. This is problematic, and there are two hooks in particular which cause issues. Let's make their failure less eventful.

```
(defadvice! shut-up-org-problematic-hooks (orig-fn &rest args)
  :around #'org-fancy-priorities-mode
  (ignore-errors (apply orig-fn args)))
```

11. Flycheck with org-lint

    Org may be simple, but that doesn't mean there's no such thing as malformed Org. Thankfully, malformed Org is a much less annoying affair than malformed zipped XML (looks at DOCX/ODT...), particularly because there's a rather helpful little tool called `org-lint` bundled with Org that can tell you about your mistakes.

    Flycheck doesn't currently support Org, and there's aren't any packages to do so ¿. However, in an issue on `org-lint` there is some code which apparently works. Surely this is what the clipboard was invented for? With that said, let's regurgitate the code, cross our fingers, and hope it works.

```
(defconst flycheck-org-lint-form
  (flycheck-prepare-emacs-lisp-form
    (require 'org)
    (require 'org-lint)
    (require 'org-attach)
    (let ((source (car command-line-args-left))
          (process-default-directory default-directory))
      (with-temp-buffer
        (insert-file-contents source 'visit)
        (setq buffer-file-name source)
        (setq default-directory process-default-directory)
        (delay-mode-hooks (org-mode))
        (setq delayed-mode-hooks nil)
        (dolist (err (org-lint))
          (let ((inf (cl-second err)))
            (princ (elt inf 0))
            (princ ": ")
            (princ (elt inf 2))
            (terpri)))))))

(defconst flycheck-org-lint-variables
  '(org-directory
```

```
    org-id-locations
    org-id-locations-file
    org-attach-id-dir
    org-attach-use-inheritance
    org-attach-id-to-path-function-list
    org-link-parameters)
  "Variables inherited by the org-lint subprocess.")

(defconst flycheck-org-lint-babel-langs
  '<<org-babel-list-langs()>>
  "Languages that org-babel should know of.")

(defun flycheck-org-lint-variables-form ()
  (require 'org-attach)  ; Needed to make variables available
  `(progn
     ,@(seq-map (lambda (opt) `(setq-default ,opt ',(symbol-value opt)))
                (seq-filter #'boundp flycheck-org-lint-variables))))

(defun flycheck-org-lint-babel-langs-form ()
  `(progn
     ,@(mapcar
        (lambda (lang)
          `(defun ,(intern (format "org-babel-execute:%s" lang)) (_body _params)
             "Stub for org-lint."))
        flycheck-org-lint-babel-langs)))

(eval ; To preveant eager macro expansion form loading flycheck early.
 '(flycheck-define-checker org-lint
   "Org buffer checker using `org-lint'."
   :command ("emacs" (eval flycheck-emacs-args)
             "--eval" (eval (concat "(add-to-list 'load-path \""
                                    (file-name-directory (locate-library "org"))
                                    "\")"))
             "--eval" (eval (flycheck-sexp-to-string
                             (flycheck-org-lint-variables-form)))
             "--eval" (eval (flycheck-sexp-to-string
                             (flycheck-org-lint-customisations-form)))
             "--eval" (eval (flycheck-sexp-to-string
                             (flycheck-org-lint-babel-langs-form)))
             "--eval" (eval flycheck-org-lint-form)
             "--" source)
   :error-patterns
   ((error line-start line ": " (message) line-end))
   :modes org-mode))
```

Turns out it almost works. Running `M-x flycheck-verify-setup` after running that snippet produces the following:

```
The following syntax checkers are not registered:
```

```
  - org-lint
Try adding these syntax checkers to `flycheck-checkers'.
```

Well that's very nice and helpful. We'll just do that 🙂.

```
(add-to-list 'flycheck-checkers 'org-lint)
```

It was missing custom link types, but that's easily fixed just by adding `org-link-parameters` to `flycheck-org-lint-variables`.

One remaining little annoyance is that it reports extra `#+options` that I've added to Org as errors. So we need to tell `org-lint` about them without having it load my whole config. Code duplication isn't great, but at least this isn't much.

```
(defun flycheck-org-lint-customisations-form ()
  `(progn
     (require 'ox)
     (cl-pushnew '(:latex-cover-page nil "coverpage" nil)
                 (org-export-backend-options (org-export-get-backend 'latex)))
     (cl-pushnew '(:latex-font-set nil "fontset" nil)
                 (org-export-backend-options (org-export-get-backend 'latex)))))
```

A larger annoyance is that org-lint doesn't actually know what languages org-babel should recognise, with Doom's lazy loading system. Since the list of languages should really only change when packages are added/removed, we might as well statically determine a list of all org-babel languages at configuration generation time.

```
(let (langs)
  (dolist (dir load-path)
    (when (file-directory-p dir)
      (dolist (file (directory-files dir t "\\.elc?$"))
        (let ((basename (file-name-base file)))
          (when (string-prefix-p "ob-" basename)
            (ignore-errors
              (require (intern basename) file t)))))))
  (mapatoms
   (lambda (symb)
     (when (functionp symb)
       (let ((name (symbol-name symb)))
         (let ((fn (symbol-function symb)))
           (when (symbolp fn)
             (setq symb (symbol-function symb)
                   fn (symbol-function symb)))
           (when (and (string-suffix-p "-mode" name)
                      (autoloadp fn))
             (ignore-errors (autoload-do-load fn))))
         (cond
          ((string-prefix-p "org-babel-execute:" name)
```

```
          (push (replace-regexp-in-string "^org-babel-execute:" "" name)
                langs))
         ((and (string-suffix-p "-mode" name)
               (provided-mode-derived-p
                symb 'prog-mode 'text-mode 'conf-mode))
          (push (replace-regexp-in-string "-mode$" "" name)
                langs))))))
  obarray)
 (dolist (mode-mapping org-src-lang-modes)
   (push (car mode-mapping) langs))
 (mapcar #'intern
         (sort (delete-dups langs) #'string<)))
```

This increases the tangle time by about 10–20%, but I think it's worth it to be extra thorough. If this really becomes a pain, we can always think about doing some sort of cache file based on the load-path/packages installed.

5.3.4 Visuals

Here I try to do two things: improve the styling of the various documents, via font changes etc, and also propagate colours from the current theme.

1. Font Display

   Mixed pitch is great. As is `+org-pretty-mode`, let's use them.

   ```
   (add-hook 'org-mode-hook #'+org-pretty-mode)
   ```

   Let's make headings a bit bigger

   ```
   (custom-set-faces!
     '(outline-1 :weight extra-bold :height 1.25)
     '(outline-2 :weight bold :height 1.15)
     '(outline-3 :weight bold :height 1.12)
     '(outline-4 :weight semi-bold :height 1.09)
     '(outline-5 :weight semi-bold :height 1.06)
     '(outline-6 :weight semi-bold :height 1.03)
     '(outline-8 :weight semi-bold)
     '(outline-9 :weight semi-bold))
   ```

   And the same with the title.

   ```
   (custom-set-faces!
     '(org-document-title :height 1.2))
   ```

   It seems reasonable to have deadlines in the error face when they're passed.

```
(setq org-agenda-deadline-faces
      '((1.001 . error)
        (1.0 . org-warning)
        (0.5 . org-upcoming-deadline)
        (0.0 . org-upcoming-distant-deadline)))
```

We can then have quote blocks stand out a bit more by making them *italic*.

```
(setq org-fontify-quote-and-verse-blocks t)
```

Org files can be rather nice to look at, particularly with some of the customisations here. This comes at a cost however, expensive font-lock. Feeling like you're typing through molasses in large files is no fun, but there is a way I can defer font-locking when typing to make the experience more responsive.

```
(defun locally-defer-font-lock ()
  "Set jit-lock defer and stealth, when buffer is over a certain size."
  (when (> (buffer-size) 50000)
    (setq-local jit-lock-defer-time 0.05
                jit-lock-stealth-time 1)))

(add-hook 'org-mode-hook #'locally-defer-font-lock)
```

Apparently this causes issues with some people, but I haven't noticed anything problematic beyond the expected slight delay in some fontification, so until I do I'll use the above.

2. Reduced text indent

   Thanks to the various bits and bobs of setup we have here, the non-heading lines tend to appear over-indented in `org-indent-mode`. We can adjust this by modifying the generated text prefixes.

   There's another issue we can have when using mixed-pitch mode, where the line height is set by the indent prefix displayed with the fixed-pitch font. This means that on 0-indent lines the line spacing can be different, which doesn't look very good. We can also solve this problem by modifying the generated text prefixes to but a fixed-pitch zero width space at the start of 0-indent lines instead of nothing.

```
(defadvice! +org-indent--reduced-text-prefixes ()
  :after #'org-indent--compute-prefixes
  (setq org-indent--text-line-prefixes
        (make-vector org-indent--deepest-level nil))
  (when (> org-indent-indentation-per-level 0)
    (dotimes (n org-indent--deepest-level)
      (aset org-indent--text-line-prefixes
            n
            (org-add-props
                (concat (make-string (* n (1- org-indent-indentation-per-level))
```

```
                                        ?\s)
                              (if (> n 0)
                                   (char-to-string org-indent-boundary-char)
                                "\u200b"))
                        nil 'face 'org-indent)))))
```

3. Fontifying inline src blocks

   Org does lovely things with `#+begin_src` blocks, like using font-lock for language's major-mode behind the scenes and pulling out the lovely colourful results. By contrast, inline `src_` blocks are somewhat neglected.

   I am not the first person to feel this way, thankfully others have taken to stackexchange to voice their desire for inline src fontification. I was going to steal their work, but unfortunately they didn't perform *true* source code fontification, but simply applied the `org-code` face to the content.

   We can do better than that, and we shall! Using `org-src-font-lock-fontify-block` we can apply language-appropriate syntax highlighting. Then, continuing on to `{{{results(...)}}}`, it can have the `org-block` face applied to match, and then the value-surrounding constructs hidden by mimicking the behaviour of `prettify-symbols-mode`.

   Warning

   This currently only highlights a single inline src block per line. I have no idea why it stops, but I'd rather it didn't. If you have any idea what's going on or how to fix this *please* get in touch.

```
(setq org-inline-src-prettify-results '("⟨" . "⟩"))
```

   Doom theme's extra fontification is more problematic than helpful.

```
(setq doom-themes-org-fontify-special-tags nil)
```

4. Symbols

   It's also nice to change the character used for collapsed items (by default `...`), I think is better for indicating 'collapsed section'. and add an extra `org-bullet` to the default list of four.

```
(setq org-ellipsis "  "
      org-hide-leading-stars t
      org-priority-highest ?A
      org-priority-lowest ?E
      org-priority-faces
      '((?A . 'nerd-icons-red)
        (?B . 'nerd-icons-orange)
        (?C . 'nerd-icons-yellow)
        (?D . 'nerd-icons-green)
        (?E . 'nerd-icons-blue)))
```

It's also nice to make use of the `prettify-symbols-mode` for a few Org syntactic tokens which we'd like to prettify that aren't covered by `org-modern` or any other settings.

```
(appendq! +ligatures-extra-symbols
          (list :list_property ""
                :em_dash       "—"
                :ellipses      "…"
                :arrow_right   "→"
                :arrow_left    "←"
                :arrow_lr      ""
                :properties    ""
                :end           ""
                :priority_a    #("" 0 1 (face nerd-icons-red))
                :priority_b    #("" 0 1 (face nerd-icons-orange))
                :priority_c    #("" 0 1 (face nerd-icons-yellow))
                :priority_d    #("" 0 1 (face nerd-icons-green))
                :priority_e    #("?" 0 1 (face nerd-icons-blue))))

(defadvice! +org-init-appearance-h--no-ligatures-a ()
  :after #'+org-init-appearance-h
  (set-ligatures! 'org-mode nil)
  (set-ligatures! 'org-mode
    :list_property "::"
    :em_dash       "---"
    :ellipsis      "..."
    :arrow_right   "->"
    :arrow_left    "<-"
    :arrow_lr      "<->"
    :properties    ":PROPERTIES:"
    :end           ":END:"
    :priority_a    "[#A]"
    :priority_b    "[#B]"
    :priority_c    "[#C]"
    :priority_d    "[#D]"
    :priority_e    "[#E]"))
```

While we're at it we may as well make tags prettier as well 🙂

```
;; (package! org-pretty-tags :pin "5c7521651b35ae9a7d3add4a66ae8cc176ae1c76")
```

```
;; (use-package org-pretty-tags
;; :config
;;  (setq org-pretty-tags-surrogate-strings
;;        `(("uni"        . ,(all-the-icons-faicon   "graduation-cap" :face
↪  'all-the-icons-purple  :v-adjust 0.01))
;;          ("ucc"        . ,(all-the-icons-material "computer"       :face
↪  'all-the-icons-silver  :v-adjust 0.01))
```

```
;;          ("assignment" . ,(all-the-icons-material "library_books"  :face
↪  'all-the-icons-orange  :v-adjust 0.01))
;;          ("test"       . ,(all-the-icons-material "timer"          :face
↪  'all-the-icons-red     :v-adjust 0.01))
;;          ("lecture"    . ,(all-the-icons-fileicon "keynote"        :face
↪  'all-the-icons-orange  :v-adjust 0.01))
;;          ("email"      . ,(all-the-icons-faicon   "envelope"       :face
↪  'all-the-icons-blue    :v-adjust 0.01))
;;          ("read"       . ,(all-the-icons-octicon  "book"           :face
↪  'all-the-icons-lblue   :v-adjust 0.01))
;;          ("article"    . ,(all-the-icons-octicon  "file-text"      :face
↪  'all-the-icons-yellow  :v-adjust 0.01))
;;          ("web"        . ,(all-the-icons-faicon   "globe"          :face
↪  'all-the-icons-green   :v-adjust 0.01))
;;          ("info"       . ,(all-the-icons-faicon   "info-circle"    :face
↪  'all-the-icons-blue    :v-adjust 0.01))
;;          ("issue"      . ,(all-the-icons-faicon   "bug"            :face
↪  'all-the-icons-red     :v-adjust 0.01))
;;          ("someday"    . ,(all-the-icons-faicon   "calendar-o"     :face
↪  'all-the-icons-cyan    :v-adjust 0.01))
;;          ("idea"       . ,(all-the-icons-octicon  "light-bulb"     :face
↪  'all-the-icons-yellow  :v-adjust 0.01))
;;          ("emacs"      . ,(all-the-icons-fileicon "emacs"          :face
↪  'all-the-icons-lpurple :v-adjust 0.01))))
;;  (org-pretty-tags-global-mode))
```

5. LaTeX Fragments

   a) Prettier highlighting

   First off, we want those fragments to look good.

   ```
   (setq org-highlight-latex-and-related '(latex script entities))
   ```

   However, by using `native` highlighting the `org-block` face is added, and that doesn't look too great — particularly when the fragments are previewed.

   Ideally `org-src-font-lock-fontify-block` wouldn't add the `org-block` face, but we can avoid advising that entire function by just adding another face with `:inherit default` which will override the background colour.

   Inspecting `org-do-latex-and-related` shows that `"latex"` is the language argument passed, and so we can override the background as discussed above.

   ```
   (require 'org-src)
   (add-to-list 'org-src-block-faces '("latex" (:inherit default :extend t)))
   ```

   b) Automatic previewing

   It would be nice if fragments could automatically be previewed after being typed,

and the overlays automatically showed and hidden when moving the point in and out of the LaTeX fragments.

Thankfully, all we need to do to make this happen is use `org-latex-preview-auto-mode`.

```
(add-hook 'org-mode-hook #'org-latex-preview-auto-mode)
```

c) Prettier rendering

It's nice to customise the look of LaTeX fragments so they fit better in the text — like this $\sqrt{\beta^2+3} - \sum_{\phi=1}^{\infty} \frac{x^{\phi}-1}{\Gamma(a)}$.

The default snippet preamble basically just sets the margins and text size, with templates to be filled in by `org-latex-default-packages-alist` and `#+latex_header:` entries (but not `#+latex_header_extra:`).

```
\documentclass{article}
[DEFAULT-PACKAGES]
[PACKAGES]
\usepackage{xcolor}
```

To this, we make two additions:

- Selection of a maths font that fits better with displayed text.
- My collection mathematical notation conveniences.

```
(setq org-latex-preview-preamble
      (concat
       <<grab("latex-default-snippet-preamble")>>
       "\n% Custom font\n\\usepackage{arev}\n\n"
       <<grab("latex-maths-conveniences")>>))
```

Since we can, instead of making the background colour match the `default` face, let's make it transparent.

```
;; Calibrated based on the TeX font and org-buffer font.
(plist-put org-format-latex-options :zoom 0.93)
```

d) Rendering speed tests

We can either render from a `dvi` or `pdf` file, so let's benchmark `latex` and `pdflatex`.

`latex` time	`pdflatex` time
135 ± 2 ms	215 ± 3 ms

On the rendering side, there are two `.dvi`-to-image converters which I am interested in: `dvipng` and `dvisvgm`.

Using the above latex expression and benchmarking lead to the following results:

`dvipng` time	`dvisvgm` time	`pdf2svg` time
89 ± 2 ms	178 ± 2 ms	12 ± 2 ms

Now let's combine this to see what's best

Tool chain	Total time	Resulting file size
`latex` + `dvipng`	226 ± 2 ms	7 KiB
`latex` + `dvisvgm`	392 ± 4 ms	8 KiB
`pdflatex` + `pdf2svg`	230 ± 2 ms	16 KiB

So, let's use `dvipng` for previewing LaTeX fragments in-Emacs, but `dvisvgm` for Item 12.

Warning

Unfortunately, it seems that SVG sizing is annoying ATM, so let's actually not do this right now.

6. Org Plot

We can use some of the variables in `org-plot` to use the current doom theme colours.

```
(defvar +org-plot-term-size '(1050 . 650)
  "The size of the GNUPlot terminal, in the form (WIDTH . HEIGHT).")

(after! org-plot
  (defun +org-plot-generate-theme (_type)
    "Use the current Doom theme colours to generate a GnuPlot preamble."
    (format "
fgt = \"textcolor rgb '%s'\" # foreground text
fgat = \"textcolor rgb '%s'\" # foreground alt text
fgl = \"linecolor rgb '%s'\" # foreground line
fgal = \"linecolor rgb '%s'\" # foreground alt line

# foreground colors
set border lc rgb '%s'
# change text colors of  tics
set xtics @fgt
set ytics @fgt
# change text colors of labels
set title @fgt
set xlabel @fgt
set ylabel @fgt
# change a text color of key
set key @fgt

# line styles
set linetype 1 lw 2 lc rgb '%s' # red
set linetype 2 lw 2 lc rgb '%s' # blue
```

```
set linetype 3 lw 2 lc rgb '%s' # green
set linetype 4 lw 2 lc rgb '%s' # magenta
set linetype 5 lw 2 lc rgb '%s' # orange
set linetype 6 lw 2 lc rgb '%s' # yellow
set linetype 7 lw 2 lc rgb '%s' # teal
set linetype 8 lw 2 lc rgb '%s' # violet

# border styles
set tics out nomirror
set border 3

# palette
set palette maxcolors 8
set palette defined ( 0 '%s',\
1 '%s',\
2 '%s',\
3 '%s',\
4 '%s',\
5 '%s',\
6 '%s',\
7 '%s' )
"
            (doom-color 'fg)
            (doom-color 'fg-alt)
            (doom-color 'fg)
            (doom-color 'fg-alt)
            (doom-color 'fg)
            ;; colours
            (doom-color 'red)
            (doom-color 'blue)
            (doom-color 'green)
            (doom-color 'magenta)
            (doom-color 'orange)
            (doom-color 'yellow)
            (doom-color 'teal)
            (doom-color 'violet)
            ;; duplicated
            (doom-color 'red)
            (doom-color 'blue)
            (doom-color 'green)
            (doom-color 'magenta)
            (doom-color 'orange)
            (doom-color 'yellow)
            (doom-color 'teal)
            (doom-color 'violet)))

  (defun +org-plot-gnuplot-term-properties (_type)
    (format "background rgb '%s' size %s,%s"
```

```
            (doom-color 'bg) (car +org-plot-term-size) (cdr
            ↪ +org-plot-term-size)))

  (setq org-plot/gnuplot-script-preamble #'+org-plot-generate-theme)
  (setq org-plot/gnuplot-term-extra #'+org-plot-gnuplot-term-properties))
```

5.3.5 Exporting

1. General settings

   By default Org only exports the first three levels of headings as ... headings. This is rather unfortunate as my documents frequently stray far beyond three levels of depth. The two main formats I care about exporting to are LaTeX and HTML. When using an `article` class, LaTeX headlines go from `\section`, `\subsection`, `\subsubsection`, and `\paragraph` to `\subgraph` — *five* levels. HTML5 has six levels of headings (`<h1>` to `<h6>`), but first level Org headings get exported as `<h2>` elements — leaving *five* usable levels.

   As such, it would seem to make sense to recognise the first *five* levels of Org headings when exporting.

   ```
   (setq org-export-headline-levels 5) ; I like nesting
   ```

   I'm also going to make use of an item in `ox-extra` so that I can add an `:ignore:` tag to headings for the content to be kept, but the heading itself ignored (unlike `:noexport:` which ignored both heading and content). This is useful when I want to use headings to provide a structure for writing that doesn't appear in the final documents.

   ```
   (require 'ox-extra)
   (ox-extras-activate '(ignore-headlines))
   ```

   Since I (roughly) track Org `HEAD`, it makes sense to include the git version in the creator string.

   ```
   (setq org-export-creator-string
         (format "Emacs %s (Org mode %s-%s)" emacs-version (org-release)
         ↪ (org-git-version)))
   ```

2. Acronym formatting

   I like automatically using spaced small caps for acronyms. For strings I want to be unaffected let's use `;` as a prefix to prevent the transformation — i.e. `;JFK` (as one would want for two-letter geographic locations and names).

   This has to be implemented on a per-format basis, currently HTML and LaTeX exports are supported.

```
(defun org-export-filter-text-acronym (text backend _info)
  "Wrap suspected acronyms in acronyms-specific formatting.
Treat sequences of 2+ capital letters (optionally succeeded by \"s\") as an
↪  acronym.
Ignore if preceeded by \";\" (for manual prevention) or \"\\\" (for LaTeX
↪  commands).

TODO abstract backend implementations."
  (let ((base-backend
         (cond
          ((org-export-derived-backend-p backend 'latex) 'latex)
          ;; Markdown is derived from HTML, but we don't want to format it
          ((org-export-derived-backend-p backend 'md) nil)
          ((org-export-derived-backend-p backend 'html) 'html)))
        (case-fold-search nil))
    (when base-backend
      (replace-regexp-in-string
       "[;\\\\]?\\b[A-Z][A-Z]+s?\\(?:[^A-Za-z]\\|\\b\\)"
       (lambda (all-caps-str)
         (cond ((equal (aref all-caps-str 0) ?\\) all-caps-str)                ;
         ↪  don't format LaTeX commands
               ((equal (aref all-caps-str 0) ?\;) (substring all-caps-str 1))  ;
               ↪  just remove not-acronym indicator char ";"
               (t (let* ((final-char (if (string-match-p "[^A-Za-z]" (substring
               ↪  all-caps-str -1 (length all-caps-str)))
                                         (substring all-caps-str -1 (length
                                         ↪  all-caps-str))
                                       nil)) ; needed to re-insert the [^A-Za-z]
                                         ↪  at the end
                         (trailing-s (equal (aref all-caps-str (- (length
                         ↪  all-caps-str) (if final-char 2 1))) ?s))
                         (acr (if final-char
                                  (substring all-caps-str 0 (if trailing-s -2
                                  ↪  -1))
                                (substring all-caps-str 0 (+ (if trailing-s -1
                                ↪  (length all-caps-str)))))))
                    (pcase base-backend
                      ('latex (concat "\\acr{" (downcase acr) "}" (when
                      ↪  trailing-s "\\acrs{}") final-char))
                      ('html (concat "<span class='acr'>" acr "</span>" (when
                      ↪  trailing-s "<small>s</small>") final-char)))))))
       text t t))))

(add-to-list 'org-export-filter-plain-text-functions
             #'org-export-filter-text-acronym)

;; We won't use `org-export-filter-headline-functions' because it
;; passes (and formats) the entire section contents. That's no good.
```

```
(defun org-html-format-headline-acronymised (todo todo-type priority text tags
↪  info)
  "Like `org-html-format-headline-default-function', but with acronym
  ↪  formatting."
  (org-html-format-headline-default-function
   todo todo-type priority (org-export-filter-text-acronym text 'html info) tags
   ↪  info))
(setq org-html-format-headline-function #'org-html-format-headline-acronymised)

(defun org-latex-format-headline-acronymised (todo todo-type priority text tags
↪  info)
  "Like `org-latex-format-headline-default-function', but with acronym
  ↪  formatting."
  (org-latex-format-headline-default-function
   todo todo-type priority (org-export-filter-text-acronym text 'latex info)
   ↪  tags info))
(setq org-latex-format-headline-function
↪  #'org-latex-format-headline-acronymised)
```

3. Nicer generated heading IDs

   Thanks to alphapapa's unpackaged.el.

   By default, Org generated heading IDs like `#org80fc2a5` which ... works, but has two issues

   - It's completely uninformative, I have no idea what's being referenced
   - If I export the same file, everything will change. Now, while without hardcoded values it's impossible to set references in stone, it would be nice for there to be a decent chance of staying the same.

   Both of these issues can be addressed by generating IDs like `#language-configuration`, which is what I'll do here.

   It's worth noting that alphapapa's use of `url-hexify-string` seemed to cause me some issues. Replacing that in `a53899` resolved this for me. To go one step further, I create a function for producing nice short links, like an inferior version of `reftex-label`.

```
(defvar org-reference-contraction-max-words 3
  "Maximum number of words in a reference reference.")
(defvar org-reference-contraction-max-length 35
  "Maximum length of resulting reference reference, including joining
  ↪  characters.")
(defvar org-reference-contraction-stripped-words
  '("the" "on" "in" "off" "a" "for" "by" "of" "and" "is" "to" "as")
  "Superfluous words to be removed from a reference.")
(defvar org-reference-contraction-joining-char "-"
```

```
  "Character used to join words in the reference reference.")

(defun org-reference-contraction-truncate-words (words)
  "Using `org-reference-contraction-max-length' as the total character 'budget'
  ↪ for the WORDS
and truncate individual words to conform to this budget.

To arrive at a budget that accounts for words undershooting their requisite
↪ average length,
the number of characters in the budget freed by short words is distributed among
↪ the words
exceeding the average length.  This adjusts the per-word budget to be the
↪ maximum feasable for
this particular situation, rather than the universal maximum average.

This budget-adjusted per-word maximum length is given by the mathematical
↪ expression below:

max length = \\floor{ \\frac{total length - chars for seperators - \\sum_{word
↪ \\leq average length} length(word) }{num(words) > average length} }"
  ;; trucate each word to a max word length determined by
  ;;
  (let* ((total-length-budget (- org-reference-contraction-max-length  ; how
  ↪ many non-separator chars we can use
                                 (1- (length words))))
         (word-length-budget (/ total-length-budget                     ; max
         ↪ length of each word to keep within budget
                                org-reference-contraction-max-words))
         (num-overlong (-count (lambda (word)                           ; how
         ↪ many words exceed that budget
                                 (> (length word) word-length-budget))
                               words))
         (total-short-length (-sum (mapcar (lambda (word)               ; total
         ↪ length of words under that budget
                                             (if (<= (length word)
                                             ↪ word-length-budget)
                                                 (length word) 0))
                                           words)))
         (max-length (/ (- total-length-budget total-short-length)      ;
         ↪ max(max-length) that we can have to fit within the budget
                        num-overlong)))
    (mapcar (lambda (word)
              (if (<= (length word) max-length)
                  word
                (substring word 0 max-length)))
            words)))

(defun org-reference-contraction (reference-string)
```

```
  "Give a contracted form of REFERENCE-STRING that is only contains alphanumeric
  ↪  characters.
Strips 'joining' words present in `org-reference-contraction-stripped-words',
and then limits the result to the first `org-reference-contraction-max-words'
↪  words.
If the total length is > `org-reference-contraction-max-length' then individual
↪  words are
truncated to fit within the limit using
↪  `org-reference-contraction-truncate-words'."
  (let ((reference-words
         (cl-remove-if-not
          (lambda (word)
            (not (member word org-reference-contraction-stripped-words)))
          (let ((str reference-string))
            (setq str (downcase str))
            (setq str (replace-regexp-in-string
            ↪  "\\[\\[[^]]+\\]\\[\\([^]]+\\)\\]\\]" "\\1" str)) ; get
            ↪  description from org-link
            (setq str (replace-regexp-in-string "[-/ ]+" " " str)) ; replace
            ↪  seperator-type chars with space
            (setq str (puny-encode-string str))
            (setq str (replace-regexp-in-string "^xn--\\(.*?\\)
            ↪  ?-?\\([a-z0-9]+\\)$" "\\2 \\1" str)) ; rearrange punycode
            (setq str (replace-regexp-in-string "[^A-Za-z0-9 ]" "" str)) ; strip
            ↪  chars which need %-encoding in a uri
            (split-string str " +")))))
    (when (> (length reference-words)
             org-reference-contraction-max-words)
      (setq reference-words
            (cl-subseq reference-words 0 org-reference-contraction-max-words)))

    (when (> (apply #'+ (1- (length reference-words))
                    (mapcar #'length reference-words))
             org-reference-contraction-max-length)
      (setq reference-words (org-reference-contraction-truncate-words
      ↪  reference-words)))

    (string-join reference-words org-reference-contraction-joining-char)))
```

Now here's alphapapa's subtly tweaked mode.

```
(define-minor-mode unpackaged/org-export-html-with-useful-ids-mode
  "Attempt to export Org as HTML with useful link IDs.
Instead of random IDs like \"#orga1b2c3\", use heading titles,
made unique when necessary."
  :global t
  (if unpackaged/org-export-html-with-useful-ids-mode
```

```
      (advice-add #'org-export-get-reference :override
      ↪  #'unpackaged/org-export-get-reference)
    (advice-remove #'org-export-get-reference
    ↪  #'unpackaged/org-export-get-reference)))
(unpackaged/org-export-html-with-useful-ids-mode 1) ; ensure enabled, and advice
↪  run

(defun unpackaged/org-export-get-reference (datum info)
  "Like `org-export-get-reference', except uses heading titles instead of random
  ↪  numbers."
  (let ((cache (plist-get info :internal-references)))
    (or (car (rassq datum cache))
        (let* ((crossrefs (plist-get info :crossrefs))
               (cells (org-export-search-cells datum))
               ;; Preserve any pre-existing association between
               ;; a search cell and a reference, i.e., when some
               ;; previously published document referenced a location
               ;; within current file (see
               ;; `org-publish-resolve-external-link').
               ;;
               ;; However, there is no guarantee that search cells are
               ;; unique, e.g., there might be duplicate custom ID or
               ;; two headings with the same title in the file.
               ;;
               ;; As a consequence, before re-using any reference to
               ;; an element or object, we check that it doesn't refer
               ;; to a previous element or object.
               (new (or (cl-some
                         (lambda (cell)
                           (let ((stored (cdr (assoc cell crossrefs))))
                             (when stored
                               (let ((old (org-export-format-reference stored)))
                                 (and (not (assoc old cache)) stored)))))
                         cells)
                        (when (org-element-property :raw-value datum)
                          ;; Heading with a title
                          (unpackaged/org-export-new-named-reference datum
                          ↪  cache))
                        (when (member (car datum) '(src-block table example
                        ↪  fixed-width property-drawer))
                          ;; Nameable elements
                          (unpackaged/org-export-new-named-reference datum
                          ↪  cache))
                        ;; NOTE: This probably breaks some Org Export
                        ;; feature, but if it does what I need, fine.
                        (org-export-format-reference
                         (org-export-new-reference cache))))
               (reference-string new))
```

```
          ;; Cache contains both data already associated to
          ;; a reference and in-use internal references, so as to make
          ;; unique references.
          (dolist (cell cells) (push (cons cell new) cache))
          ;; Retain a direct association between reference string and
          ;; DATUM since (1) not every object or element can be given
          ;; a search cell (2) it permits quick lookup.
          (push (cons reference-string datum) cache)
          (plist-put info :internal-references cache)
          reference-string))))

(defun unpackaged/org-export-new-named-reference (datum cache)
  "Return new reference for DATUM that is unique in CACHE."
  (cl-macrolet ((inc-suffixf (place)
                  `(progn
                     (string-match (rx bos
                                       (minimal-match (group (1+ anything)))
                                       (optional "--" (group (1+ digit)))
                                       eos)
                                   ,place)
                     ;; HACK: `s1' instead of a gensym.
                     (let* ((s1 (match-string 1 ,place))
                            (suffix-1 (match-string 2 ,place))
                            (suffix (if suffix-1 (string-to-number suffix-1)
                            ↪  0)))
                       (setf ,place (format "%s--%s" s1 (1+ suffix)))))))
    (let* ((headline-p (eq (car datum) 'headline))
           (title (if headline-p
                      (org-element-property :raw-value datum)
                    (or (org-element-property :name datum)
                        (concat (org-element-property :raw-value
                                                      (org-element-property
                                                      ↪  :parent

                                                                          ↪  (org-element-property
                                                                          ↪  :parent
                                                                          ↪  datum)))))))
           ;; get ascii-only form of title without needing percent-encoding
           (ref (concat (org-reference-contraction (substring-no-properties
           ↪  title))
                        (unless (or headline-p (org-element-property :name
                        ↪  datum))
                          (concat ","
                                  (pcase (car datum)
                                    ('src-block "code")
                                    ('example "example")
                                    ('fixed-width "mono")
                                    ('property-drawer "properties")
```

```
                                  (_ (symbol-name (car datum))))
                                "--1"))))
          (parent (when headline-p (org-element-property :parent datum))))
      (while (member ref (mapcar #'car cache))
        ;; Title not unique: make it so.
        (if parent
            ;; Append ancestor title.
            (setf title (concat (org-element-property :raw-value parent)
                                "--" title)
                  ;; get ascii-only form of title without needing
                  ↪ percent-encoding
                  ref (org-reference-contraction (substring-no-properties
                  ↪ title))
                  parent (when headline-p (org-element-property :parent
                  ↪ parent)))
          ;; No more ancestors: add and increment a number.
          (inc-suffixf ref)))
      ref)))

(add-hook 'org-load-hook #'unpackaged/org-export-html-with-useful-ids-mode)
```

We also need to redefine `(org-export-format-reference)` as it now may be passed a string as well as a number.

```
(defadvice! org-export-format-reference-a (reference)
  "Format REFERENCE into a string.

REFERENCE is a either a number or a string representing a reference,
as returned by `org-export-new-reference'."
  :override #'org-export-format-reference
  (if (stringp reference) reference (format "org%07x" reference)))
```

4. Strip zero width spaces

   Zero width spaces are handy as a semantic separator, but not something we want passed through to the exports.

```
(defun +org-export-remove-zero-width-space (text _backend _info)
  "Remove zero width spaces from TEXT."
  (unless (org-export-derived-backend-p 'org)
    (replace-regexp-in-string "\u200B" "" text)))

(add-to-list 'org-export-filter-final-output-functions
↪ #'+org-export-remove-zero-width-space t)
```

5. Exporting Org code

   With all our Org config and hooks, exporting an Org code block when using a font-lock based method can produce undesirable results. To address this, we can tweak `+org-babel-mode-alist`

when exporting.

```
(defun +org-mode--fontlock-only-mode ()
  "Just apply org-mode's font-lock once."
  (let (org-mode-hook
        org-hide-leading-stars
        org-hide-emphasis-markers)
    (org-set-font-lock-defaults)
    (font-lock-ensure))
  (setq-local major-mode #'fundamental-mode))

(defun +org-export-babel-mask-org-config (_backend)
  "Use `+org-mode--fontlock-only-mode' instead of `org-mode'."
  (setq-local org-src-lang-modes
              (append org-src-lang-modes
                      (list (cons "org" #'+org-mode--fontlock-only)))))

(add-hook 'org-export-before-processing-hook
↪  #'+org-export-babel-mask-org-config)
```

5.3.6 HTML Export

I want to tweak a whole bunch of things. While I'll want my tweaks almost all the time, occasionally I may want to test how something turns out using a more default config. With that in mind, a global minor mode seems like the most appropriate architecture to use.

```
(define-minor-mode org-fancy-html-export-mode
  "Toggle my fabulous org export tweaks. While this mode itself does a little bit,
the vast majority of the change in behaviour comes from switch statements in:
 - `org-html-template-fancier'
 - `org-html--build-meta-info-extended'
 - `org-html-src-block-collapsable'
 - `org-html-block-collapsable'
 - `org-html-table-wrapped'
 - `org-html--format-toc-headline-colapseable'
 - `org-html--toc-text-stripped-leaves'
 - `org-export-html-headline-anchor'"
  :global t
  :init-value t
  (if org-fancy-html-export-mode
      (setq org-html-style-default org-html-style-fancy
            org-html-meta-tags #'org-html-meta-tags-fancy
            org-html-checkbox-type 'html-span)
    (setq org-html-style-default org-html-style-plain
          org-html-meta-tags #'org-html-meta-tags-default
```

```
        org-html-checkbox-type 'html)))
```

1. Extra header content

   We want to tack on a few more bits to the start of the body. Unfortunately, there doesn't seem to be any nice variable or hook, so we'll just override the relevant function.

   This is done to allow me to add the date and author to the page header, implement a CSS-only light/dark theme toggle, and a sprinkle of Open Graph metadata.

```
(defadvice! org-html-template-fancier (orig-fn contents info)
  "Return complete document string after HTML conversion.
CONTENTS is the transcoded contents string.  INFO is a plist
holding export options. Adds a few extra things to the body
compared to the default implementation."
  :around #'org-html-template
  (if (or (not org-fancy-html-export-mode) (bound-and-true-p
  ↪  org-msg-export-in-progress))
      (funcall orig-fn contents info)
    (concat
     (when (and (not (org-html-html5-p info)) (org-html-xhtml-p info))
       (let* ((xml-declaration (plist-get info :html-xml-declaration))
              (decl (or (and (stringp xml-declaration) xml-declaration)
                        (cdr (assoc (plist-get info :html-extension)
                                    xml-declaration))
                        (cdr (assoc "html" xml-declaration))
                        "")))
         (when (not (or (not decl) (string= "" decl)))
           (format "%s\n"
                   (format decl
                           (or (and org-html-coding-system
                                    (fboundp 'coding-system-get)
                                    (coding-system-get org-html-coding-system
                                    ↪  'mime-charset))
                               "iso-8859-1"))))))
     (org-html-doctype info)
     "\n"
     (concat "<html"
             (cond ((org-html-xhtml-p info)
                    (format
                     " xmlns=\"http://www.w3.org/1999/xhtml\" lang=\"%s\"
                     ↪  xml:lang=\"%s\""
                     (plist-get info :language) (plist-get info :language)))
                   ((org-html-html5-p info)
                    (format " lang=\"%s\"" (plist-get info :language))))
             ">\n")
     "<head>\n"
     (org-html--build-meta-info info)
```

```
    (org-html--build-head info)
    (org-html--build-mathjax-config info)
    "</head>\n"
    "<body>\n<input type='checkbox' id='theme-switch'><div id='page'><label
    ↪  id='switch-label' for='theme-switch'></label>"
    (let ((link-up (org-trim (plist-get info :html-link-up)))
          (link-home (org-trim (plist-get info :html-link-home))))
      (unless (and (string= link-up "") (string= link-home ""))
        (format (plist-get info :html-home/up-format)
                (or link-up link-home)
                (or link-home link-up))))
    ;; Preamble.
    (org-html--build-pre/postamble 'preamble info)
    ;; Document contents.
    (let ((div (assq 'content (plist-get info :html-divs))))
      (format "<%s id=\"%s\">\n" (nth 1 div) (nth 2 div)))
    ;; Document title.
    (when (plist-get info :with-title)
      (let ((title (and (plist-get info :with-title)
                        (plist-get info :title)))
            (subtitle (plist-get info :subtitle))
            (html5-fancy (org-html--html5-fancy-p info)))
        (when title
          (format
           (if html5-fancy
               "<header class=\"page-header\">%s\n<h1
               ↪  class=\"title\">%s</h1>\n%s</header>"
             "<h1 class=\"title\">%s%s</h1>\n")
           (if (or (plist-get info :with-date)
                   (plist-get info :with-author))
               (concat "<div class=\"page-meta\">"
                       (when (plist-get info :with-date)
                         (org-export-data (plist-get info :date) info))
                       (when (and (plist-get info :with-date) (plist-get info
                       ↪  :with-author)) ", ")
                       (when (plist-get info :with-author)
                         (org-export-data (plist-get info :author) info))
                       "</div>\n")
             "")
           (org-export-data title info)
           (if subtitle
               (format
                (if html5-fancy
                    "<p class=\"subtitle\" role=\"doc-subtitle\">%s</p>\n"
                  (concat "\n" (org-html-close-tag "br" nil info) "\n"
                          "<span class=\"subtitle\">%s</span>\n"))
                (org-export-data subtitle info))
             "")))))
```

```
    contents
    (format "</%s>\n" (nth 1 (assq 'content (plist-get info :html-divs))))
    ;; Postamble.
    (org-html--build-pre/postamble 'postamble info)
    ;; Possibly use the Klipse library live code blocks.
    (when (plist-get info :html-klipsify-src)
      (concat "<script>" (plist-get info :html-klipse-selection-script)
              "</script><script src=\""
              org-html-klipse-js
              "\"></script><link rel=\"stylesheet\" type=\"text/css\" href=\""
              org-html-klipse-css "\"/>"))
    ;; Closing document.
    "</div>\n</body>\n</html>")))
```

I think it would be nice if "Table of Contents" brought you back to the top of the page. Well, since we've done this much advising already...

```
(defadvice! org-html-toc-linked (depth info &optional scope)
  "Build a table of contents.

Just like `org-html-toc', except the header is a link to \"#\".

DEPTH is an integer specifying the depth of the table.  INFO is
a plist used as a communication channel.  Optional argument SCOPE
is an element defining the scope of the table.  Return the table
of contents as a string, or nil if it is empty."
  :override #'org-html-toc
  (let ((toc-entries
         (mapcar (lambda (headline)
                   (cons (org-html--format-toc-headline headline info)
                         (org-export-get-relative-level headline info)))
                 (org-export-collect-headlines info depth scope))))
    (when toc-entries
      (let ((toc (concat "<div id=\"text-table-of-contents\">"
                         (org-html--toc-text toc-entries)
                         "</div>\n")))
        (if scope toc
          (let ((outer-tag (if (org-html--html5-fancy-p info)
                               "nav"
                             "div")))
            (concat (format "<%s id=\"table-of-contents\">\n" outer-tag)
                    (let ((top-level (plist-get info :html-toplevel-hlevel)))
                      (format "<h%d><a href=\"#\" style=\"color:inherit;
                      ↪  text-decoration: none;\">%s</a></h%d>\n"
                              top-level
                              (org-html--translate "Table of Contents" info)
                              top-level))
                    toc
```

```
                    (format "</%s>\n" outer-tag))))))))
```

Lastly, let's pile on some metadata. This gives my pages nice embeds.

```
(defvar org-html-meta-tags-opengraph-image
  '(:image "https://tecosaur.com/resources/org/nib.png"
    :type "image/png"
    :width "200"
    :height "200"
    :alt "Green fountain pen nib")
  "Plist of og:image:PROP properties and their value, for use in
  ↪ `org-html-meta-tags-fancy'.")

(defun org-html-meta-tags-fancy (info)
  "Use the INFO plist to construct the meta tags, as described in
  ↪ `org-html-meta-tags'."
  (let* ((title (org-html-plain-text
                 (org-element-interpret-data (plist-get info :title)) info))
         (author (and (plist-get info :with-author)
                      (let ((auth (plist-get info :author)))
                        ;; Return raw Org syntax.
                        (and auth (org-html-plain-text
                                   (org-element-interpret-data auth) info)))))
         (author-first-last
          (and (not (org-string-nw-p author))
               (save-match-data
                 (if (string-match "\\`\\(.+?\\) +\\(.+?\\)\\'" author)
                     (cons (match-string 1 author)
                           (match-string 2 author))
                   (cons author nil))))))
    (append
     (list
      (when (org-string-nw-p author)
        (list "name" "author" author))
      (when (org-string-nw-p (plist-get info :description))
        (list "name" "description"
              (plist-get info :description)))
      '("name" "generator" "org mode")
      '("name" "theme-color" "#77aa99")
      '("property" "og:type" "article")
      (list "property" "og:title" title)
      (let ((subtitle (org-export-data (plist-get info :subtitle) info)))
        (when (org-string-nw-p subtitle)
          (list "property" "og:description" subtitle))))
     (when org-html-meta-tags-opengraph-image
       (list (list "property" "og:image" (plist-get
       ↪  org-html-meta-tags-opengraph-image :image))
```

```
            (list "property" "og:image:type" (plist-get
            ↪  org-html-meta-tags-opengraph-image :type))
            (list "property" "og:image:width" (plist-get
            ↪  org-html-meta-tags-opengraph-image :width))
            (list "property" "og:image:height" (plist-get
            ↪  org-html-meta-tags-opengraph-image :height))
            (list "property" "og:image:alt" (plist-get
            ↪  org-html-meta-tags-opengraph-image :alt))))
    (list
     (when (car author-first-last)
       (list "property" "og:article:author:first_name" (car
       ↪  author-first-last)))
     (when (cdr author-first-last)
       (list "property" "og:article:author:last_name" (cdr author-first-last)))
     (list "property" "og:article:published_time"
           (format-time-string
            "%FT%T%z"
            (or
             (when-let ((date-str (cadar (org-collect-keywords '("DATE")))))
               (unless (string= date-str (format-time-string "%F"))
                 (ignore-errors (encode-time (org-parse-time-string
                 ↪  date-str)))))
             (if buffer-file-name
                 (file-attribute-modification-time (file-attributes
                 ↪  buffer-file-name))
               (current-time)))))
     (when buffer-file-name
       (list "property" "og:article:modified_time"
             (format-time-string "%FT%T%z" (file-attribute-modification-time
             ↪  (file-attributes buffer-file-name)))))))))

(unless (functionp #'org-html-meta-tags-default)
  (defalias 'org-html-meta-tags-default #'ignore))
(setq org-html-meta-tags #'org-html-meta-tags-fancy)
```

2. Custom CSS/JS

   The default org HTML export is … alright, but we can really jazz it up. lepisma.xyz has a really nice style, and from and org export too! Suffice to say I've snatched it, with a few of my own tweaks applied.

```
<link rel="icon" href="https://tecosaur.com/resources/org/nib.ico"
↪  type="image/ico" />

<link rel="preload" as="font" crossorigin="anonymous" type="font/woff2"
↪  href="https://tecosaur.com/resources/org/etbookot-roman-webfont.woff2">
<link rel="preload" as="font" crossorigin="anonymous" type="font/woff2"
↪  href="https://tecosaur.com/resources/org/etbookot-italic-webfont.woff2">
```

```
<link rel="preload" as="font" crossorigin="anonymous" type="font/woff2"
↪  href="https://tecosaur.com/resources/org/Merriweather-TextRegular.woff2">
<link rel="preload" as="font" crossorigin="anonymous" type="font/woff2"
↪  href="https://tecosaur.com/resources/org/Merriweather-TextItalic.woff2">
<link rel="preload" as="font" crossorigin="anonymous" type="font/woff2"
↪  href="https://tecosaur.com/resources/org/Merriweather-TextBold.woff2">
```

```
(setq org-html-style-plain org-html-style-default
      org-html-htmlize-output-type 'css
      org-html-doctype "html5"
      org-html-html5-fancy t)

(defun org-html-reload-fancy-style ()
  (interactive)
  (setq org-html-style-fancy
        (with-temp-buffer
          (insert-file-contents (expand-file-name "misc/org-export-header.html"
          ↪  doom-user-dir))
          (goto-char (point-max))
          (insert "<script>\n")
          (insert-file-contents (expand-file-name "misc/org-css/main.js"
          ↪  doom-user-dir))
          (goto-char (point-max))
          (insert "</script>\n<style>\n")
          (insert-file-contents (expand-file-name "misc/org-css/main.min.css"
          ↪  doom-user-dir))
          (goto-char (point-max))
          (insert "</style>")
          (buffer-string)))
  (when org-fancy-html-export-mode
    (setq org-html-style-default org-html-style-fancy)))
(org-html-reload-fancy-style)
```

3. Collapsable src and example blocks

   By wrapping the `<pre>` element in a `<details>` block, we can obtain collapsable blocks with no CSS, though we will toss a little in anyway to have this looking somewhat spiffy.

   Since this collapsability seems useful to have on by default for certain chunks of code, it would be nice if you could set it with `#+attr_html: :collapsed t`.

   It would be nice to also have a corresponding global / session-local way of setting this, but I haven't quite been able to get that working (yet).

```
(defvar org-html-export-collapsed nil)
(eval '(cl-pushnew '(:collapsed "COLLAPSED" "collapsed"
↪  org-html-export-collapsed t)
                   (org-export-backend-options (org-export-get-backend 'html))))
(add-to-list 'org-default-properties "EXPORT_COLLAPSED")
```

We can take our src block modification a step further, and add a gutter on the side of the src block containing both an anchor referencing the current block, and a button to copy the content of the block.

```
(defadvice! org-html-src-block-collapsable (orig-fn src-block contents info)
  "Wrap the usual <pre> block in a <details>"
  :around #'org-html-src-block
  (if (or (not org-fancy-html-export-mode) (bound-and-true-p
  ↪  org-msg-export-in-progress))
      (funcall orig-fn src-block contents info)
    (let* ((properties (cadr src-block))
           (lang (mode-name-to-lang-name
                  (plist-get properties :language)))
           (name (plist-get properties :name))
           (ref (org-export-get-reference src-block info))
           (collapsed-p (member (or (org-export-read-attribute :attr_html
           ↪  src-block :collapsed)
                                    (plist-get info :collapsed))
                                '("y" "yes" "t" t "true" "all"))))
      (format
       "<details id='%s' class='code'%s><summary%s>%s</summary>
<div class='gutter'>
<a href='#%s'>#</a>
<button title='Copy to clipboard' onclick='copyPreToClipbord(this)'></button>\
</div>
%s
</details>"
       ref
       (if collapsed-p "" " open")
       (if name " class='named'" "")
       (concat
        (when name (concat "<span class=\"name\">" name "</span>"))
        "<span class=\"lang\">" lang "</span>")
       ref
       (if name
           (replace-regexp-in-string (format "<pre\\( class=\"[^\"]+\"\\)?
           ↪  id=\"%s\">" ref) "<pre\\1>"
                                     (funcall orig-fn src-block contents info))
         (funcall orig-fn src-block contents info))))))

(defun mode-name-to-lang-name (mode)
  (or (cadr (assoc mode
                   '(("asymptote" "Asymptote")
                     ("awk" "Awk")
                     ("C" "C")
                     ("clojure" "Clojure")
                     ("css" "CSS")
                     ("D" "D")
```

```
                    ("ditaa" "ditaa")
                    ("dot" "Graphviz")
                    ("calc" "Emacs Calc")
                    ("emacs-lisp" "Emacs Lisp")
                    ("fortran" "Fortran")
                    ("gnuplot" "gnuplot")
                    ("haskell" "Haskell")
                    ("hledger" "hledger")
                    ("java" "Java")
                    ("js" "Javascript")
                    ("latex" "LaTeX")
                    ("ledger" "Ledger")
                    ("lisp" "Lisp")
                    ("lilypond" "Lilypond")
                    ("lua" "Lua")
                    ("matlab" "MATLAB")
                    ("mscgen" "Mscgen")
                    ("ocaml" "Objective Caml")
                    ("octave" "Octave")
                    ("org" "Org mode")
                    ("oz" "OZ")
                    ("plantuml" "Plantuml")
                    ("processing" "Processing.js")
                    ("python" "Python")
                    ("R" "R")
                    ("ruby" "Ruby")
                    ("sass" "Sass")
                    ("scheme" "Scheme")
                    ("screen" "Gnu Screen")
                    ("sed" "Sed")
                    ("sh" "shell")
                    ("sql" "SQL")
                    ("sqlite" "SQLite")
                    ("forth" "Forth")
                    ("io" "IO")
                    ("J" "J")
                    ("makefile" "Makefile")
                    ("maxima" "Maxima")
                    ("perl" "Perl")
                    ("picolisp" "Pico Lisp")
                    ("scala" "Scala")
                    ("shell" "Shell Script")
                    ("ebnf2ps" "ebfn2ps")
                    ("cpp" "C++")
                    ("abc" "ABC")
                    ("coq" "Coq")
                    ("groovy" "Groovy")
                    ("bash" "bash")
```

```
                    ("csh" "csh")
                    ("ash" "ash")
                    ("dash" "dash")
                    ("ksh" "ksh")
                    ("mksh" "mksh")
                    ("posh" "posh")
                    ("ada" "Ada")
                    ("asm" "Assembler")
                    ("caml" "Caml")
                    ("delphi" "Delphi")
                    ("html" "HTML")
                    ("idl" "IDL")
                    ("mercury" "Mercury")
                    ("metapost" "MetaPost")
                    ("modula-2" "Modula-2")
                    ("pascal" "Pascal")
                    ("ps" "PostScript")
                    ("prolog" "Prolog")
                    ("simula" "Simula")
                    ("tcl" "tcl")
                    ("tex" "LaTeX")
                    ("plain-tex" "TeX")
                    ("verilog" "Verilog")
                    ("vhdl" "VHDL")
                    ("xml" "XML")
                    ("nxml" "XML")
                    ("conf" "Configuration File"))))
      mode))
```

```
(defun org-html-block-collapsable (orig-fn block contents info)
  "Wrap the usual block in a <details>"
  (if (or (not org-fancy-html-export-mode) (bound-and-true-p
  ↪  org-msg-export-in-progress))
      (funcall orig-fn block contents info)
    (let ((ref (org-export-get-reference block info))
          (type (pcase (car block)
                  ('property-drawer "Properties")))
          (collapsed-default (pcase (car block)
                               ('property-drawer t)
                               (_ nil)))
          (collapsed-value (org-export-read-attribute :attr_html block
          ↪  :collapsed))
          (collapsed-p (or (member (org-export-read-attribute :attr_html block
          ↪  :collapsed)
                                   '("y" "yes" "t" t "true"))
                           (member (plist-get info :collapsed) '("all")))))
      (format
       "<details id='%s' class='code'%s>
```

```
<summary%s>%s</summary>
<div class='gutter'>\
<a href='#%s'>#</a>
<button title='Copy to clipboard' onclick='copyPreToClipbord(this)'></button>\
</div>
%s\n
</details>"
       ref
       (if (or collapsed-p collapsed-default) "" " open")
       (if type " class='named'" "")
       (if type (format "<span class='type'>%s</span>" type) "")
       ref
       (funcall orig-fn block contents info)))))

(advice-add 'org-html-example-block   :around #'org-html-block-collapsable)
(advice-add 'org-html-fixed-width     :around #'org-html-block-collapsable)
(advice-add 'org-html-property-drawer :around #'org-html-block-collapsable)
```

4. Include extra font-locking in htmlize

   Org uses htmlize.el to export buffers with syntax highlighting.

   The works fantastically, for the most part. Minor modes that provide font-locking are *not* loaded, and so do not impact the result.

   By enabling these modes in `htmlize-before-hook` we can correct this behaviour.

```
(autoload #'highlight-numbers--turn-on "highlight-numbers")
(add-hook 'htmlize-before-hook #'highlight-numbers--turn-on)
```

5. Handle table overflow

   In order to accommodate wide tables —particularly on mobile devices— we want to set a maximum width and scroll overflow. Unfortunately, this cannot be applied directly to the `table` element, so we have to wrap it in a `div`.

   While we're at it, we can a link gutter, as we did with src blocks, and show the `#+name`, if one is given.

```
(defadvice! org-html-table-wrapped (orig-fn table contents info)
  "Wrap the usual <table> in a <div>"
  :around #'org-html-table
  (if (or (not org-fancy-html-export-mode) (bound-and-true-p
  ↪  org-msg-export-in-progress))
      (funcall orig-fn table contents info)
    (let* ((name (plist-get (cadr table) :name))
           (ref (org-export-get-reference table info)))
      (format "<div id='%s' class='table'>
<div class='gutter'><a href='#%s'>#</a></div>
```

```
<div class='tabular'>
%s
</div>\
</div>"
              ref ref
              (if name
                  (replace-regexp-in-string (format "<table id=\"%s\"" ref)
                  ↪  "<table"
                                            (funcall orig-fn table contents
                                            ↪  info))
                (funcall orig-fn table contents info))))))
```

6. TOC as a collapsable tree

   The TOC is much nicer to navigate as a collapsable tree. Unfortunately we cannot achieve this with CSS alone. Thankfully we can avoid JS though, by adapting the TOC generation code to use a `label` for each item, and a hidden `checkbox` to keep track of state.

   To add this, we need to change one line in org-html--format-toc-headline.

   Since we can actually accomplish the desired effect by adding advice *around* the function, without overriding it — let's do that to reduce the bug surface of this config a tad.

```
(defadvice! org-html--format-toc-headline-colapseable (orig-fn headline info)
  "Add a label and checkbox to `org-html--format-toc-headline's usual output,
to allow the TOC to be a collapseable tree."
  :around #'org-html--format-toc-headline
  (if (or (not org-fancy-html-export-mode) (bound-and-true-p
  ↪  org-msg-export-in-progress))
      (funcall orig-fn headline info)
    (let ((id (or (org-element-property :CUSTOM_ID headline)
                  (org-export-get-reference headline info))))
      (format "<input type='checkbox' id='toc--%s'/><label
      ↪  for='toc--%s'>%s</label>"
              id id (funcall orig-fn headline info)))))
```

   Now, leaves (headings with no children) shouldn't have the `label` item. The obvious way to achieve this is by including some *if no children...* logic in `org-html--format-toc-headline-colapseable`. Unfortunately, I can't my elisp isn't up to par to extract the number of child headings from the mountain of info that org provides.

```
(defadvice! org-html--toc-text-stripped-leaves (orig-fn toc-entries)
  "Remove label"
  :around #'org-html--toc-text
  (if (or (not org-fancy-html-export-mode) (bound-and-true-p
  ↪  org-msg-export-in-progress))
      (funcall orig-fn toc-entries)
```

```
    (replace-regexp-in-string "<input [^>]+><label [^>]+>\\(.+?\\)</label></li>"
    ↪  "\\1</li>"
                              (funcall orig-fn toc-entries))))
```

7. Make verbatim different to code

   Since we have `verbatim` and `code`, let's make use of the difference.

   We can use `code` exclusively for code snippets and commands like: "calling `(message "Hello")` in batch-mode Emacs prints to stdout like `echo`". Then we can use `verbatim` for miscellaneous 'other monospace' like keyboard shortcuts: "either `C-c C-c` or `C-g` is likely the most useful keybinding in Emacs", or file names: "I keep my configuration in `~/.config/doom/`", among other things.

   Then, styling these two cases differently can help improve clarity in a document.

```
(setq org-html-text-markup-alist
      '((bold . "<b>%s</b>")
        (code . "<code>%s</code>")
        (italic . "<i>%s</i>")
        (strike-through . "<del>%s</del>")
        (underline . "<span class=\"underline\">%s</span>")
        (verbatim . "<kbd>%s</kbd>")))
```

8. Change checkbox type

   We also want to use HTML checkboxes, however we want to get a bit fancier than default

```
(appendq! org-html-checkbox-types
          '((html-span
             (on . "<span class='checkbox'></span>")
             (off . "<span class='checkbox'></span>")
             (trans . "<span class='checkbox'></span>"))))
(setq org-html-checkbox-type 'html-span)
```

   I'm yet to do this

   ⊟ Work in progress

   ☑ This is done

9. Extra special strings

   The `org-html-special-string-regexps` variable defines substitutions for:

   - `\-`, a shy hyphen
   - `---`, an em dash
   - `--`, an en dash
   - `...`, (horizontal) ellipses

However I think it would be nice if there was also a substitution for left/right arrows (`->` and `<-`). This is a `defconst`, but as you may tell from the amount of advice in this config, I'm not above messing with things I'm not 'supposed' to.

The only minor complication is that < and > are converted to `<` and `>` before this stage of output processing.

```
(pushnew! org-html-special-string-regexps
          '("-&gt;" . "&#8594;")
          '("&lt;-" . "&#8592;"))
```

10. Header anchors

    I want to add GitHub-style links on hover for headings.

```
(defun org-export-html-headline-anchor (text backend info)
  (when (and (org-export-derived-backend-p backend 'html)
             (not (org-export-derived-backend-p backend 're-reveal))
             org-fancy-html-export-mode)
    (unless (bound-and-true-p org-msg-export-in-progress)
      (replace-regexp-in-string
       "<h\\([0-9]\\) id=\"\\([a-z0-9-]+\\)\">\\(.*[^ ]\\)<\\/h[0-9]>" ; this is
       ↪ quite restrictive, but due to `org-reference-contraction' I can do
       ↪ this
       "<h\\1 id=\"\\2\">\\3<a aria-hidden=\"true\" href=\"#\\2\">#</a> </h\\1>"
       text))))

(add-to-list 'org-export-filter-headline-functions
             'org-export-html-headline-anchor)
```

11. Link previews

    Sometimes it's nice to make a link particularly prominent, an embed/preview like Twitter does would be nice I think.

    We can do this without too much trouble by adding a new link type ever so slightly different from `https` — `Https`.

```
(org-link-set-parameters "Https"
                         :follow (lambda (url arg) (browse-url (concat "https:"
                         ↪ url) arg))
                         :export #'org-url-fancy-export)
```

    Then, if we can fetch a plist of the form `(:title "..." :description "..." :image "...")` for such links via a function `org-url-unfurl-metadata`, we can make a fancy export.

```
(defun org-url-fancy-export (url _desc backend)
  (let ((metadata (org-url-unfurl-metadata (concat "https:" url))))
    (cond
     ((org-export-derived-backend-p backend 'html)
      (concat
       "<div class=\"link-preview\">"
       (format "<a href=\"%s\">" (concat "https:" url))
       (when (plist-get metadata :image)
         (format "<img src=\"%s\"/>" (plist-get metadata :image)))
       "<small>"
       (replace-regexp-in-string "//\\(?:www\\.\\)?\\([^/]+\\)/?.*" "\\1" url)
       "</small><p>"
       (when (plist-get metadata :title)
         (concat "<b>" (org-html-encode-plain-text (plist-get metadata :title))
         ↪  "</b></br>"))
       (when (plist-get metadata :description)
         (org-html-encode-plain-text (plist-get metadata :description)))
       "</p></a></div>"))
     (t url))))
```

Now we just need to actually implement that metadata extraction function.

```
(setq org-url-unfurl-metadata--cache nil)
(defun org-url-unfurl-metadata (url)
  (cdr (or (assoc url org-url-unfurl-metadata--cache)
           (car (push
                 (cons
                  url
                  (let* ((head-data
                          (cl-remove-if-not
                           #'listp
                           (cdaddr
                            (with-current-buffer
                                (progn (message "Fetching metadata from %s" url)
                                       (if (executable-find "curl")
                                           (with-current-buffer
                                           ↪  (generate-new-buffer " *curl*")
                                             (call-process "curl" nil t nil
                                             ↪  "--max-time" "5" "-sSL" url)
                                             (current-buffer))
                                         (url-retrieve-synchronously url t t
                                         ↪  5)))
                              (goto-char (point-min))
                              (delete-region (point-min) (- (search-forward
                              ↪  "<head") 6))
                              (delete-region (search-forward "</head>")
                              ↪  (point-max))
                              (goto-char (point-min))
```

```
                        (while (re-search-forward
                        ↪  "<script[^\u2800]+?</script>" nil t)
                          (replace-match ""))
                        (goto-char (point-min))
                        (while (re-search-forward
                        ↪  "<style[^\u2800]+?</style>" nil t)
                          (replace-match ""))
                        (libxml-parse-html-region (point-min)
                        ↪  (point-max))))))
                  (meta (delq nil
                              (mapcar
                               (lambda (tag)
                                 (when (eq 'meta (car tag))
                                   (cons (or (cdr (assoc 'name (cadr
                                   ↪  tag)))
                                             (cdr (assoc 'property (cadr
                                             ↪  tag))))
                                         (cdr (assoc 'content (cadr
                                         ↪  tag))))))
                               head-data))))
             (let ((title (or (cdr (assoc "og:title" meta))
                              (cdr (assoc "twitter:title" meta))
                              (nth 2 (assq 'title head-data))))
                   (description (or (cdr (assoc "og:description" meta))
                                    (cdr (assoc "twitter:description"
                                    ↪  meta))
                                    (cdr (assoc "description" meta))))
                   (image (or (cdr (assoc "og:image" meta))
                              (cdr (assoc "twitter:image" meta)))))
               (when image
                 (setq image (replace-regexp-in-string
                              "^/" (concat "https://"
                              ↪  (replace-regexp-in-string
                              ↪  "//\\([^/]+\\)/?.*" "\\1" url) "/")
                              (replace-regexp-in-string
                               "^//" "https://"
                               image))))
               (list :title title :description description :image
               ↪  image))))
           org-url-unfurl-metadata--cache)))))
```

12. LaTeX Rendering

    a) Pre-rendered

    I consider `dvisvgm` to be a rather compelling option. However this isn't scaled very well at the moment.

    ```
    ;; (setq-default org-html-with-latex `dvisvgm)
    ```

b) MathJax

I want to use svg MathJax by default, and with a few of the custom commands that are part of my LaTeX preamble.

```
(setcdr (assoc 'path org-html-mathjax-options)
        (list "https://cdn.jsdelivr.net/npm/mathjax@3/es5/tex-svg.js"))

(setq org-html-mathjax-template
  "<script>
  window.MathJax = {
    loader: {
      load: ['[tex]/mathtools'],
    },
    tex: {
      ams: {
        multlineWidth: '%MULTLINEWIDTH'
      },
      tags: '%TAGS',
      tagSide: '%TAGSIDE',
      tagIndent: '%TAGINDENT',
      packages: {'[+]': ['mathtools']},
      macros: {
        RR: ['\\\\ifstrempty{#1}{\\\\mathbb{R}}{\\\\mathbb{R}^{#1}}', 1,
        ↪  ''],
        NN: ['\\\\ifstrempty{#1}{\\\\mathbb{N}}{\\\\mathbb{N}^{#1}}', 1,
        ↪  ''],
        ZZ: ['\\\\ifstrempty{#1}{\\\\mathbb{Z}}{\\\\mathbb{Z}^{#1}}', 1,
        ↪  ''],
        QQ: ['\\\\ifstrempty{#1}{\\\\mathbb{Q}}{\\\\mathbb{Q}^{#1}}', 1,
        ↪  ''],
        CC: ['\\\\ifstrempty{#1}{\\\\mathbb{C}}{\\\\mathbb{C}^{#1}}', 1,
        ↪  ''],
        EE: '\\\\mathbb{E}',
        Lap: '\\\\operatorname{\\\\mathcal{L}}',
        Var: '\\\\operatorname{Var}',
        Cor: '\\\\operatorname{Cor}',
        E: '\\\\operatorname{E}',
      },
      mathtools: {
        pairedDelimiters: {
          abs: ['\\\\lvert', '\\\\rvert'],
          norm: ['\\\\lVert', '\\\\rVert'],
          ceil: ['\\\\lceil', '\\\\rceil'],
          floor: ['\\\\lfloor', '\\\\rfloor'],
          round: ['\\\\lfloor', '\\\\rceil'],
        }
      }
```

```
    },
    chtml: {
      scale: %SCALE,
      displayAlign: '%ALIGN',
      displayIndent: '%INDENT'
    },
    svg: {
      scale: %SCALE,
      displayAlign: '%ALIGN',
      displayIndent: '%INDENT'
    },
    output: {
      font: '%FONT',
      displayOverflow: '%OVERFLOW'
    }
  };
</script>

<script
  id=\"MathJax-script\"
  async
  src=\"%PATH\">
</script>")
```

5.3.7 LaTeX Export

1. Compiling

   By default Org uses `pdflatex` × 3 + `bibtex`. This simply won't do in our modern world. `latexmk` + `biber` (which is used automatically with `latexmk`) is a simply superior combination.

   ```
   ;; org-latex-compilers = ("pdflatex" "xelatex" "lualatex"), which are the
   ↪  possible values for %latex
   (setq org-latex-pdf-process '("LC_ALL=en_US.UTF-8 latexmk -f -pdf -%latex
   ↪  -shell-escape -interaction=nonstopmode -output-directory=%o %f"))
   ```

   While `org-latex-pdf-process` does support a function, and we could use that instead, this would no longer use the log buffer — it's a bit blind, you give it the file name and expect it to do its thing.

   The default values of `org-latex-compilers` is given in commented form to see how `org-latex-pdf-process` works with them.

   While the `-%latex` above is slightly hacky (`-pdflatex` expects to be given a value) it allows us to leave `org-latex-compilers` unmodified. This is nice in case I open an org file that uses `#+LATEX_COMPILER` for example, it should still work.

2. Nicer checkboxes

   We'll assume that thanks to the clever preamble the various custom `\checkbox...` commands below are defined.

```
(defun +org-export-latex-fancy-item-checkboxes (text backend info)
  (when (org-export-derived-backend-p backend 'latex)
    (replace-regexp-in-string
     "\\\\item\\[{$\\\\\\(\\w+\\)$}\\]"
     (lambda (fullmatch)
       (concat "\\\\item[" (pcase (substring fullmatch 9 -3) ; content of
       ↪  capture group
                             ("square"   "\\\\checkboxUnchecked")
                             ("boxminus" "\\\\checkboxTransitive")
                             ("boxtimes" "\\\\checkboxChecked")
                             (_ (substring fullmatch 9 -3))) "]"))
     text)))

(add-to-list 'org-export-filter-item-functions
             '+org-export-latex-fancy-item-checkboxes)
```

3. Class templates

   I really like the KOMA bundle. It provides a set of mechanisms to tweak document styling which is both easy to use, and quite comprehensive. For example, I rather like section numbers in the margin, which can be accomplished with

```
\renewcommand\sectionformat{\llap{\thesection\autodot\enskip}}
\renewcommand\subsectionformat{\llap{\thesubsection\autodot\enskip}}
\renewcommand\subsubsectionformat{\llap{\thesubsubsection\autodot\enskip}}
```

   It can also be nice to have big `\chapters`.

```
\RedeclareSectionCommand[afterindent=false, beforeskip=0pt, afterskip=0pt,
↪  innerskip=0pt]{chapter}
\setkomafont{chapter}{\normalfont\Huge}
\renewcommand*{\chapterheadstartvskip}{\vspace*{0\baselineskip}}
\renewcommand*{\chapterheadendvskip}{\vspace*{0\baselineskip}}
\renewcommand*{\chapterformat}{%
  \fontsize{60}{30}\selectfont\rlap{\hspace{6pt}\thechapter}}
\renewcommand*\chapterlinesformat[3]{%
  \parbox[b]{\dimexpr\textwidth-0.5em\relax}{%
    \raggedleft{{\large\scshape\bfseries\chapapp}\vspace{-0.5ex}\par\Huge#3}}%
    \hfill\makebox[0pt][l]{#2}}
```

   Now let's just sprinkle some KOMA all over the Org LaTeX classes.

```
(after! ox-latex
  (let* ((article-sections '(("\\section{%s}" . "\\section*{%s}")
                             ("\\subsection{%s}" . "\\subsection*{%s}")
                             ("\\subsubsection{%s}" . "\\subsubsection*{%s}")
                             ("\\paragraph{%s}" . "\\paragraph*{%s}")
                             ("\\subparagraph{%s}" . "\\subparagraph*{%s}")))
         (book-sections (append '(("\\chapter{%s}" . "\\chapter*{%s}"))
                                article-sections))
         (hanging-secnum-preamble <<grab("latex-hanging-secnum")>>)
         (big-chap-preamble <<grab("latex-big-chapter")>>))
    (setcdr (assoc "article" org-latex-classes)
            `(,(concat "\\documentclass{scrartcl}" hanging-secnum-preamble)
              ,@article-sections))
    (add-to-list 'org-latex-classes
                 `("report" ,(concat "\\documentclass{scrartcl}"
                 ↪  hanging-secnum-preamble)
                   ,@article-sections))
    (add-to-list 'org-latex-classes
                 `("book" ,(concat "\\documentclass[twoside=false]{scrbook}"
                                   big-chap-preamble hanging-secnum-preamble)
                   ,@book-sections))
    (add-to-list 'org-latex-classes
                 `("blank" "[NO-DEFAULT-PACKAGES]\n[NO-PACKAGES]\n[EXTRA]"
                   ,@article-sections))
    (add-to-list 'org-latex-classes
                 `("bmc-article"
                 ↪  "\\documentclass[article,code,maths]{bmc}\n[NO-DEFAULT-PACKAGES]\n[NO-PACKAGES]\
                   ,@article-sections))
    (add-to-list 'org-latex-classes
                 `("bmc"
                 ↪  "\\documentclass[code,maths]{bmc}\n[NO-DEFAULT-PACKAGES]\n[NO-PACKAGES]\n[EXTRA]
                   ,@book-sections))))

(setq org-latex-tables-booktabs t
      org-latex-hyperref-template
      <<grab("latex-fancy-hyperref")>>
      org-latex-reference-command "\\cref{%s}")
```

The `hyperref` setup needs to be handled separately however.

```
\providecolor{url}{HTML}{0077bb}
\providecolor{link}{HTML}{882255}
\providecolor{cite}{HTML}{999933}
\hypersetup{
  pdfauthor={%a},
  pdftitle={%t},
  pdfkeywords={%k},
  pdfsubject={%d},
```

```
  pdfcreator={%c},
  pdflang={%L},
  breaklinks=true,
  colorlinks=true,
  linkcolor=link,
  urlcolor=url,
  citecolor=cite
}
\urlstyle{same}
```

4. A cleverer preamble

   a) Use case

   We often want particular snippets of LaTeX in our documents preambles. It's a pain to have to work out / remember them every time.

   We could have every package we could possibly need in every one of `org-latex-classes`, but that's *horribly* inefficient and I don't want to think about maintaining that.

   Instead we can provide some granularity by splitting up the features we want, and then take the experience to a whole new level by implementing a system to automatically detect which features are desired and generating a preamble that provides these features.

   b) Conditional Content

   Let's consider content we want in particular situations.

   Captions could do with a bit of tweaking such that

   - You can easily have multiple captions
   - Links to figures take you to the *top* of the figure (not the bottom)
   - Caption labels could do with being emphasised slightly more
   - Multiline captions should run ragged-right, but only when then span more than one line

```
\usepackage{subcaption}
\usepackage[hypcap=true]{caption}
\setkomafont{caption}{\sffamily\small}
\setkomafont{captionlabel}{\upshape\bfseries}
\captionsetup{justification=raggedright,singlelinecheck=true}
\usepackage{capt-of} % required by Org
```

   The default checkboxes look rather ugly, so let's provide some prettier alternatives.

```
\newcommand{\checkboxUnchecked}{$\square$}
```

```
\newcommand{\checkboxTransitive}{\rlap{\raisebox{-0.1ex}{\hspace{0.35ex}\Large\textbf
↪  -}}$\square$}
\newcommand{\checkboxChecked}{\rlap{\raisebox{0.2ex}{\hspace{0.35ex}\scriptsize
↪  \ding{52}}}$\square$}
```

We set up a maths typesetting preamble later on, but it would be nice to save it to a variable here:

```
(defvar org-latex-maths-preamble
  <<grab("latex-maths-conveniences")>>
  "Preamble that sets up a bunch of mathematical conveniences.")
```

It's nice to have "message blocks", things like info/warning/error/success. A LaTeX macro should make them trivial to create.

```
\ExplSyntaxOn
\NewCoffin\SBXBaseline
\NewCoffin\SBXHeader
\NewCoffin\SBXContent
\NewCoffin\SBXSideRule
\newbox\SBXSplitBox
\cs_new_protected:Nn \simplebox_start:nnn {
  % #1 ding, #3 name, #4 label
  \vcoffin_set:Nnn \SBXHeader { \linewidth - 1em } {
  \noindent\textcolor{#2}{#1}~\textcolor{#2}{\textbf{#3}}}
  \vcoffin_set:Nnw \SBXContent { \linewidth - 1.5em }
}
\cs_new_protected:Nn \simplebox_split_content:n {
  % #1 name
  \setbox\SBXSplitBox = \vbox:n { \vbox_unpack_drop:N \SBXContent }
  \dim_set:Nn \l_tmpa_dim { \dim_eval:n { \dim_min:nn { \pagegoal } {
  ↪  \textheight } - \pagetotal - 2\baselineskip } }
  \setbox0 = \vsplit\SBXSplitBox to \l_tmpa_dim
  \vcoffin_set:Nnn \SBXContent { \CoffinWidth \SBXContent } { \box0 %
    \vspace{-1.7\baselineskip}
    \noindent\textcolor{#1}{\textbf{\ldots }}
    \vspace*{-0.3\baselineskip}}
}
\cs_new_protected:Nn \simplebox_split_refill:nnnn {
  % #1 ding, #2 ding offset, #3 name, #4 label
  \simplebox_start:nnn {#1} {#3} {#4,\space{}\emph{\textit{continued}}}
  \vspace*{-0.2\baselineskip}
  \vbox_unpack_drop:N \SBXSplitBox
  \vcoffin_set_end:
}
\cs_new_protected:Nn \simplebox_typeset:nn {
    % #1 name, #2 ding offset
    \vcoffin_set:Nnn \SBXBaseline {0pt} {\vbox{}}
```

```
    \SetHorizontalCoffin\SBXSideRule{\color{#1}\rule{1pt}{\dim_eval:n {
    ↪  \CoffinTotalHeight\SBXContent + \baselineskip }}}
    \JoinCoffins*\SBXContent[l,t]\SBXSideRule[l,t](\dim_eval:n {#2 - 1em},
    ↪  \dim_eval:n{\baselineskip - 0.5em})
    \JoinCoffins*\SBXContent[l,t]\SBXHeader[l,B](-1em, 0.5\baselineskip)
    \JoinCoffins*\SBXBaseline[l,T]\SBXContent[l,T]
    \vspace{-0.5\baselineskip}
    \noindent\TypesetCoffin\SBXBaseline(\dim_eval:n { 1em - #2 + 1pt },
    ↪  0pt)
    \vspace*{\CoffinTotalHeight\SBXContent}
    \vspace{-0.08em} % Why on earth is this needed for baseline alignment!?
}
\cs_new_protected:Nn \simplebox_typeset_breakable:nnnn {
    % #1 ding, #2 ding offset, #3 name, #4 label
    \dim_set:Nn \l_tmpa_dim {\dim_eval:n { \CoffinTotalHeight\SBXContent +
    ↪  \baselineskip }}
    \dim_set:Nn \l_tmpb_dim { \dim_eval:n { \dim_min:nn { \pagegoal } {
    ↪  \textheight } - \pagetotal - \baselineskip } }
    \dim_compare:nNnTF {\l_tmpa_dim} > {\l_tmpb_dim} {
      \simplebox_split_content:n {#3}
      \simplebox_typeset:nn {#3} {#2}
      \newpage
      \simplebox_split_refill:nnnn {#1} {#2} {#3} {#4}
      \simplebox_typeset_breakable:nnnn {#1} {#2} {#3} {#4}
    }{
      \simplebox_typeset:nn {#3} {#2}
    }
}
\NewDocumentCommand{\defsimplebox}{O{\ding{117}} O{0.35em} O{#1} O{#2} m m
↪  m}{
  % #1 ding, #2 ding offset, #3 alt-ding, #4 alt-ding offset,
  % #5 name, #6 colour, #7 default label
  \definecolor{#5}{HTML}{#6}
  \NewDocumentEnvironment{#5}{ O{#7} }{
    \simplebox_start:nnn {#1} {#5} {##1}
  }{
    \vcoffin_set_end:
    \simplebox_typeset_breakable:nnnn {#3} {#4} {#5} {##1}
  }
}
\ExplSyntaxOff
```

Lastly, we will pass this content into some global variables we for ease of access.

```
(defvar org-latex-embed-files-preamble
  <<grab("org-latex-embed-files-preamble")>>
  "Preamble that embeds files within the pdf.")
```

```
(defvar org-latex-caption-preamble
  <<grab("org-latex-caption-preamble")>>
  "Preamble that improves captions.")

(defvar org-latex-checkbox-preamble
  <<grab("org-latex-checkbox-preamble")>>
  "Preamble that improves checkboxes.")

(defvar org-latex-box-preamble
  <<grab("org-latex-box-preamble")>>
  "Preamble that provides a macro for custom boxes.")
```

In the "universal preamble", we already embed the source `.org` file, but it would be nice to embed all the tangled files. This is fairly easy to accomplish by mapping each tangled file to a form which embeds the file if it exists. Considering we're going this far, why not add a dedicated `#+emded` keyword, so we can embed whatever we want.

```
(defun org-latex-embed-extra-files ()
  "Return a string that uses embedfile to embed all tangled files."
  (mapconcat
   (lambda (file-desc)
     (format "\\IfFileExists{%1$s}{\\embedfile[desc=%2$s]{%1$s}}{}"
             (thread-last (car file-desc)
                          (replace-regexp-in-string "\\\\" "\\\\\\\\")
                          (replace-regexp-in-string "~" "\\\\string~"))
             (cdr file-desc)))
   (append
    (let (tangle-fspecs) ; All files being tangled to.
      (org-element-cache-map
       (lambda (src)
         (when (and (not (org-in-commented-heading-p nil src))
                    (not (org-in-archived-heading-p nil src)))
           (when-let ((lang (org-element-property :language src))
                      (params
                       (apply
                        #'org-babel-merge-params
                        (append
                         (org-with-point-at (org-element-property :begin
                         ↪  src)
                           (org-babel-params-from-properties lang t))
                         (mapcar
                          (lambda (h)
                            (org-babel-parse-header-arguments h t))
                          (cons (org-element-property :parameters src)
                                (org-element-property :header src))))))
                      (tangle-value
                       (pcase (alist-get :tangle params)
```

```
                        ((and (pred stringp) (pred (string-match-p
                        ↪  "^(.*)$")) expr)
                         (eval (read expr)))
                        (val val)))
                     (tangle-file
                      (pcase tangle-value
                        ((or "no" (guard (member (alist-get :export-embed
                        ↪  params) '("no" "nil"))))
                         nil)
                        ("yes"
                         (file-name-with-extension
                          (file-name-nondirectory (buffer-file-name))
                          (or (alist-get lang org-babel-tangle-lang-exts
                          ↪  nil nil #'equal)
                              lang)))
                        (val val))))
              (unless (assoc tangle-file tangle-fspecs)
                (push
                 (cons tangle-file (format "Tangled %s file" lang))
                 tangle-fspecs)))))
      :granularity 'element
      :restrict-elements '(src-block))
    (nreverse tangle-fspecs))
  (let (extra-files)
    (save-excursion
      (goto-char (point-min))
      (while (re-search-forward "^[ \t]*#\\+embed:" nil t)
        (let* ((file-desc (split-string (org-element-property :value
        ↪  (org-element-at-point)) " :desc\\(?:ription\\)? ")))
          (push (cons (car file-desc) (or (cdr file-desc) "Extra file"))
          ↪  extra-files))))
      (nreverse extra-files)))
  "\n"))
```

Now all tangled files will be embedded, and we can embed arbitrary files like so:

```
#+embed: some-file :description flavour text about the file
```

This currently won't complete or anything like that, as we haven't told Org that it's a keyword yet. It's also LaTeX-specific, so maybe it should be changed to `#+latex_embed` or something like that.

c) Content-feature-preamble association

Initially this idea was implemented with an alist that associated a construct that would search the current Org file for an indication that some feature was needed, with a LaTeX snippet to be inserted in the preamble which would provide that feature. This is all well and good when there is a bijection between detected features and the LaTeX code needed to support those features, but in many cases this relation is not

injective.

To better model the reality of the situation, I add an extra layer to this process where each detected feature gives a list of required "feature flags". Simply be merging the lists of feature flags we no longer have to require injectivity to avoid LaTeX duplication. Then the extra layer forms a bijection between there feature flags and a specification which can be used to implement the feature.

This model also provides a number of nice secondary benefits, such as a simple implementation of feature dependency.

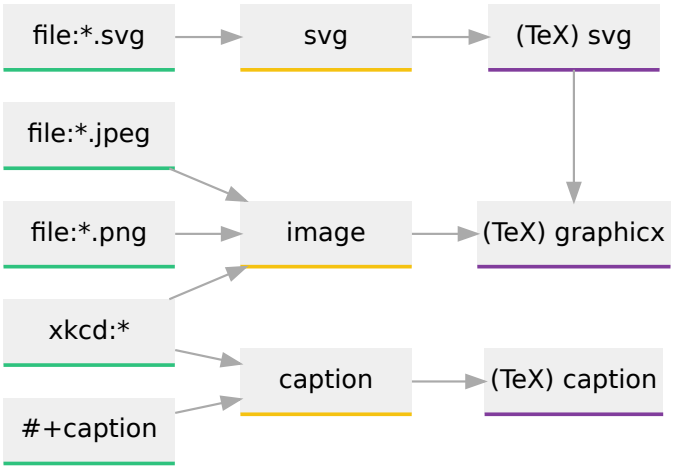


Figure 5.1: Association between Org features, feature flags, and LaTeX snippets required.

First we will implement the feature detection component of this model. I'd like this to be able to use as much state information as possible, so the feature tests should be very versatile.

```
(defvar org-latex-embed-files t
  "Embed the source .org, .tex, and any tangled files.")
(defvar org-latex-use-microtype t
  "Use the microtype pakage.")
(defvar org-latex-italic-quotes t
  "Make \"quote\" environments italic.")
(defvar org-latex-par-sep t
  "Vertically seperate paragraphs, and remove indentation.")

(org-export-update-features 'latex
  ((image caption)
   :condition "\\[\\[xkcd:"))
```

Then we provide a way to generate the preamble that provides those features. In addition to the features named in `org-latex-conditional-features` we'll also create *meta-features*, which can be required by other features (with `:requires`). For

further control I some features may only be used when certain other features are active (with `:when`), and masked by other features (with `:prevents`). I will use the convention of starting meta-features with `.`, to make their nature more readily apparent.

Another consideration in LaTeX is load order, which matters in some cases. Beyond that, it's nice to have some sort of sensible ordering. For this I'll introduce an `:order` keyword. Using this I'll arrange snippets as follows.

- `0` Typography
  - `0` Fonts themselves
  - `0.1` Typographic tweaks (`microtype`)
  - `0.2` Maths setup
  - `0.3` Maths font
  - `0.4` Extra text shaping (`\acr`)
  - `0.5-0.9` Miscellaneous text modifications, trying to put shorter snippets first
- `1` (*default*)
- `2` Tables and figures
- `3` Miscellaneous short content
- `4` Fancy boxes
- `70` setup for non-precompilable content
- `80` non-precompileable content

```
(org-export-update-features 'latex
  (maths
   :snippet org-latex-maths-preamble
   :order 0.2)
  (cleveref
   :condition "cref:\\|\\cref{\\|\\[\\[^\\]+\n?[^\\]\\]\\]"
   :snippet "\\usepackage[capitalize]{cleveref}
% Fix for cleveref in order to work with long range of pages
% See https://tex.stackexchange.com/a/620066
\\makeatletter
\\newcommand*{\\@setcpagerefrange}[3]{%
  \\@@setcpagerefrange{#1}{#2}{cref}{#3}}
\\newcommand*{\\@setCpagerefrange}[3]{%
  \\@@setcpagerefrange{#1}{#2}{Cref}{#3}}
\\newcommand*{\\@setlabelcpagerefrange}[3]{%
  \\@@setcpagerefrange{#1}{#2}{labelcref}{#3}}
\\makeatother"
```

```
   :order 1)
  (caption
   :snippet org-latex-caption-preamble
   :order 2.1)
  (microtype
   :condition org-latex-use-microtype
   :snippet
   ↪  "\\usepackage[activate={true,nocompatibility},final,tracking=true,kerning=true,spacing=tr
   :order 0.1)
  (embed-files
   :condition org-latex-embed-files
   :snippet "\\usepackage[include]{embedall}"
   :order 70)
  (embed-source
   :condition t
   :when embed-files
   :snippet "\\IfFileExists{./\\jobname.org}{\\embedfile[desc=Primary
   ↪  source file]{\\jobname.org}}{}
\\IfFileExists{./\\jobname.tex}{\\embedfile[desc=The (generated) LaTeX
↪  source file]{\\jobname.tex}}{}"
   :no-precompile t
   :after embed-files
   :order 80)
  (embed-tangled
   :condition (and org-latex-embed-files
                   "^[ \t]*#\\+embed\\|^[ \t]*#\\+begin_src\\|^[
                   ↪  \t]*#\\+BEGIN_SRC")
   :requires embed-files
   :snippet (org-latex-embed-extra-files)
   :no-precompile t
   :after (embed-source embed-files)
   :order 80)
  (acronym
   :condition "[;\\\\]?\\b[A-Z][A-Z]+s?[^A-Za-z]"
   :snippet "\\newcommand{\\acr}[1]{\\protect\\textls*[110]{\\scshape
   ↪  #1}}\n\\newcommand{\\acrs}{\\protect\\scalebox{.91}[.84]{\\hspace{0.15ex}s}}"
   :order 0.4)
  (box-drawing
   :condition "[\u2500-\u259F]"
   :snippet "\\usepackage{pmboxdraw}"
   :order 0.05)
  (italic-quotes
   :condition (and org-latex-italic-quotes "^[
   ↪  \t]*#\\+begin_quote\\|\\\\begin{quote}")
   :snippet
   ↪  "\\renewcommand{\\quote}{\\list{}{\\rightmargin\\leftmargin}\\item\\relax\\em}\n"
   :order 0.5)
  (par-sep
```

```
 :condition org-latex-par-sep
 :snippet
 ↪  "\\setlength{\\parskip}{\\baselineskip}\n\\setlength{\\parindent}{0pt}"
 :order 0.5)
(.pifont
 :snippet "\\usepackage{pifont}")
(.xcoffins
 :snippet "\\usepackage{xcoffins}")
(checkbox
 :condition "^[ \t]*\\(?:[-+*]\\|[0-9]+[.)]\\|[A-Za-z]+[.)]\\) \\[[
 ↪  -X]\\]"
 :requires .pifont
 :snippet (concat (unless (memq 'maths features)
                    "\\usepackage{amssymb} % provides \\square")
                  org-latex-checkbox-preamble)
 :after .pifont)
(.fancy-box
 :requires (.pifont .xcoffins)
 :snippet org-latex-box-preamble
 :after (.pifont .xcoffins))
(box-warning
 :condition "^[ \t]*#\\+begin_warning\\|\\\\begin{warning}"
 :requires .fancy-box
 :snippet "\\defsimplebox{warning}{e66100}{Warning}"
 :after .fancy-box)
(box-info
 :condition "^[ \t]*#\\+begin_info\\|\\\\begin{info}"
 :requires .fancy-box
 :snippet "\\defsimplebox{info}{3584e4}{Information}"
 :after .fancy-box)
(box-notes
 :condition "^[ \t]*#\\+begin_notes\\|\\\\begin{notes}"
 :requires .fancy-box
 :snippet "\\defsimplebox{notes}{26a269}{Notes}"
 :after .fancy-box)
(box-success
 :condition "^[ \t]*#\\+begin_success\\|\\\\begin{success}"
 :requires .fancy-box
 :snippet "\\defsimplebox{success}{26a269}{\\vspace{-\\baselineskip}}"
 :after .fancy-box)
(box-error
 :condition "^[ \t]*#\\+begin_error\\|\\\\begin{error}"
 :requires .fancy-box
 :snippet "\\defsimplebox{error}{c01c28}{Important}"
 :after .fancy-box)
(hanging-section-numbers
 :condition
 (let ((latex-class
```

```
          (assoc (plist-get info :latex-class) (plist-get info
          ↪  :latex-classes))))
     (and (cadr latex-class)
          (string-match-p "\\`\\\\documentclass\\(?:\\[.*\\]\\)?{scr" (cadr
          ↪  latex-class))
          (not (string-match-p "[[,]twocolumn[],]" (or (plist-get info
          ↪  :latex-class-options) "")))))
   :snippet
   "\\renewcommand\\sectionformat{\\llap{\\thesection\\autodot\\enskip}}
\\renewcommand\\subsectionformat{\\llap{\\thesubsection\\autodot\\enskip}}
\\renewcommand\\subsubsectionformat{\\llap{\\thesubsubsection\\autodot\\enskip}}")
  (toc-hidelinks
   :condition
   (or (plist-get info :with-toc)
       (save-excursion
         (goto-char (point-min))
         (re-search-forward "\\tableofcontents" nil t)))
   :snippet "%% hide links styles in toc
\\NewCommandCopy{\\oldtoc}{\\tableofcontents}
\\renewcommand{\\tableofcontents}{\\begingroup\\hypersetup{hidelinks}\\oldtoc\\endgroup}"))
```

d) Content-feature graph

```
(with-temp-buffer
  (let ((lambda-count 0)
        (regexp-count 0)
        (string-count 0)
        (nil-count 0)
        cond-names feats impl-names)
    (dolist (cond-feats (org-export-get-all-feature-conditions (intern
    ↪  backend)))
      (dolist (feat (cdr cond-feats))
        (let ((cond-name
               (pcase (car cond-feats)
                 ((and (pred symbolp) f)
                  (symbol-name f))
                 ((and (pred stringp) f)
                  (format "Regexp #%d" (cl-incf regexp-count)))
                 ((and (pred functionp) f)
                  (format " #%d" (cl-incf lambda-count)))
                 (_ "???"))))
          (push cond-name cond-names)
          (push feat feats)
          (insert (format "\"%s\" -> \"%s\"\n" cond-name feat)))))
    (dolist (feat-impl (org-export-get-all-feature-implementations (intern
    ↪  backend)))
      (let ((impl-name
             (pcase (plist-get (cdr feat-impl) :snippet)
```

```
               ((pred not)
                (format "nil #%d" (cl-incf nil-count)))
               ((and (pred symbolp) imp)
                (symbol-name imp))
               ((pred stringp)
                (format "String #%d" (cl-incf string-count)))
               ((pred functionp)
                (format " #%d" (cl-incf lambda-count))))))
        (push impl-name impl-names)
        (push (car feat-impl) feats)
        (insert (format "\"%s\" -> \"%s\"\n" (car feat-impl) impl-name))
        (dolist (req (ensure-list (plist-get (cdr feat-impl) :requires)))
          (insert (format "\"%s\" -> \"%s\" [color=\"#a991f1\"
          ↪  labelfontcolor=\"#a991f1\"]" impl-name req)))
        (dolist (prv (ensure-list (plist-get (cdr feat-impl) :prevents)))
          (insert (format "\"%s\" -> \"%s\" [color=\"#ff665c\"
          ↪  penwidth=\"0.9\" arrowhead=empty]" impl-name prv)))
        (dolist (whn (ensure-list (plist-get (cdr feat-impl) :when)))
          (insert (format "\"%s\" -> \"%s\" [style=\"dashed\"
          ↪  color=\"#4db5bd\" penwidth=\"0.9\" arrowhead=empty
          ↪  labelfontcolor=\"#4db5bd\" taillabel=\"%s\"]" whn impl-name
          ↪  impl-name)))
        (dolist (bfr (ensure-list (plist-get (cdr feat-impl) :before)))
          (insert (format "\"%s\" -> \"%s\" [style=\"dotted\"
          ↪  color=\"#fcce7b\" penwidth=\"1.4\" arrowhead=halfopen]"
          ↪  impl-name bfr)))
        (dolist (afr (ensure-list (plist-get (cdr feat-impl) :after)))
          (insert (format "\"%s\" -> \"%s\" [style=\"dotted\"
          ↪  color=\"#7bc275\" penwidth=\"1.4\" arrowhead=halfopen]" afr
          ↪  impl-name)))))
    (goto-char (point-min))
    (insert (concat "subgraph cluster_0 {\n  peripheries=0\n  \""
                    (string-join (nreverse cond-names) "\"
                    ↪  [color=\"#e69055\"]\n  \"")
                    "\" [color=\"#e69055\"]\n}\n")
            (concat "subgraph cluster_1 {\n  peripheries=0\n  \""
                    (string-join (mapcar #'symbol-name (nreverse
                    ↪  (delete-dups feats))) "\"\n  \"")
                    "\"\n}\n")
            (concat "subgraph cluster_2 {\n  peripheries=0\n  \""
                    (string-join (nreverse impl-names) "\"
                    ↪  [color=\"#4db5bd\"]\n  \"")
                    "\" [color=\"#4db5bd\"]\n}\n"))
    )
  (buffer-string))
```

```
digraph {
    graph [bgcolor="transparent", ranksep="2.5"];
```

```
    node  [shape="underline" penwidth="2" style="rounded,filled"
    ↪  fillcolor="#efefef" color="#c9c9c9" fontcolor="#000000"
    ↪  fontname="Alegreya Sans"];
    edge  [color="#9ca0a4" penwidth="1.2" fontname="Alegreya Sans"]
    rankdir="LR"
    <<generate-cfg("beamer")>>
}
```

e) Adding xcolor as an unconditional package

`xcolor` is just convenient to have.

```
(setq org-latex-packages-alist
      '(("" "xcolor" t)))
```

5. Font collections

Using the lovely conditional preamble, I'll define a number of font collections that can be used for LaTeX exports. Who knows, maybe I'll use it with other export formats too at some point.

To start with I'll create a default state variable and register `fontset` as part of `#+options`.

```
(defvar org-latex-default-fontset 'alegreya
  "Fontset from `org-latex-fontsets' to use by default.
As cm (computer modern) is TeX's default, that causes nothing
to be added to the document.

If \"nil\" no custom fonts will ever be used.")

(eval '(cl-pushnew '(:latex-font-set nil "fontset" org-latex-default-fontset)
                   (org-export-backend-options (org-export-get-backend
                   ↪  'latex))))
```

Then a function is needed to generate a LaTeX snippet which applies the fontset. It would be nice if this could be done for individual styles and use different styles as the main document font. If the individual typefaces for a fontset are defined individually as `:serif`, `:sans`, `:mono`, and `:maths`. I can use those to generate LaTeX for subsets of the full fontset. Then, if I don't let any fontset names have `-` in them, I can use `-sans` and `-mono` as suffixes that specify the document font to use.

```
(defun org-latex-fontset-entry ()
  "Get the fontset spec of the current file.
Has format \"name\" or \"name-style\" where 'name' is one of
the cars in `org-latex-fontsets'."
  (let ((fontset-spec
         (symbol-name
```

```
          (or (car (delq nil
                         (mapcar
                          (lambda (opt-line)
                            (plist-get (org-export--parse-option-keyword
                            ↪  opt-line 'latex)
                                       :latex-font-set))
                          (cdar (org-collect-keywords '("OPTIONS"))))))
              org-latex-default-fontset))))
    (cons (intern (car (split-string fontset-spec "-")))
          (when (cadr (split-string fontset-spec "-"))
            (intern (concat ":" (cadr (split-string fontset-spec "-"))))))))

(defun org-latex-fontset (&rest desired-styles)
  "Generate a LaTeX preamble snippet which applies the current fontset for
  ↪  DESIRED-STYLES."
  (let* ((fontset-spec (org-latex-fontset-entry))
         (fontset (alist-get (car fontset-spec) org-latex-fontsets)))
    (if fontset
        (string-trim
         (concat
          (mapconcat
           (lambda (style)
             (when (plist-get fontset style)
               (concat (plist-get fontset style) "\n")))
           desired-styles
           "")
          (when (memq (cdr fontset-spec) desired-styles)
            (pcase (cdr fontset-spec)
              (:serif "\\renewcommand{\\familydefault}{\\rmdefault}\n")
              (:sans "\\renewcommand{\\familydefault}{\\sfdefault}\n")
              (:mono "\\renewcommand{\\familydefault}{\\ttdefault}\n")))))
      (error "Font-set %s is not provided in org-latex-fontsets" (car
      ↪  fontset-spec)))))
```

Now that all the functionality has been implemented, we should hook it into our preamble generation.

```
(org-export-update-features 'latex
  (custom-font
   :condition org-latex-default-fontset
   :snippet (org-latex-fontset :serif :sans :mono)
   :order 0)
  (custom-maths-font
   :condition t
   :when (custom-font maths)
   :snippet (org-latex-fontset :maths)
   :after (custom-font maths)
   :order 0))
```

Finally, we just need to add some fonts.

```
(defvar org-latex-fontsets
  '((cm nil) ; computer modern
    (## nil) ; no font set
    (alegreya
     :serif "\\usepackage[osf]{Alegreya}"
     :sans "\\usepackage{AlegreyaSans}"
     :mono "\\usepackage[scale=0.88]{sourcecodepro}"
     :maths "\\let\\Bbbk\\relax\n\\usepackage[varbb]{newpxmath}")
    (biolinum
     :serif "\\usepackage[osf]{libertineRoman}"
     :sans "\\usepackage[sfdefault,osf]{biolinum}"
     :mono "\\usepackage[scale=0.88]{sourcecodepro}"
     :maths "\\usepackage[libertine,varvw]{newtxmath}")
    (fira
     :sans "\\usepackage[sfdefault,scale=0.85]{FiraSans}"
     :mono "\\usepackage[scale=0.80]{FiraMono}"
     :maths "\\usepackage{newtxsf} % change to firamath in future?")
    (kp
     :serif "\\usepackage{kpfonts}")
    (newpx
     :serif "\\usepackage{newpxtext}"
     :sans "\\usepackage{gillius}"
     :mono "\\usepackage[scale=0.9]{sourcecodepro}"
     :maths "\\let\\Bbbk\\relax\n\\usepackage[varbb]{newpxmath}")
    (noto
     :serif "\\usepackage[osf]{noto-serif}"
     :sans "\\usepackage[osf]{noto-sans}"
     :mono "\\usepackage[scale=0.96]{noto-mono}"
     :maths "\\usepackage{notomath}")
    (plex
     :serif "\\usepackage{plex-serif}"
     :sans "\\usepackage{plex-sans}"
     :mono "\\usepackage[scale=0.95]{plex-mono}"
     :maths "\\usepackage{newtxmath}") ; may be plex-based in future
    (source
     :serif "\\usepackage[osf,semibold]{sourceserifpro}"
     :sans "\\usepackage[osf,semibold]{sourcesanspro}"
     :mono "\\usepackage[scale=0.92]{sourcecodepro}"
     :maths "\\usepackage{newtxmath}") ; may be sourceserifpro-based in future
    (times
     :serif "\\usepackage{newtxtext}"
     :maths "\\usepackage{newtxmath}"))
  "Alist of fontset specifications.
Each car is the name of the fontset (which cannot include \"-\").

Each cdr is a plist with (optional) keys :serif, :sans, :mono, and :maths.
```

```
A key's value is a LaTeX snippet which loads such a font.")
```

When we're using Alegreya we can apply a lovely little tweak to `tabular` which (locally) changes the figures used to lining fixed-width.

```
(org-export-update-features 'latex
  (alegreya-typeface
   :condition (string= (car (org-latex-fontset-entry)) "alegreya")
   :snippet nil)
  (alegreya-tabular-figures
   :condition t
   :when (alegreya-typeface table)
   :snippet "\
\\makeatletter
% tabular lining figures in tables
\\renewcommand{\\tabular}{\\AlegreyaTLF\\let\\@halignto\\@empty\\@tabular}
\\makeatother"
   :after custom-font
   :order 0.5))
```

Due to Alegreya's metrics, the `\LaTeX` symbol doesn't quite look right. We can correct for this by redefining it with subtlety shifted kerning.

```
(org-export-update-features 'latex
  (alegreya-latex-symbol
    :condition "LaTeX"
    :when alegreya-typeface
    :snippet "\
\\makeatletter
% Kerning around the A needs adjusting
\\DeclareRobustCommand{\\LaTeX}{L\\kern-.24em%
        {\\sbox\\z@ T%
         \\vbox to\\ht\\z@{\\hbox{\\check@mathfonts
                              \\fontsize\\sf@size\\z@
                              \\math@fontsfalse\\selectfont
                              A}%
                         \\vss}%
        }%
        \\kern-.10em%
        \\TeX}
\\makeatother"
    :after alegreya-typeface
    :order 0.5))
```

6. Maths notation conveniences Maths has a way of popping up relentlessly. I think this says something both about me and the subject itself. While the LaTeX set of commands is quite reasonable, we can make a few common bits of notation a tad more convenient.

   a) Packages

First, there are a few useful packages we want to use.

```
%% Maths-related packages
% More maths environments, commands, and symbols.
\usepackage{amsmath, amssymb}
% Slanted fractions with \sfrac{a}{b}, in text and maths.
\usepackage{xfrac}
% Visually cancel expressions with \cancel{value} and
↪  \cancelto{expression}{value}
\usepackage[makeroom]{cancel}
% Improvements on amsmath and utilities for mathematical typesetting
\usepackage{mathtools}
```

b) Custom delimiters

Next up we want to make the various types of rounding-related and absolute value delimitors accessible as commands.

```
% Deliminators
\DeclarePairedDelimiter{\abs}{\lvert}{\rvert}
\DeclarePairedDelimiter{\norm}{\lVert}{\rVert}

\DeclarePairedDelimiter{\ceil}{\lceil}{\rceil}
\DeclarePairedDelimiter{\floor}{\lfloor}{\rfloor}
\DeclarePairedDelimiter{\round}{\lfloor}{\rceil}
```

c) Number sets

Then we have the various common number sets, it would be nice to have a convenient way of typing them and optionally giving them powers. It's fairly easy to support both `\XX` and `\XX[n]`.

```
\newcommand{\RR}[1][]{\ensuremath{\ifstrempty{#1}{\mathbb{R}}{\mathbb{R}^{#1}}}}
↪  % Real numbers
\newcommand{\NN}[1][]{\ensuremath{\ifstrempty{#1}{\mathbb{N}}{\mathbb{N}^{#1}}}}
↪  % Natural numbers
\newcommand{\ZZ}[1][]{\ensuremath{\ifstrempty{#1}{\mathbb{Z}}{\mathbb{Z}^{#1}}}}
↪  % Integer numbers
\newcommand{\QQ}[1][]{\ensuremath{\ifstrempty{#1}{\mathbb{Q}}{\mathbb{Q}^{#1}}}}
↪  % Rational numbers
\newcommand{\CC}[1][]{\ensuremath{\ifstrempty{#1}{\mathbb{C}}{\mathbb{C}^{#1}}}}
↪  % Complex numbers
```

d) Derivatives

Derivatives are actually a bit of a pain to typeset, it would be nice to have a `\dv` command that supports:

- `\dv{x}` for the derivative with respect to `x`

- `\dv{f}{x}` for the derivative of `f` with respect to `x`
- `\dv[2]{f}{x}` for the second order derivative of `f` with respect to `x`

Similarly, it would be nice to have a partial derivate counterpart `\pdv` which behaves in a similar way, but with the possibility of providing multiple comma-delimited variables — e.g. `\pdv{f}{x,y,z}`.

```
% Easy derivatives
\ProvideDocumentCommand\dv{o m g}{%
  \IfNoValueTF{#3}{%
    \dv[#1]{}{#2}}{%
    \IfNoValueTF{#1}{%
      \frac{\dd #2}{\dd #3}%
    }{\frac{\dd[#1] #2}{\dd {#3}^{#1}}}}}
% Easy partial derivatives
\ExplSyntaxOn
\ProvideDocumentCommand\pdv{o m g}{%
  \IfNoValueTF{#3}{\pdv[#1]{}{#2}}%
  {\ifnum\clist_count:n{#3}<2
    \IfValueTF{#1}{\frac{\partial^{#1} #2}{\partial {#3}^{#1}}}%
    {\frac{\partial #2}{\partial #3}}
    \else
    \frac{\IfValueTF{#1}{\partial^{#1}}{\partial^{\clist_count:n{#3}}}#2}%
    {\clist_map_inline:nn{#3}{\partial ##1 \,}\!}
    \fi}}
\ExplSyntaxOff
```

e) Common operators

The default set of operators could benefit from a bit of expansion.

```
% Laplacian
\DeclareMathOperator{\Lap}{\mathcal{L}}

% Statistics
\DeclareMathOperator{\Var}{Var} % varience
\DeclareMathOperator{\Cov}{Cov} % covarience
\newcommand{\EE}{\ensuremath{\mathbb{E}}} % expected value
\DeclareMathOperator{\E}{E} % expected value
```

f) Slanted inequalities

As a matter of personal taste, I prefer the slanted less/greater than or equal to operators, and would like to use them by default.

```
% I prefer the slanted \leq/\geq
\let\barleq\leq % Save them in case they're every wanted
\let\bargeq\geq
```

```
\renewcommand{\leq}{\leqslant}
\renewcommand{\geq}{\geqslant}
```

g) Alignment of matrix columns

By default, everything in a matrix is centred, which I actually find often undesirable. It would be much nicer to take the alignment as an optional argument of the environment, and default to right-alignment.

```
% Redefine the matrix environment to allow for alignment
% via an optional argument, and use r as the default.
\makeatletter
\renewcommand*\env@matrix[1][r]{\hskip -\arraycolsep%
    \let\@ifnextchar\new@ifnextchar
    \array{*\c@MaxMatrixCols #1}}
\makeatother
```

h) Slanted derivative "d"

Determining an appropriate styling for a derivative "d" (e.g. "dx") is surprisingly hard, as the "d" is neither:

- An operator (which are typeset as upright roman)
- A variable (which are typeset as italic roman)

The ISO 80000-2 standard (2009) specifies that it should be upright, however (a) it is still not an operator, (b) not used in any maths book I've seen, and (c) doesn't look very good. I'm not entirely comfortable with the variable styling either though, so perhaps something else is in order?

After trying a few different options, I rather like the idea of using a *slanted roman "d"*. This stylistically works for me, while being just distinct enough from other faces. As long as we are creating a PDF, we can apply a transform that slants a "d".

```
% Slanted roman "d" for derivatives
\ifcsname pdfoutput\endcsname
  \ifnum\pdfoutput>0 % PDF
    \newsavebox\diffdbox{}
    \newcommand{\slantedromand}{{\mathpalette\makesl{d}}}
    \newcommand{\makesl}[2]{%
      \begingroup
      \sbox{\diffdbox}{$\mathsurround=0pt#1\mathrm{#2}$}%
      \pdfsave%
      \pdfsetmatrix{1 0 0.2 1}%
      \rlap{\usebox{\diffdbox}}%
      \pdfrestore%
      \hskip\wd\diffdbox%
      \endgroup}
```

```
  \else % DVI
    \newcommand{\slantedromand}{d} % fallback
  \fi
\else % Also DVI
  \newcommand{\slantedromand}{d} % fallback
\fi
```

Now there's the matter of *placing* the "d", or rather adjusting the space around it. After much fiddling, I've ended up with the following.

```
% Derivative d^n, nicely spaced
\makeatletter
\newcommand{\dd}[1][]{\mathop{}\!%
  \expandafter\ifx\expandafter&\detokenize{#1}&% \ifstrempty from etoolbox
    \slantedromand\@ifnextchar^{\hspace{0.2ex}}{\hspace{0.1ex}}
  \else
    \slantedromand\hspace{0.2ex}^{#1}
  \fi}
\makeatother
```

While `\dd` isn't much effort to type, it would be much cleaner to be able to do . The problem with defining `\d` is that it is already used for the under-dot accent. However, since this is a text-mode (only) accent, and defined with instead of we can redefine the command to mean `\dd` in math-mode.

```
\NewCommandCopy{\daccent}{\d}
\renewcommand{\d}{\ifmmode\dd\else\daccent\fi}
```

7. Cover page

   To make a nice cover page, a simple method that comes to mind is just redefining `\maketitle`. To get precise control over the positioning we'll use the `tikz` package, and then add in the Tikz libraries `calc` and `shapes.geometric` to make some nice decorations for the background.

   I'll start off by setting up the required additions to the preamble. This will accomplish the following:

   - Load the required packages
   - Redefine `\maketitle`
   - Draw an Org icon with Tikz to use in the cover page (it's a little easter egg)
   - Start a new page after the table of contents by redefining `\tableofcontents`

```
\usepackage{tikz}
\usetikzlibrary{shapes.geometric}
\usetikzlibrary{calc}
```

```
\newsavebox\orgicon
\begin{lrbox}{\orgicon}
  \begin{tikzpicture}[y=0.80pt, x=0.80pt, inner sep=0pt, outer sep=0pt]
    \path[fill=black!6] (16.15,24.00) .. controls (15.58,24.00) and
    ↪  (13.99,20.69) .. (12.77,18.06)arc(215.55:180.20:2.19) .. controls
    ↪  (12.33,19.91) and (11.27,19.09) .. (11.43,18.05) .. controls
    ↪  (11.36,18.09) and (10.17,17.83) .. (10.17,17.82) .. controls
    ↪  (9.94,18.75) and (9.37,19.44) .. (9.02,18.39) .. controls (8.32,16.72)
    ↪  and (8.14,15.40) .. (9.13,13.80) .. controls (8.22,9.74) and (2.18,7.75)
    ↪  .. (2.81,4.47) .. controls (2.99,4.47) and (4.45,0.99) .. (9.15,2.41) ..
    ↪  controls (14.71,3.99) and (17.77,0.30) .. (18.13,0.04) .. controls
    ↪  (18.65,-0.49) and (16.78,4.61) .. (12.83,6.90) .. controls (10.49,8.18)
    ↪  and (11.96,10.38) .. (12.12,11.15) .. controls (12.12,11.15) and
    ↪  (14.00,9.84) .. (15.36,11.85) .. controls (16.58,11.53) and
    ↪  (17.40,12.07) .. (18.46,11.69) .. controls (19.10,11.41) and
    ↪  (21.79,11.58) .. (20.79,13.08) .. controls (20.79,13.08) and
    ↪  (21.71,13.90) .. (21.80,13.99) .. controls (21.97,14.75) and
    ↪  (21.59,14.91) .. (21.47,15.12) .. controls (21.44,15.60) and
    ↪  (21.04,15.79) .. (20.55,15.44) .. controls (19.45,15.64) and
    ↪  (18.36,15.55) .. (17.83,15.59) .. controls (16.65,15.76) and
    ↪  (15.67,16.38) .. (15.67,16.38) .. controls (15.40,17.19) and
    ↪  (14.82,17.01) .. (14.09,17.32) .. controls (14.70,18.69) and
    ↪  (14.76,19.32) .. (15.50,21.32) .. controls (15.76,22.37) and
    ↪  (16.54,24.00) .. (16.15,24.00) -- cycle(7.83,16.74) .. controls
    ↪  (6.83,15.71) and (5.72,15.70) .. (4.05,15.42) .. controls (2.75,15.19)
    ↪  and (0.39,12.97) .. (0.02,10.68) .. controls (-0.02,10.07) and
    ↪  (-0.06,8.50) .. (0.45,7.18) .. controls (0.94,6.05) and (1.27,5.45) ..
    ↪  (2.29,4.85) .. controls (1.41,8.02) and (7.59,10.18) .. (8.55,13.80) --
    ↪  (8.55,13.80) .. controls (7.73,15.00) and (7.80,15.64) .. (7.83,16.74)
    ↪  -- cycle;
  \end{tikzpicture}
\end{lrbox}

\makeatletter
\g@addto@macro\tableofcontents{\clearpage}
\renewcommand\maketitle{
  \thispagestyle{empty}
  \hyphenpenalty=10000 % hyphens look bad in titles
  \renewcommand{\baselinestretch}{1.1}
  \NewCommandCopy{\oldtoday}{\today}
  \renewcommand{\today}{\LARGE\number\year\\\large%
    \ifcase \month \or Jan\or Feb\or Mar\or Apr\or May \or Jun\or Jul\or Aug\or
    ↪  Sep\or Oct\or Nov\or Dec\fi
    ~\number\day}
  \begin{tikzpicture}[remember picture,overlay]
    %% Background Polygons %%
    \foreach \i in {2.5,...,22} % bottom left
```

```
    {\node[rounded corners,black!3.5,draw,regular polygon,regular polygon
    ↪  sides=6, minimum size=\i cm,ultra thick] at ($(current
    ↪  page.west)+(2.5,-4.2)$) {} ;}
    \foreach \i in {0.5,...,22} % top left
    {\node[rounded corners,black!5,draw,regular polygon,regular polygon sides=6,
    ↪  minimum size=\i cm,ultra thick] at ($(current page.north west)+(2.5,2)$)
    ↪  {} ;}
    \node[rounded corners,fill=black!4,regular polygon,regular polygon sides=6,
    ↪  minimum size=5.5 cm,ultra thick] at ($(current page.north
    ↪  west)+(2.5,2)$) {};
    \foreach \i in {0.5,...,24} % top right
    {\node[rounded corners,black!2,draw,regular polygon,regular polygon sides=6,
    ↪  minimum size=\i cm,ultra thick] at ($(current page.north
    ↪  east)+(0,-8.5)$) {} ;}
    \node[fill=black!3,rounded corners,regular polygon,regular polygon sides=6,
    ↪  minimum size=2.5 cm,ultra thick] at ($(current page.north
    ↪  east)+(0,-8.5)$) {};
    \foreach \i in {21,...,3} % bottom right
    {\node[black!3,rounded corners,draw,regular polygon,regular polygon sides=6,
    ↪  minimum size=\i cm,ultra thick] at ($(current page.south
    ↪  east)+(-1.5,0.75)$) {} ;}
    \node[fill=black!3,rounded corners,regular polygon,regular polygon sides=6,
    ↪  minimum size=2 cm,ultra thick] at ($(current page.south
    ↪  east)+(-1.5,0.75)$) {};
    \node[align=center, scale=1.4] at ($(current page.south east)+(-1.5,0.75)$)
    ↪  {\usebox\orgicon};
    %% Text %%
    \node[left, align=right, black, text width=0.8\paperwidth, minimum
    ↪  height=3cm, rounded corners,font=\Huge\bfseries] at ($(current
    ↪  page.north east)+(-2,-8.5)$)
    {\@title};
    \node[left, align=right, black, text width=0.8\paperwidth, minimum
    ↪  height=2cm, rounded corners, font=\Large] at ($(current page.north
    ↪  east)+(-2,-11.8)$)
    {\scshape \@author};
    \renewcommand{\baselinestretch}{0.75}
    \node[align=center,rounded corners,fill=black!3,text=black,regular
    ↪  polygon,regular polygon sides=6, minimum size=2.5 cm,inner sep=0,
    ↪  font=\Large\bfseries ] at ($(current page.west)+(2.5,-4.2)$)
    {\@date};
  \end{tikzpicture}
  \let\today\oldtoday
  \clearpage}
\makeatother
```

Now we've got a nice cover page to work with, we just need to use it every now and then. Adding this to `#+options` feels most appropriate. Let's have the `coverpage` option accept `auto` as a value and then decide whether or not a cover page should be used based on the

word count — I'll have this be the global default. Then we just want to insert a LaTeX snippet tweak the subtitle format to use the cover page.

```
(defvar org-latex-cover-page 'auto
  "When t, use a cover page by default.
When auto, use a cover page when the document's wordcount exceeds
`org-latex-cover-page-wordcount-threshold'.

Set with #+option: coverpage:{yes,auto,no} in org buffers.")
(defvar org-latex-cover-page-wordcount-threshold 5000
  "Document word count at which a cover page will be used automatically.
This condition is applied when cover page option is set to auto.")
(defvar org-latex-subtitle-coverpage-format
↪  "\\\\\\bigskip\n\\LARGE\\mdseries\\itshape\\color{black!80} %s\\par"
  "Variant of `org-latex-subtitle-format' to use with the cover page.")
(defvar org-latex-cover-page-maketitle
  <<grab("latex-cover-page")>>
  "LaTeX preamble snippet that sets \\maketitle to produce a cover page.")

(eval '(cl-pushnew '(:latex-cover-page nil "coverpage" org-latex-cover-page)
                   (org-export-backend-options (org-export-get-backend
                   ↪  'latex))))

(defun org-latex-cover-page-p ()
  "Whether a cover page should be used when exporting this Org file."
  (pcase (or (car
              (delq nil
                    (mapcar
                     (lambda (opt-line)
                       (plist-get (org-export--parse-option-keyword opt-line
                       ↪  'latex) :latex-cover-page))
                     (cdar (org-collect-keywords '("OPTIONS"))))))
             org-latex-cover-page)
    ((or 't 'yes) t)
    ('auto (when (> (count-words (point-min) (point-max))
    ↪  org-latex-cover-page-wordcount-threshold) t))
    (_ nil)))

(defadvice! org-latex-set-coverpage-subtitle-format-a (contents info)
  "Set the subtitle format when a cover page is being used."
  :before #'org-latex-template
  (when (org-latex-cover-page-p)
    (setf info (plist-put info :latex-subtitle-format
    ↪  org-latex-subtitle-coverpage-format))))

(org-export-update-features 'latex
  (cover-page
   :condition (org-latex-cover-page-p)
```

```
   :snippet org-latex-cover-page-maketitle
   :order 9))
```

8. Condensed lists

   LaTeX is generally pretty good by default, but it's *really* generous with how much space it puts between list items by default. I'm generally not a fan.

   Thankfully this is easy to correct with a small snippet:

```
\newcommand{\setuplistspacing}{\setlength{\itemsep}{-0.5ex}\setlength{\parskip}{1.5ex}\setlength{\par
\let\olditem\itemize\renewcommand{\itemize}{\olditem\setuplistspacing}
\let\oldenum\enumerate\renewcommand{\enumerate}{\oldenum\setuplistspacing}
\let\olddesc\description\renewcommand{\description}{\olddesc\setuplistspacing}
```

   Then we can just hook this in with our clever preamble.

```
(defvar org-latex-condense-lists t
  "Reduce the space between list items.")
(defvar org-latex-condensed-lists
  <<grab("latex-condense-lists")>>
  "LaTeX preamble snippet that reduces the space between list items.")

(org-export-update-features 'latex
  (condensed-lists
   :condition (and org-latex-condense-lists "^[ \t]*[-+]\\|^[ \t]*[1Aa][.)] ")
   :snippet org-latex-condensed-lists
   :order 0.7))
```

9. Upright parentheses in italic text

   TODO, see https://tex.stackexchange.com/a/13057/167605

10. Pretty code blocks

    We could just use minted for syntax highlighting — however, we can do better! The `engrave-faces` package lets us use Emacs' font-lock for syntax highlighting, exporting that as LaTeX commands.

```
(package! engrave-faces :recipe (:local-repo "lisp/engrave-faces"))
```

```
(use-package! engrave-faces-latex
  :after ox-latex)
```

    Using this as in LaTeX exports is now as easy as

```
(setq org-latex-listings 'engraved
      org-latex-engraved-theme 'doom-one-light)
```

    One little annoyance with this is the interaction between microtype and `Verbatim` environments.

Protrusion is not desirable here. Thankfully, we can patch the `Verbatim` environment to turn off protrusion locally.

```
(org-export-update-features 'latex
  (no-protrusion-in-code
   :condition t
   :when (microtype engraved-code)
   :snippet "\\ifcsname Code\\endcsname\n
   ↪  \\let\\oldcode\\Code\\renewcommand{\\Code}{\\microtypesetup{protrusion=false}\\oldcode}\n\\fi"
   :after (engraved-code microtype)))
```

At some point it would be nice to make the box colours easily customisable. At the moment it's fairly easy to change the syntax highlighting colours with `(setq engrave-faces-preset-styles (engrave-faces-generate-preset))`, but perhaps a toggle which specifies whether to use the default values, the current theme, or any named theme could be a good idea. It should also possible to set the box background dynamically to match. The named theme could work by looking for a style definition with a certain name in a cache dir, and then switching to that theme and producing (and saving) the style definition if it doesn't exist.

Now let's have the example block be styled similarly.

```
(defadvice! org-latex-example-block-engraved (orig-fn example-block contents
↪  info)
  "Like `org-latex-example-block', but supporting an engraved backend"
  :around #'org-latex-example-block
  (let ((output-block (funcall orig-fn example-block contents info)))
    (if (eq 'engraved (plist-get info :latex-listings))
        (format "\\begin{Code}[alt]\n%s\n\\end{Code}" output-block)
      output-block)))
```

In addition to the vastly superior visual output, this should also be much faster to compile for code-heavy documents (like this config).

Performing a little benchmark with this document, I find that this is indeed the case.

LaTeX syntax highlighting backend	Compile time	Overhead	Overhead ratio
verbatim	12 s	0	0.0
lstlistings	15 s	3 s	0.2
Engrave	34 s	22 s	1.8
Pygments (Minted)	184 s	172 s	14.3

Treating the verbatim (no syntax highlighting) result as a baseline; this rudimentary test suggest that `engrave-faces` is around eight times faster than `pygments`, and takes three times as long as no syntax highlighting (verbatim).

11. Julia code blocks

Julia code has fantastic support for unicode! The downside is that `pdflatex` is *still* a pain to use with unicode symbols. The solution — `lualatex`. Now we just need to make it automatic

```
(defadvice! org-latex-pick-compiler (_contents info)
  :before #'org-latex-template
  :before #'org-beamer-template
  (when (and (memq 'code (plist-get info :features))
             (memq 'julia-code (plist-get info :features))
             (save-excursion
               (goto-char (point-min))
               (re-search-forward "[^\x00-\x7F\u200b]" nil t)))
    (setf info (plist-put
                (if (member #'+org-latex-replace-non-ascii-chars (plist-get info
                ↪  :filter-final-output))
                    (plist-put info :filter-final-output
                               (delq #'+org-latex-replace-non-ascii-chars
                               ↪  (plist-get info :filter-final-output)))
                  info)
                :latex-compiler "lualatex"))))
```

Then a font with unicode support must be used. JuliaMono is the obvious choice, and we can use it with the `fontspec` package. In future it may be nice to set this just as a fallback font (when it isn't a pain to do so).

```
\ifcsname directlua\endcsname
  \usepackage{fontspec}

  ↪  \newfontfamily\JuliaMono{JuliaMono-Regular.ttf}[Path=/usr/share/fonts/truetype/,
  ↪  Extension=.ttf]
  \newfontface\JuliaMonoRegular{JuliaMono-Regular}
  \setmonofont{JuliaMonoRegular}[Contextuals=Alternate, Scale=MatchLowercase]
\fi
```

Now all that remains is to hook this into the preamble generation.

```
(defvar org-latex-julia-mono-fontspec
  <<grab("julia-mono-fontspec")>>
  "LaTeX preamble snippet that sets LuaLaTeX's fontspec to use Julia Mono.")

(org-export-update-features 'latex
  (julia-code
   :condition "^[ \t]*#\\+begin_src julia\\|^[ \t]*#\\+BEGIN_SRC
   ↪  julia\\|src_julia"
   :when code
   :snippet org-latex-julia-mono-fontspec
   :after custom-font
   :order 0)
```

```
 (microtype-lualatex
  :condition t
  :when (microtype julia-code)
  :prevents microtype
  :snippet
  ↪  "\\usepackage[activate={true,nocompatibility},final,tracking=true,factor=2000]{microtype}\n"
  :order 0.1)
 (custom-font-no-mono
  :condition t
  :when julia-code
  :prevents custom-font
  :snippet (org-latex-fontset :serif :sans)
  :order 0))
```

12. Emojis

    It would be nice to actually include emojis where used. Thanks to `emojify`, we have a folder of emoji images just sitting and waiting to be used 🙂.

    First up, we want to detect when emojis are actually present. Manually constructing a regex for this would be a huge pain with the way the codepoints are scattered around, but thanks to `char-script-table` we don't have to!

```
(defvar org-latex-emoji--rx
  (let (emojis)
    (map-char-table
     (lambda (char set)
       (when (eq set 'emoji)
         (push (copy-tree char) emojis)))
     char-script-table)
    (rx-to-string `(any ,@emojis)))
  "A regexp to find all emoji-script characters.")
```

    Once we've found an Emoji, we would like to include it in LaTeX. We'll set up the infrastructure for this with the help of two packages

    - `accsupp`, to provide the copy-paste text overlay
    - `transparent`, to provide invisible text to enable text copying at the image

    With these packages we can insert an emoji image at the point and then place some invisible text on-top of it that copies as the emoji codepoint.

    Unfortunately though, `accsupp` doesn't seem to accept five digit hexadecimal codepoints at this point in time, instead we need to convert to UTF-16 surrogate pairs, so we'll give our `\DeclareEmoji` command two arguments: one for the non-surrogate form required by `\DeclareUnicodeCharacter`, and another for the surrogate form required by `\BeginAccSupp`.

```
\usepackage{accsupp}
% The transparent package is also needed, but will be loaded later.
\newsavebox\emojibox

\NewDocumentCommand\DeclareEmoji{m m}{% UTF-8 codepoint, UTF-16 codepoint
  \DeclareUnicodeCharacter{#1}{%
    \sbox\emojibox{\raisebox{OFFSET}{%
        \includegraphics[height=HEIGHT]{EMOJI-FOLDER/#1}}}%
    \usebox\emojibox
    \llap{%
      \resizebox{\wd\emojibox}{\height}{%
        \BeginAccSupp{method=hex,unicode,ActualText=#2}%
        \texttransparent{0}{X}%
        \EndAccSupp{}}}}}
```

Once we know that there are emojis present we can add a bit of preamble to the buffer to make insertion easier.

```
(defconst org-latex-emoji-base-dir
  (expand-file-name "emojis/" doom-cache-dir)
  "Directory where emojis should be saved and look for.")

(defvar org-latex-emoji-sets
  '(("twemoji" :url
  ↪  "https://github.com/jdecked/twemoji/archive/refs/tags/v15.1.0.zip"
     :folder "twemoji-15.1.0/assets/svg" :height "1.8ex" :offset "-0.3ex")
    ("twemoji-bw" :url
    ↪  "https://github.com/youdly/twemoji-color-font/archive/refs/heads/v11-release.zip"
     :folder "twemoji-color-font-11-release/assets/builds/svg-bw" :height
     ↪  "1.8ex" :offset "-0.3ex")
    ("openmoji" :url
    ↪  "https://github.com/hfg-gmuend/openmoji/releases/latest/download/openmoji-svg-color.zip"
     :height "2.2ex" :offset "-0.45ex")
    ("openmoji-bw" :url
    ↪  "https://github.com/hfg-gmuend/openmoji/releases/latest/download/openmoji-svg-black.zip"
     :height "2.2ex" :offset "-0.45ex")
    ("emojione" :url
    ↪  "https://github.com/joypixels/emojione/archive/refs/tags/v2.2.7.zip"
     :folder "emojione-2.2.7/assets/svg") ; Warning, poor coverage
    ("noto" :url
    ↪  "https://github.com/googlefonts/noto-emoji/archive/refs/tags/v2.038.zip"
     :folder "noto-emoji-2.038/svg" :file-regexp "^emoji_u\\([0-9a-f_]+\\)"
     :height "2.0ex" :offset "-0.3ex"))
  "An alist of pliststs of emoji sets.
Specified with the minimal form:
  (\"SET-NAME\" :url \"URL\")
The following optional parameters are supported:
  :folder (defaults to \"\")
```

```
  The folder within the archive where the emojis exist.
  :file-regexp (defaults to nil)
  Pattern with the emoji code point as the first capture group.
  :height (defaults to \"1.8ex\")
  Height of the emojis to be used.
  :offset (defaults to \"-0.3ex\")
  Baseline offset of the emojis.")

(defconst org-latex-emoji-keyword
  "LATEX_EMOJI_SET"
  "Keyword used to set the emoji set from `org-latex-emoji-sets'.")

(defvar org-latex-emoji-preamble <<grab("latex-emoji-preamble")>>
  "LaTeX preamble snippet that will allow for emojis to be declared.
Contains the string \"EMOJI-FOLDER\" which should be replaced with
the path to the emoji folder.")

(defun org-latex-emoji-utf16 (char)
  "Return the pair of UTF-16 surrogates that represent CHAR."
  (list
   (+ #xD7C0 (ash char -10))
   (+ #xDC00 (logand char #x03FF))))

(defun org-latex-emoji-declaration (char)
  "Construct the LaTeX command declaring CHAR as an emoji."
  (format "\\DeclareEmoji{%X}{%s} %% %s"
          char
          (if (< char #xFFFF)
              (format "%X" char)
            (apply #'format "%X%X" (org-latex-emoji-utf16 char)))
          (capitalize (get-char-code-property char 'name))))

(defun org-latex-emoji-fill-preamble (emoji-folder &optional height offset
↪  svg-p)
  "Fill in `org-latex-emoji-preamble' with EMOJI-FOLDER, HEIGHT, and OFFSET.
If SVG-P is set \"includegraphics\" will be replaced with \"includesvg\"."
  (let* (case-fold-search
         (filled-preamble
          (replace-regexp-in-string
           "HEIGHT"
           (or height "1.8ex")
           (replace-regexp-in-string
            "OFFSET"
            (or offset "-0.3ex")
            (replace-regexp-in-string
             "EMOJI-FOLDER"
             (directory-file-name
              (if (getenv "HOME")
```

```
                  (replace-regexp-in-string
                   (regexp-quote (getenv "HOME"))
                   "\\string~"
                   emoji-folder t t)
                emoji-folder))
             org-latex-emoji-preamble t t)
            t t)
           t t)))
    (if svg-p
        (replace-regexp-in-string
         "includegraphics" "includesvg"
         filled-preamble t t)
      filled-preamble)))

(defun org-latex-emoji-setup (&optional info)
  "Construct a preamble snippet to set up emojis based on INFO."
  (let* ((emoji-set
          (or (org-element-map
                  (plist-get info :parse-tree)
                  'keyword
                (lambda (keyword)
                  (and (string= (org-element-property :key keyword)
                                org-latex-emoji-keyword)
                       (org-element-property :value keyword)))
                info t)
              (caar org-latex-emoji-sets)))
         (emoji-spec (cdr (assoc emoji-set org-latex-emoji-sets)))
         (emoji-folder
          (expand-file-name emoji-set org-latex-emoji-base-dir))
         (emoji-svg-only
          (and (file-exists-p emoji-folder)
               (not (cl-some
                     (lambda (path)
                       (not (string= (file-name-extension path) "svg")))
                     (directory-files emoji-folder nil "\\....$"))))))
    (cond
     ((not emoji-spec)
      (error "Emoji set `%s' is unknown. Try one of: %s" emoji-set
             (string-join (mapcar #'car org-latex-emoji-sets) ", ")))
     ((not (file-exists-p emoji-folder))
      (if (and (not noninteractive)
               (yes-or-no-p (format "Emoji set `%s' is not installed, would you
               ↪  like to install it?" emoji-set)))
          (org-latex-emoji-install
           emoji-set
           (or (executable-find "cairosvg") (executable-find "inkscape")))
        (error "Emoji set `%s' is not installed" emoji-set))))
    (org-latex-emoji-fill-preamble
```

```
     emoji-folder (plist-get emoji-spec :height)
     (plist-get emoji-spec :offset) emoji-svg-only)))

(org-export-update-features 'latex
  (emoji-setup ; The precompilable bit
   :condition (save-excursion
                (goto-char (point-min))
                (re-search-forward org-latex-emoji--rx nil t))
   :requires (image pkg-transparent)
   :snippet org-latex-emoji-setup
   :order 3)
  (pkg-transparent ; Part of emoji setup, but non-precompilable.
   :snippet "\\usepackage{transparent}"
   :order 84)
  (emoji-declarations
   :condition t
   :when emoji-setup
   :snippet
   (mapconcat
    #'org-latex-emoji-declaration
    (let (unicode-cars)
      (save-excursion
        (goto-char (point-min))
        (while (re-search-forward org-latex-emoji--rx nil t)
          (push (aref (match-string 0) 0) unicode-cars)))
      (cl-delete-duplicates unicode-cars))
    "\n")
   :order 85))
```

Unfortunately this isn't a global solution, as LuaLaTeX doesn't have `\DeclareUnicodeCharacter`. However, we can fix this with a hack for the one case when we know it will be used.

```
(org-export-update-features 'latex
  (emoji-lualatex-hack
   :condition t
   :when (emoji julia-code) ; LuaLaTeX is used with julia-code.
   :snippet
   "\\usepackage{newunicodechar}
\\newcommand{\\DeclareUnicodeCharacter}[2]{%
    \\begingroup\\lccode`|=\\string\"#1\\relax
    \\lowercase{\\endgroup\\newunicodechar{|}}{#2}}"
   :before emoji))
```

This works fairly nicely, there's just one little QOL upgrade that we can perform. `emojify` downloads the `72x72` versions of Twemoji, however SVG versions are also produced. We could use `inkscape` to convert those to PDFs, which would likely be best for including.

This works fairly nicely, but it would be good to use `.pdf` forms whenever possible. We can use `texdef` to check the file extension priority list.

```
texdef -t pdflatex -p graphicx Gin@extensions
```

```
\Gin@extensions:
macro:->.pdf,.png,.jpg,.mps,.jpeg,.jbig2,.jb2,.PDF,.PNG,.JPG,.JPEG,.JBIG2,.JB2,.eps
```

Fantastic! We can see that `.pdf` actually comes first in the priority list. Now we just need to fetch and convert the emoji images.

```
(defun org-latex-emoji-install (set &optional convert)
  "Dowload, convert, and install emojis for use with LaTeX."
  (interactive
   (list (completing-read "Emoji set to install: "
                          (mapcar
                           (lambda (set-spec)
                             (if (file-exists-p (expand-file-name (car set-spec)
                             ↪  org-latex-emoji-base-dir))
                                 (propertize (car set-spec) 'face
                                 ↪  'font-lock-doc-face)
                               (car set-spec)))
                           org-latex-emoji-sets)
                          nil t)
         (if (or (executable-find "cairosvg") (executable-find "inkscape"))
             (yes-or-no-p "Would you like to create .pdf forms of the Emojis
             ↪  (strongly recommended)?")
           (message "Install `cairosvg' (recommended) or `inkscape' to convert
           ↪  to PDF forms")
           nil)))
  (let ((emoji-folder (expand-file-name set org-latex-emoji-base-dir)))
    (when (or (not (file-exists-p emoji-folder))
              (and (not noninteractive)
                   (yes-or-no-p "Emoji folder already present, would you like to
                   ↪  re-download?")
                   (progn (delete-directory emoji-folder t) t)))
      (let* ((spec (cdr (assoc set org-latex-emoji-sets)))
             (dir (org-latex-emoji-install--download set (plist-get spec :url)))
             (svg-dir (expand-file-name (or (plist-get spec :folder) "") dir)))
        (org-latex-emoji-install--install
         set svg-dir (plist-get spec :file-regexp))))
    (when convert
      (org-latex-emoji-install--convert (file-name-as-directory emoji-folder))))
  (message "Emojis set `%s' installed." set))

(defun org-latex-emoji-install--download (name url)
  "Download the emoji archive URL for the set NAME."
  (let* ((dest-folder (make-temp-file (format "%s-" name) t)))
    (message "Downloading %s..." name)
    (let ((default-directory dest-folder))
      (call-process "curl" nil nil nil "-sL" url "--output" "emojis.zip")
```

```
      (message "Unzipping")
      (call-process "unzip" nil nil nil "emojis.zip")
      dest-folder)))

(defun org-latex-emoji-install--install (name dir &optional filename-regexp)
  "Install the emoji files in DIR to the NAME set folder.
If a FILENAME-REGEXP, only files matching this regexp will be moved,
and they will be renamed to the first capture group of the regexp."
  (message "Installing %s emojis into emoji directory" name)
  (let ((images (append (directory-files dir t ".*.svg")
                        (directory-files dir t ".*.pdf")))
        (emoji-dir (file-name-as-directory
                    (expand-file-name name org-latex-emoji-base-dir))))
    (unless (file-exists-p emoji-dir)
      (make-directory emoji-dir t))
    (mapc
     (lambda (image)
       (if filename-regexp
           (when (string-match filename-regexp (file-name-nondirectory image))
             (rename-file image
                          (expand-file-name
                           (file-name-with-extension
                            (upcase (match-string 1 (file-name-nondirectory
                            ↪  image)))
                            (file-name-extension image))
                           emoji-dir)
                          t))
         (rename-file image
                      (expand-file-name
                       (file-name-with-extension
                        (upcase (file-name-nondirectory image))
                        (file-name-extension image))
                       emoji-dir)
                      t)))
     images)
    (message "%d emojis installed" (length images))))

(defun org-latex-emoji-install--convert (dir)
  "Convert all .svg files in DIR to .pdf forms.
Uses cairosvg if possible, falling back to inkscape."
  (let ((default-directory dir))
    (if (executable-find "cairosvg") ; cairo's PDFs are ~10% smaller
        (let* ((images (directory-files dir nil ".*.svg"))
               (num-images (length images))
               (index 0)
               (max-threads (1- (string-to-number (shell-command-to-string
               ↪  "nproc"))))
               (threads 0))
```

```
        (while (< index num-images)
          (setf threads (1+ threads))
          (let (message-log-max)
            (message "Converting emoji %d/%d (%s)" (1+ index) num-images (nth
            ↪  index images)))
          (make-process :name "cairosvg"
                        :command (list "cairosvg" (nth index images) "-o"
                        ↪  (concat (file-name-sans-extension (nth index
                        ↪  images)) ".pdf"))
                        :sentinel (lambda (proc msg)
                                    (when (memq (process-status proc) '(exit
                                    ↪  signal))
                                      (setf threads (1- threads)))))
          (setq index (1+ index))
          (while (> threads max-threads)
            (sleep-for 0.01)))
        (while (> threads 0)
          (sleep-for 0.01)))
      (message "Cairosvg not found. Proceeding with inkscape as a fallback.")
      (shell-command "inkscape --batch-process --export-type='pdf' *.svg"))
    (message "Finished conversion!")))
```

13. Remove non-ascii chars

    When using `pdflatex`, almost non-ascii characters are generally problematic, and don't appear in the pdf. It's preferable to see that there was *some* character which wasn't displayed as opposed to nothing.

    We check every non-ascii character to make sure it's not a character encoded by the `inputenc` packages when loaded with the `utf8` option. We'll also allow box-drawing characters since they can be mostly supported with `pmboxdraw`. Finally, we see if we have our own LaTeX conversion we can apply and if there is none we replace the non-ascii char with ¿.

    No to make sure we only remove characters that can't be displayed, we check `/usr/share/texmf/tex/latex/b`

    We just need to make sure this is appended to the list of filter functions, since we want to let emoji processing occur first.

```
(defvar +org-pdflatex-inputenc-encoded-chars

  ↪  "[[:ascii:]\u00A0-\u01F0\u0218-\u021B\u0237\u02C6\u02DC¿\u0400-\u04FF\u200B\u200C\u2010-\u201E\u2020\u2021\u2022\u2026\u2030\u2039\u203A\u2122\u2212]")

(defun +org-latex-replace-non-ascii-chars (text backend info)
  "Replace non-ascii chars with \\char\"XYZ forms."
  (when (and (org-export-derived-backend-p backend 'latex)
             (string= (plist-get info :latex-compiler) "pdflatex"))
    (let (case-replace)
      (replace-regexp-in-string "[^[:ascii:]]"
```

```
                                (lambda (nonascii)
                                  (if (or (string-match-p
                                  ↪  +org-pdflatex-inputenc-encoded-chars
                                  ↪  nonascii)
                                          (string-match-p org-latex-emoji--rx
                                          ↪  nonascii))
                                      nonascii
                                    (or (cdr (assoc nonascii
                                    ↪  +org-latex-non-ascii-char-substitutions))
                                        "¿")))
                                text))))

(add-to-list 'org-export-filter-plain-text-functions
↪  #'+org-latex-replace-non-ascii-chars t)
```

Now, there are some symbols that aren't included in `inputenc`, but we should be able to handle anyway. For them we define a table of LaTeX translations

```
(replace-regexp-in-string
 " '((" "\n   '(("
 (replace-regexp-in-string
  ") (" ")\n     ("
  (prin1-to-string
   `(defvar +org-latex-non-ascii-char-substitutions
      ',(mapcar
        (lambda (entry)
          (cons (car entry) (replace-regexp-in-string "\\\\" "\\\\\\\\" (cadr
          ↪  entry))))
        latex-non-ascii-char-substitutions)))))
```

```
<<gen-latex-non-ascii-char-substitutions()>>
```

14. Normal spaces after abbreviations

    In LaTeX inter-word and sentence spaces are typically of different widths. This can be an issue when using abbreviations i.e. e.g. etc. et al.. This can be corrected by forcing a normal space with . When exporting Org documents, we can add a filter to check for common abbreviations and make the space normal.

```
(defvar +org-latex-abbreviations
  '(;; Latin
    "cf." "e.g." "etc." "et al." "i.e." "v." "vs." "viz." "n.b."
    ;; Corperate
    "inc." "govt." "ltd." "pty." "dept."
    ;; Temporal
    "est." "c."
    ;; Honorifics
    "Prof." "Dr." "Mr." "Mrs." "Ms." "Miss." "Sr." "Jr."
```

Character	LaTeX
α	α
β	β
γ	γ
δ	δ
ϵ	ϵ
ε	ε
ζ	ζ
η	η
θ	θ
ϑ	ϑ
ι	ι
κ	κ
λ	λ
	μ
ν	ν
ξ	ξ
π	π
ϖ	ϖ
ρ	ρ
ϱ	ϱ
σ	σ
ς	ς
τ	τ
υ	υ
ϕ	ϕ
φ	φ
ψ	ψ
	ω
	Γ
	Δ
	Θ
	Λ
	Ξ
	Π
	Σ
	Υ
	Φ
	Ψ
	Ω
$\aleph$	$\aleph$
$\beth$	$\beth$
$\daleth$	$\daleth$
$\gimel$	$\gimel$

```
    ;; Components of a work
    "ed." "vol." "sec." "chap." "pt." "pp." "op." "no."
    ;; Common usage
    "approx." "misc." "min." "max.")
  "A list of abbreviations that should be spaced correctly when exporting to
  ↪ LaTeX.")

(defun +org-latex-correct-latin-abbreviation-spaces (text backend _info)
  "Normalise spaces after Latin abbreviations."
  (when (org-export-derived-backend-p backend 'latex)
    (replace-regexp-in-string (rx (group (or line-start space)
                                         (regexp (regexp-opt-group
                                         ↪ +org-latex-abbreviations)))
                                  (or line-end space))
                              "\\1\\\\ "
                              text)))

(add-to-list 'org-export-filter-paragraph-functions
↪ #'+org-latex-correct-latin-abbreviation-spaces t)
```

15. Extra special strings

    LaTeX already recognises `---` and `--` as em/en-dashes, `\-` as a shy hyphen, and the conversion of `...` to `\ldots{}` is hardcoded into `org-latex-plain-text` (unlike `org-html-plain-text`).

    I'd quite like to also recognise `->` and `<-`, so let's set come up with some advice.

```
(defvar org-latex-extra-special-string-regexps
  '(("<->" . "\\\\(\\\\leftrightarrow{}\\\\)")
    ("->" . "\\\\textrightarrow{}")
    ("<-" . "\\\\textleftarrow{}")))

(defun org-latex-convert-extra-special-strings (string)
  "Convert special characters in STRING to LaTeX."
  (dolist (a org-latex-extra-special-string-regexps string)
    (let ((re (car a))
          (rpl (cdr a)))
      (setq string (replace-regexp-in-string re rpl string t)))))

(defadvice! org-latex-plain-text-extra-special-a (orig-fn text info)
  "Make `org-latex-plain-text' handle some extra special strings."
  :around #'org-latex-plain-text
  (let ((output (funcall orig-fn text info)))
    (when (plist-get info :with-special-strings)
      (setq output (org-latex-convert-extra-special-strings output)))
    output))
```

16. Chameleon — aka. match theme

    Once I had the idea of having the look of the LaTeX document produced match the current

Emacs theme, I was enraptured. The result is the pseudo-class `chameleon`, which I have implemented in the package `ox-chameleon`.

```
(package! ox-chameleon :recipe (:local-repo "lisp/ox-chameleon"))
```

```
(use-package! ox-chameleon
  :after ox)
```

17. Make verbatim different to code

    Since have just gone to so much effort above let's make the most of it by making `verbatim` use `verb` instead of `protectedtexttt` (default).

    This gives the same advantages as mentioned in the HTML export section.

```
(setq org-latex-text-markup-alist
      '((bold . "\\textbf{%s}")
        (code . protectedtexttt)
        (italic . "\\emph{%s}")
        (strike-through . "\\sout{%s}")
        (underline . "\\uline{%s}")
        (verbatim . verb)))
```

18. Check for required packages

    For how I've setup Org's LaTeX export, the following packages are needed:

    Then for the various fontsets:

    - Alegreya
    - arev
    - arevmath
    - biolinum
    - FiraMono
    - FiraSans
    - fourier
    - gillius
    - kpfonts
    - libertine
    - newpxmath
    - newpxtext
    - newtxmath
    - newtxtext

Package	Description
adjustbox	Adjust general LaTeX material in like includegraphics
accsupp	Copy-paste text overlay for emoji images
amsmath	A near-essential maths package
booktabs	Nice horizontal lines in tables
cancel	Cancel terms in equations
capt-of	Captions outside floats
caption	Finer control over captions
cleveref	Easy cross-referencing
embedall	Embed files in the document
etoolbox	Document hooks
float	Floating environments
fontenc	Font encodings
fvextra	Enhanced verbatim environments
graphicx	An extended graphics package
hanging	Used by oc-csl
hyperref	Links
inputenc	Input file encodings
longtable	Multi-page tables
mathalpha	Set extended math alphabet fonts
mathtools	Typesetting tools for maths
microtype	Microtypography
pdfx	Create pdf/a- and pdf/x- compatible documents
pifont	A collection of symbols
pmboxdraw	Good-looking box drawing characters
preview	Needed for AUCTeX and ob-latex
scrbase	KOMA classes and more
scrextend	KOMA utilities
siunitx	Proper unit support
soul	Strikethrough and underline, flexibly
subcaption	Form subfigures and subcaptions
svg	Insert SVG images
tcolorbox	Nice boxes for code
textcomp	Font encodings
tikz	Generally handy, as a dependancy and for graphics
transparent	Invisible text for emoji copying
xcoffins	Manipulate coffins (boxes) for typesetting
xcolor	Colours
xparse	Extended command/env definition forms

- newtxsf
- noto
- notomath
- plex-mono
- plex-sans
- plex-serif
- sourcecodepro
- sourcesanspro
- sourceserifpro

We can write a function which will check for each of these packages with `kpsewhich`, and then if any of them are missing we'll inject some advice into the generated config that gets a list of missing packages and warns us every time we export to a PDF.

```
(setq org-required-latex-packages
      (append org-latex-required-packages-list
              org-latex-font-packages-list))

(defun check-for-latex-packages (packages)
  (delq nil (mapcar (lambda (package)
                      (unless
                          (= 0 (call-process "kpsewhich" nil nil nil (concat
                          ↪  package ".sty")))
                        package))
                    packages)))

(if-let (((executable-find "kpsewhich"))
         (missing-pkgs (check-for-latex-packages org-required-latex-packages)))
    (concat
     (pp-to-string `(setq org-required-latex-packages
     ↪  ',org-required-latex-packages))
     (message ";; Detected missing LaTeX packages: %s\n" (mapconcat #'identity
     ↪  missing-pkgs ", "))
     (pp-to-string
      '(defun check-for-latex-packages (packages)
         (delq nil (mapcar (lambda (package)
                             (unless
                                 (= 0 (call-process "kpsewhich" nil nil nil
                                 ↪  (concat package ".sty")))
                               package))
                           packages))))
     (pp-to-string
      '(defun +org-warn-about-missing-latex-packages (&rest _)
         (message "Checking for missing LaTeX packages...")
```

```
        (sleep-for 0.4)
        (if-let (missing-pkgs (check-for-latex-packages
        ↪  org-required-latex-packages))
            (message "%s You are missing the following LaTeX packages: %s."
                     (propertize "Warning!" 'face '(bold warning))
                     (mapconcat (lambda (pkg) (propertize pkg 'face
                     ↪  'font-lock-variable-name-face))
                                missing-pkgs
                                ", "))
          (message "%s You have all the required LaTeX packages. Run %s to make
          ↪  this message go away."
                   (propertize "Success!" 'face '(bold success))
                   (propertize "doom sync" 'face 'font-lock-keyword-face))
          (advice-remove 'org-latex-export-to-pdf
          ↪  #'+org-warn-about-missing-latex-packages))
        (sleep-for 1)))
    (pp-to-string
     '(advice-add 'org-latex-export-to-pdf :before
     ↪  #'+org-warn-about-missing-latex-packages)))
 ";; No missing LaTeX packags detected")
```

```
<<org-missing-latex-packages()>>
```

5.3.8 Beamer Export

It's nice to use a different theme

```
(setq org-beamer-theme "[progressbar=foot]metropolis")
```

When using metropolis though, we want to make a few tweaks:

```
\NewCommandCopy{\moldusetheme}{\usetheme}
\renewcommand*{\usetheme}[2][]{\moldusetheme[#1]{#2}
  \setbeamertemplate{items}{$\bullet$}
  \setbeamerfont{block title}{size=\normalsize,
  ↪  series=\bfseries\parbox{0pt}{\rule{0pt}{4ex}}}}

\makeatletter
\newcommand{\setmetropolislinewidth}{
  \setlength{\metropolis@progressinheadfoot@linewidth}{1.2px}}
\makeatother

\usepackage{etoolbox}
\AtEndPreamble{\setmetropolislinewidth}
```

Now let's just apply this along with some extra beamer tweaks.

```
(defun org-beamer-p (info)
  (eq 'beamer (and (plist-get info :back-end)
                   (org-export-backend-name (plist-get info :back-end)))))

(org-export-update-features 'beamer
  (beamer-setup
   :condition t
   :requires .missing-koma
   :prevents (italic-quotes condensed-lists cover-page)))

(org-export-update-features 'latex
  (.missing-koma
   :snippet "\\usepackage{scrextend}"
   :order 2))

(defvar org-beamer-metropolis-tweaks
  <<grab("beamer-metropolis-tweaks")>>
  "LaTeX preamble snippet that tweaks the Beamer metropolis theme styling.")

(org-export-update-features 'beamer
  (beamer-metropolis
   :condition (string-match-p "metropolis$" (plist-get info :beamer-theme))
   :snippet org-beamer-metropolis-tweaks
   :order 3))
```

And I think that it's natural to divide a presentation into sections, e.g. Introduction, Overview... so let's set bump up the headline level that becomes a frame from 1 to 2.

```
(setq org-beamer-frame-level 2)
```

5.3.9 Reveal export

By default reveal is rather nice, there are just a few tweaks that I consider a good idea.

```
(setq org-re-reveal-theme "white"
      org-re-reveal-transition "slide"
      org-re-reveal-plugins '(markdown notes math search zoom))
```

5.3.10 ASCII export

To start with, why settle for ASCII when UTF-8 exists?

```
(setq org-ascii-charset 'utf-8)
```

The ASCII export is generally fairly nice. I think the main aspect that could benefit from improvement is the appearance of LaTeX fragments. There's a nice utility we can use to create unicode representation, which are much nicer. It's called `latex2text`, and it's part of the `pylatexenc` package, and it's not really packaged. So, we'll resort to installing it with `pip`.

```
sudo python3 -m pip install pylatexenc
```

With an accompanying `doctor` check.

```
(unless (executable-find "latex2text")
  (warn! "Couldn't find latex2text executable (from pylatexenc), will be unable to
  ↪  render LaTeX fragments in org→text exports."))
```

With that installed, we can override the `(org-ascii-latex-fragment)` and `(org-ascii-latex-environment)` functions, which are conveniently very slim — just extracting the content, and indenting. We'll only do something different when `utf-8` is set.

```
(when (executable-find "latex2text")
  (after! ox-ascii
    (defvar org-ascii-convert-latex t
      "Use latex2text to convert LaTeX elements to unicode.")

    (defadvice! org-ascii-latex-environment-unicode-a (latex-environment _contents
    ↪  info)
      "Transcode a LATEX-ENVIRONMENT element from Org to ASCII, converting to unicode.
CONTENTS is nil.  INFO is a plist holding contextual
information."
      :override #'org-ascii-latex-environment
      (when (plist-get info :with-latex)
        (org-ascii--justify-element
         (org-remove-indentation
          (let* ((latex (org-element-property :value latex-environment))
                 (unicode (and (eq (plist-get info :ascii-charset) 'utf-8)
                               org-ascii-convert-latex
                               (doom-call-process "latex2text" "-q" "--code" latex))))
            (if (= (car unicode) 0) ; utf-8 set, and sucessfully ran latex2text
                (cdr unicode) latex)))
         latex-environment info)))

    (defadvice! org-ascii-latex-fragment-unicode-a (latex-fragment _contents info)
      "Transcode a LATEX-FRAGMENT object from Org to ASCII, converting to unicode.
CONTENTS is nil.  INFO is a plist holding contextual
information."
      :override #'org-ascii-latex-fragment
      (when (plist-get info :with-latex)
        (let* ((latex (org-element-property :value latex-fragment))
```

```
            (unicode (and (eq (plist-get info :ascii-charset) 'utf-8)
                          org-ascii-convert-latex
                          (doom-call-process "latex2text" "-q" "--code" latex))))
      (if (and unicode (= (car unicode) 0)) ; utf-8 set, and sucessfully ran
      ↪ latex2text
          (cdr unicode) latex))))))
```

5.3.11 Markdown Export

1. GFM

   Because of the *lovely variety in markdown implementations* there isn't actually such a thing a standard table spec ... or standard anything really. Because `org-md` is a goody-two-shoes, it just uses HTML for all these non-standardised elements (a lot of them). So `ox-gfm` is handy for exporting markdown with all the features that GitHub has.

   ```
   (package! ox-gfm :pin "4f774f13d34b3db9ea4ddb0b1edc070b1526ccbb")
   ```

   ```
   (use-package! ox-gfm
     :after ox)
   ```

2. Character substitutions

   When I want to paste exported markdown somewhere (for example when using Emacs Everywhere), it can be preferable to have unicode characters for `---` etc. instead of `&#x2014;`.

   To accomplish this, we just need to locally rebind the alist which provides these substitution.

   ```
   (defadvice! org-md-plain-text-unicode-a (orig-fn text info)
     "Locally rebind `org-html-special-string-regexps'"
     :around #'org-md-plain-text
     (let ((org-html-special-string-regexps
            '(("\\\\-" . "-")
              ("---\\([^-]\\|$\\)" . "-\\1")
              ("--\\([^-]\\|$\\)" . "-\\1")
              ("\\.\\.\\." . "...")
              ("<->" . "")
              ("->" . "→")
              ("<-" . "←"))))
       (funcall orig-fn text (plist-put info :with-smart-quotes nil))))
   ```

   In the future, I may want to check `info` to only have this active when `ox-gfm` is being used.

   Another worthwhile consideration is LaTeX formatting. It seems most Markdown parsers are fixated on TeX-style syntax ($ and $$). As unfortunate as this is, it's probably best to accommodate them, for the sake of decent rendering.

`ox-md` doesn't provide any transcoders for this, so we'll have to whip up our own and push them onto the `md` transcoders alist.

```
(after! ox-md
  (defun org-md-latex-fragment (latex-fragment _contents info)
    "Transcode a LATEX-FRAGMENT object from Org to Markdown."
    (let ((frag (org-element-property :value latex-fragment)))
      (cond
       ((string-match-p "^\\\\(" frag)
        (concat "$" (substring frag 2 -2) "$"))
       ((string-match-p "^\\\\[" frag)
        (concat "$$" (substring frag 2 -2) "$$"))
       (t (message "unrecognised fragment: %s" frag)
          frag))))

  (defun org-md-latex-environment (latex-environment contents info)
    "Transcode a LATEX-ENVIRONMENT object from Org to Markdown."
    (concat "$$\n"
            (org-html-latex-environment latex-environment contents info)
            "$$\n"))

  (defun org-utf8-entity (entity _contents _info)
    "Transcode an ENTITY object from Org to utf-8.
CONTENTS are the definition itself.  INFO is a plist holding
contextual information."
    (org-element-property :utf-8 entity))

  ;; We can't let this be immediately parsed and evaluated,
  ;; because eager macro-expansion tries to call as-of-yet
  ;; undefined functions.
  ;; NOTE in the near future this shouldn't be required
  (eval
   '(dolist (extra-transcoder
             '((latex-fragment . org-md-latex-fragment)
               (latex-environment . org-md-latex-environment)
               (entity . org-utf8-entity)))
      (unless (member extra-transcoder (org-export-backend-transcoders
                                        (org-export-get-backend 'md)))
        (push extra-transcoder (org-export-backend-transcoders
                                (org-export-get-backend 'md)))))))
```

5.3.12 Babel

Doom lazy-loads babel languages, with is lovely. It also pulls in ob-async, which is nice, but it would be even better if it was used by default.

There are two caveats to `ob-async`:

1. It does not support `:session`
   - So, we don't want `:async` used when `:session` is set
2. It adds a fixed delay to execution
   - This is undesirable in a number of cases, for example it's generally unwanted with `emacs-lisp` code
   - As such, I also introduce a async language blacklist to control when it's automatically enabled

Due to the nuance in the desired behaviour, instead of just adding `:async` to `org-babel-default-header-args`, I advice `org-babel-get-src-block-info` to add `:async` intelligently. As an escape hatch, it also recognises `:sync` as an indication that `:async` should not be added.

I did originally have this enabled for everything except for `emacs-lisp` and `LaTeX` (there were weird issues), but this added a ~3s "startup" cost to every src block evaluation, which was a bit of a pain. Since `:async` can be added easily with `#+properties`, I've turned this behaviour from a blacklist to a whitelist.

```
(add-transient-hook! #'org-babel-execute-src-block
  (require 'ob-async))

(defvar org-babel-auto-async-languages '()
  "Babel languages which should be executed asyncronously by default.")

(defadvice! org-babel-get-src-block-info-eager-async-a (orig-fn &optional light datum)
  "Eagarly add an :async parameter to the src information, unless it seems
  ↪ problematic.
This only acts o languages in `org-babel-auto-async-languages'.
Not added when either:
+ session is not \"none\"
+ :sync is set"
  :around #'org-babel-get-src-block-info
  (let ((result (funcall orig-fn light datum)))
    (when (and (string= "none" (cdr (assoc :session (caddr result))))
               (member (car result) org-babel-auto-async-languages)
               (not (assoc :async (caddr result))) ; don't duplicate
               (not (assoc :sync (caddr result))))
      (push '(:async) (caddr result)))
    result))
```

5.3.13 ESS

We don't want R evaluation to hang the editor, hence

```
(setq ess-eval-visibly 'nowait)
```

Syntax highlighting is nice, so let's turn all of that on

```
(setq ess-R-font-lock-keywords
      '((ess-R-fl-keyword:keywords . t)
        (ess-R-fl-keyword:constants . t)
        (ess-R-fl-keyword:modifiers . t)
        (ess-R-fl-keyword:fun-defs . t)
        (ess-R-fl-keyword:assign-ops . t)
        (ess-R-fl-keyword:%op% . t)
        (ess-fl-keyword:fun-calls . t)
        (ess-fl-keyword:numbers . t)
        (ess-fl-keyword:operators . t)
        (ess-fl-keyword:delimiters . t)
        (ess-fl-keyword:= . t)
        (ess-R-fl-keyword:F&T . t)))
```

Lastly, in the event that I use JAGS, it would be nice to be able to use `jags` as the language identifier, not `ess-jags`.

```
(after! org
  (add-to-list '+org-babel-mode-alist '(jags . ess-jags)))
```

5.4 LaTeX

5.4.1 To-be-implemented ideas

- Paste image from clipboard
  - Determine first folder in `graphicspath` if applicable
  - Ask for file name
  - Use `xclip` to save file to graphics folder, or current directory (whichever applies)

```
command -v xclip >/dev/null 2>&1 || { echo >&1 "no xclip"; exit 1; }

if
    xclip -selection clipboard -target image/png -o >/dev/null 2>&1
```

```
then
    xclip -selection clipboard -target image/png -o >$1 2>/dev/null
    echo $1
else
    echo "no image"
fi
```

- Insert figure, with filled in details as a result (activate `yasnippet` with filename as variable maybe?)

5.4.2 Compilation

```
(setq TeX-save-query nil
      TeX-show-compilation t
      TeX-command-extra-options "-shell-escape")
(after! latex
  (add-to-list 'TeX-command-list '("XeLaTeX" "%`xelatex%(mode)%' %t" TeX-run-TeX nil
  ↪  t)))
```

For viewing the PDF, I rather like the pdf-tools viewer. While auctex is trying to be nice in recognising that I have some PDF viewing apps installed, I'd rather not have it default to using them, so let's re-order the preferences.

```
(setq +latex-viewers '(pdf-tools evince zathura okular skim sumatrapdf))
```

5.4.3 Snippet helpers

1. Template

   For use in the new-file template, let's set out a nice preamble we may want to use.

```
\\usepackage[pdfa,unicode=true,hidelinks]{hyperref}

\\usepackage[dvipsnames,svgnames,table,hyperref]{xcolor}
\\renewcommand{\\UrlFont}{\\ttfamily\\small}

\\usepackage[a-2b]{pdfx} % why not be archival

\\usepackage[T1]{fontenc}
\\usepackage[osf]{newpxtext}  % Palatino
\\usepackage{gillius}
\\usepackage[scale=0.9]{sourcecodepro}
```

```
\\usepackage{mathtools}
\\usepackage{amssymb}
\\let\\Bbbk\\relax
\\usepackage[varbb]{newpxmath}

\\usepackage[activate={true,nocompatibility},final,tracking=true,kerning=true,spacing=true,factor=200
% microtype makes text look nicer

\\usepackage{graphicx} % include graphics

\\usepackage{booktabs} % nice table rules
```

Then let's bind the content to a function, and define some nice helpers.

```
(setq tec/yas-latex-template-preamble "
<<latex-nice-preamble>>
")

(defun tec/yas-latex-get-class-choice ()
  "Prompt user for LaTeX class choice"
  (setq tec/yas-latex-class-choice (completing-read "Select document class: "
  ↪  '("article" "scrartcl" "bmc"))))

(defun tec/yas-latex-preamble-if ()
  "Based on class choice prompt for insertion of default preamble"
  (if (equal tec/yas-latex-class-choice "bmc") 'nil
    (eq (read-char-choice "Include default preamble? [Type y/n]" '(?y ?n)) ?y)))
```

2. Deliminators

```
(after! tex
  (defvar tec/tex-last-delim-char nil
    "Last open delim expanded in a tex document")
  (defvar tec/tex-delim-dot-second t
    "When the `tec/tex-last-delim-char' is . a second character (this) is
    ↪  prompted for")
  (defun tec/get-open-delim-char ()
    "Exclusivly read next char to tec/tex-last-delim-char"
    (setq tec/tex-delim-dot-second nil)
    (setq tec/tex-last-delim-char (read-char-exclusive "Opening deliminator,
    ↪  recognises: 9 ( [ { < | ."))
    (when (eql ?. tec/tex-last-delim-char)
      (setq tec/tex-delim-dot-second (read-char-exclusive "Other deliminator,
      ↪  recognises: 0 9 (  ) [ ] { } < > |"))))
  (defun tec/tex-open-delim-from-char (&optional open-char)
    "Find the associated opening delim as string"
    (unless open-char (setq open-char (if (eql ?. tec/tex-last-delim-char)
```

```
                                        tec/tex-delim-dot-second
                                      tec/tex-last-delim-char)))
  (pcase open-char
    (?\( "(")
    (?9  "(")
    (?\[ "[")
    (?\{ "\\{")
    (?<  "<")
    (?|  (if tec/tex-delim-dot-second "." "|"))
    (_   ".")))
(defun tec/tex-close-delim-from-char (&optional open-char)
  "Find the associated closing delim as string"
  (if tec/tex-delim-dot-second
      (pcase tec/tex-delim-dot-second
        (?\) ")")
        (?0  ")")
        (?\] "]")
        (?\} "\\}")
        (?\> ">")
        (?|  "|")
        (_   "."))
    (pcase (or open-char tec/tex-last-delim-char)
      (?\( ")")
      (?9  ")")
      (?\[ "]")
      (?\{ "\\}")
      (?<  ">")
      (?\) ")")
      (?0  ")")
      (?\] "]")
      (?\} "\\}")
      (?\> ">")
      (?|  "|")
      (_   "."))))
(defun tec/tex-next-char-smart-close-delim (&optional open-char)
  (and (bound-and-true-p smartparens-mode)
       (eql (char-after) (pcase (or open-char tec/tex-last-delim-char)
                           (?\( ?\))
                           (?\[ ?\])
                           (?{ ?})
                           (?< ?>)))))
(defun tec/tex-delim-yas-expand (&optional open-char)
  (yas-expand-snippet (yas-lookup-snippet "_deliminators" 'latex-mode) (point)
  ↪  (+ (point) (if (tec/tex-next-char-smart-close-delim open-char) 2 1))))
```

5.4.4 Editor visuals

Let's enhance `TeX-fold-math` a bit

```
(after! latex
  (setcar (assoc "" LaTeX-fold-math-spec-list) "")) ;; make \star bigger

(setq TeX-fold-math-spec-list
      `(;; missing/better symbols
        ("" ("le"))
        ("" ("ge"))
        ("" ("ne"))
        ;; convenience shorts -- these don't work nicely ATM
        ;; ("<" ("left"))
        ;; (">" ("right"))
        ;; private macros
        ("" ("RR"))
        ("" ("NN"))
        ("" ("ZZ"))
        ("" ("QQ"))
        ("" ("CC"))
        ("" ("PP"))
        ("" ("HH"))
        ("" ("EE"))
        ("" ("dd"))
        ;; known commands
        ("" ("phantom"))
        (,(lambda (num den) (if (and (TeX-string-single-token-p num)
        ↪  (TeX-string-single-token-p den))
                                (concat num "" den)
                              (concat "" num "" den ""))) ("frac"))
        (,(lambda (arg) (concat "" (TeX-fold-parenthesize-as-necessary arg)))
        ↪  ("sqrt"))
        (,(lambda (arg) (concat "" (TeX-fold-parenthesize-as-necessary arg))) ("vec"))
        ("‘{1}’" ("text"))
        ;; private commands
        ("|{1}|" ("abs"))
        ("‖{1}‖" ("norm"))
        ("⌊{1}⌋" ("floor"))
        ("⌈{1}⌉" ("ceil"))
        ("⌊{1}⌉" ("round"))
        ("{1}/{2}" ("dv"))
        ("{1}/{2}" ("pdv"))
        ;; fancification
        ("{1}" ("mathrm"))
        (,(lambda (word) (string-offset-roman-chars 119743 word)) ("mathbf"))
        (,(lambda (word) (string-offset-roman-chars 119951 word)) ("mathcal"))
```

```
        (,(lambda (word) (string-offset-roman-chars 120003 word)) ("mathfrak"))
        (,(lambda (word) (string-offset-roman-chars 120055 word)) ("mathbb"))
        (,(lambda (word) (string-offset-roman-chars 120159 word)) ("mathsf"))
        (,(lambda (word) (string-offset-roman-chars 120367 word)) ("mathtt"))
        )
      TeX-fold-macro-spec-list
      '(
        ;; as the defaults
        ("[f]" ("footnote" "marginpar"))
        ("[c]" ("cite"))
        ("[l]" ("label"))
        ("[r]" ("ref" "pageref" "eqref"))
        ("[i]" ("index" "glossary"))
        ("..." ("dots"))
        ("{1}" ("emph" "textit" "textsl" "textmd" "textrm" "textsf" "texttt"
                "textbf" "textsc" "textup"))
        ;; tweaked defaults
        ("©" ("copyright"))
        ("®" ("textregistered"))
        ("™"  ("texttrademark"))
        ("[1]:||" ("item"))
        ("{1}" ("part" "part*"))
        ("{1}" ("chapter" "chapter*"))
        ("§{1}" ("section" "section*"))
        ("§§{1}" ("subsection" "subsection*"))
        ("§§§{1}" ("subsubsection" "subsubsection*"))
        ("¶{1}" ("paragraph" "paragraph*"))
        ("¶¶{1}" ("subparagraph" "subparagraph*"))
        ;; extra
        ("{1}" ("begin"))
        ("{1}" ("end"))
        ))

(defun string-offset-roman-chars (offset word)
  "Shift the codepoint of each character in WORD by OFFSET with an extra -6 shift if
  ↪  the letter is lowercase"
  (apply 'string
         (mapcar (lambda (c)
                   (string-offset-apply-roman-char-exceptions
                    (+ (if (>= c 97) (- c 6) c) offset)))
                 word)))

(defvar string-offset-roman-char-exceptions
  '(;; lowercase serif
    (119892 .  8462) ;
    ;; lowercase caligraphic
    (119994 . 8495) ;
    (119996 . 8458) ;
```

```
    (120004 . 8500) ;
    ;; caligraphic
    (119965 . 8492) ;
    (119968 . 8496) ;
    (119969 . 8497) ;
    (119971 . 8459) ;
    (119972 . 8464) ;
    (119975 . 8466) ;
    (119976 . 8499) ;
    (119981 . 8475) ;
    ;; fraktur
    (120070 . 8493) ;
    (120075 . 8460) ;
    (120076 . 8465) ;
    (120085 . 8476) ;
    (120092 . 8488) ;
    ;; blackboard
    (120122 . 8450) ;
    (120127 . 8461) ;
    (120133 . 8469) ;
    (120135 . 8473) ;
    (120136 . 8474) ;
    (120137 . 8477) ;
    (120145 . 8484) ;
    )
  "An alist of deceptive codepoints, and then where the glyph actually resides.")

(defun string-offset-apply-roman-char-exceptions (char)
  "Sometimes the codepoint doesn't contain the char you expect.
Such special cases should be remapped to another value, as given in
↪  `string-offset-roman-char-exceptions'."
  (if (assoc char string-offset-roman-char-exceptions)
      (cdr (assoc char string-offset-roman-char-exceptions))
    char))

(defun TeX-fold-parenthesize-as-necessary (tokens &optional suppress-left
↪  suppress-right)
  "Add   parenthesis as if multiple LaTeX tokens appear to be present"
  (if (TeX-string-single-token-p tokens) tokens
    (concat (if suppress-left "" "")
            tokens
            (if suppress-right "" ""))))

(defun TeX-string-single-token-p (teststring)
  "Return t if TESTSTRING appears to be a single token, nil otherwise"
  (if (string-match-p "^\\\\?\\w+$" teststring) t nil))
```

Some local keybindings to make life a bit easier

```
(after! tex
  (map!
   :map LaTeX-mode-map
   :ei [C-return] #'LaTeX-insert-item)
  (setq TeX-electric-math '("\\(" . "")))
```

Maths deliminators can be de-emphasised a bit

```
;; Making \( \) less visible
(defface unimportant-latex-face
  '((t :inherit font-lock-comment-face :weight extra-light))
  "Face used to make \\(\\), \\[ \\] less visible."
  :group 'LaTeX-math)

(font-lock-add-keywords
 'latex-mode
 `(("\\\\[]()[]" 0 'unimportant-latex-face prepend))
 'end)

;; (font-lock-add-keywords
;;  'latex-mode
;;  '(("\\\\[[:word:]]+" 0 'font-lock-keyword-face prepend))
;;  'end)
```

And enable shell escape for the preview

```
(setq preview-LaTeX-command '("%`%l \"\\nonstopmode\\nofiles\
\\PassOptionsToPackage{" "," . preview-required-option-list) "}{preview}\
\\AtBeginDocument{\\ifx\\ifPreview\\undefined"
preview-default-preamble "\\fi}\"%' \"\\detokenize{\" %t \"}\""))
```

5.4.5 Math input

1. CDLaTeX

   The symbols and modifies are very nice by default, but could do with a bit of fleshing out. Let's change the prefix to a key which is similarly rarely used, but more convenient, like ;.

   ```
   (after! cdlatex
     (setq cdlatex-env-alist
           '(("bmatrix" "\\begin{bmatrix}\n?\n\\end{bmatrix}" nil)
             ("equation*" "\\begin{equation*}\n?\n\\end{equation*}" nil)))
     (setq ;; cdlatex-math-symbol-prefix ?\; ;; doesn't work at the moment :(
      cdlatex-math-symbol-alist
      '( ;; adding missing functions to 3rd level symbols
   ```

```
    (?_    ("\\downarrow"  ""           "\\inf"))
    (?2    ("^2"           "\\sqrt{?}"     ""     ))
    (?3    ("^3"           "\\sqrt[3]{?}"  ""     ))
    (?^    ("\\uparrow"    ""           "\\sup"))
    (?k    ("\\kappa"      ""           "\\ker"))
    (?m    ("\\mu"         ""           "\\lim"))
    (?c    (""             "\\circ"     "\\cos"))
    (?d    ("\\delta"      "\\partial"  "\\dim"))
    (?D    ("\\Delta"      "\\nabla"    "\\deg"))
    ;; no idea why \Phi isnt on 'F' in first place, \phi is on 'f'.
    (?F    ("\\Phi"))
    ;; now just convenience
    (?.    ("\\cdot" "\\dots"))
    (?:    ("\\vdots" "\\ddots"))
    (?*    ("\\times" "\\star" "\\ast")))
  cdlatex-math-modify-alist
  '( ;; my own stuff
    (?B    "\\mathbb"        nil          t    nil  nil)
    (?a    "\\abs"           nil          t    nil  nil))))
```

2. LAAS

   This makes use of aas (*Auto Activating Snippets*) for CDLaTeX-like symbol input.

```
(package! laas :recipe (:local-repo "lisp/LaTeX-auto-activating-snippets"))
```

```
(use-package! laas
  :hook (LaTeX-mode . laas-mode)
  :config
  (defun laas-tex-fold-maybe ()
    (unless (equal "/" aas-transient-snippet-key)
      (+latex-fold-last-macro-a)))
  (add-hook 'aas-post-snippet-expand-hook #'laas-tex-fold-maybe))
```

5.4.6 SyncTeX

```
(after! tex
  (add-to-list 'TeX-view-program-list '("Evince" "evince %o"))
  (add-to-list 'TeX-view-program-selection '(output-pdf "Evince")))
```

5.4.7 Fixes

In case of Emacs28:

```
(when (>= emacs-major-version 28)
  (add-hook 'latex-mode-hook #'TeX-latex-mode))
```

With Emacs 29.4

```
(when (and (= emacs-major-version 29) (= emacs-minor-version 4))
  (after! auctex ; See <https://github.com/minad/vertico/discussions/475>
    (fmakunbound 'ConTeXt-mode)))
```

5.5 Python

Since I'm using `mypyls`, as suggested in :lang python LSP support I'll tweak the priority of `mypyls`

```
(after! lsp-python-ms
  (set-lsp-priority! 'mspyls 1))
```

5.6 PDF

5.6.1 MuPDF

`pdf-tools` is nice, but a `mupdf`-based solution is nicer.

```
(package! paper :recipe (:host github :repo "ymarco/paper-mode"
                         :files ("*.el" ".so")
                         :pre-build ("make")))
```

```
;; (use-package paper
;;   ;; :mode ("\\.pdf\\'"  . paper-mode)
;;   ;; :mode ("\\.epub\\'"  . paper-mode)
;;   :config
;;   (require 'evil-collection-paper)
;;   (evil-collection-paper-setup))
```

5.6.2 Terminal viewing

Sometimes I'm in a terminal and I still want to see the content. Additionally, sometimes I'd like to act on the textual content and so would like a plaintext version. Thanks to we have a convenient

way of performing this conversion. I've integrated this into a little package, `pdftotext.el`.

```
(package! pdftotext :recipe (:local-repo "lisp/pdftotext"))
```

The output can be slightly nicer without spelling errors, and with prettier page feeds (`^L` by default).

This is very nice, now we just need to associate it with `.pdf` files, and make sure `pdf-tools` doesn't take priority.

Lastly, whenever Emacs is non-graphical (i.e. a TUI), we want to use this by default.

```
(use-package! pdftotext
  :init
  (unless (display-graphic-p)
    (add-to-list 'auto-mode-alist '("\\.[pP][dD][fF]\\'" . pdftotext-mode))
    (add-to-list 'magic-mode-alist '("%PDF" . pdftotext-mode)))
  :config
  (unless (display-graphic-p) (after! pdf-tools (pdftotext-install)))
  ;; For prettyness
  (add-hook 'pdftotext-mode-hook #'spell-fu-mode-disable)
  (add-hook 'pdftotext-mode-hook (lambda () (page-break-lines-mode 1)))
  ;; I have no idea why this is needed
  (map! :map pdftotext-mode-map
        "<mouse-4>" (cmd! (scroll-down mouse-wheel-scroll-amount-horizontal))
        "<mouse-5>" (cmd! (scroll-up mouse-wheel-scroll-amount-horizontal))))
```

5.7 R

5.7.1 Editor Visuals

```
(after! ess-r-mode
  (appendq! +ligatures-extra-symbols
            '(:assign ""
              :multiply "×"))
  (set-ligatures! 'ess-r-mode
    ;; Functional
    :def "function"
    ;; Types
    :null "NULL"
    :true "TRUE"
    :false "FALSE"
```

```
    :int "int"
    :floar "float"
    :bool "bool"
    ;; Flow
    :not "!"
    :and "&&" :or "||"
    :for "for"
    :in "%in%"
    :return "return"
    ;; Other
    :assign "<-"
    :multiply "%*%"))
```

5.8 Julia

It would be nice if `julia-mode` also highlighted the `julia>` prompt when writing REPL examples.

```
(add-to-list
 'julia-font-lock-keywords
 '("^julia>" 0 '(font-lock-string-face bold) prepend))
```

As mentioned in lsp-julia#35, `lsp-mode` seems to serve an invalid response to the Julia server. The pseudo-fix is rather simple at least

```
(add-hook 'julia-mode-hook #'rainbow-delimiters-mode-enable)
(add-hook! 'julia-mode-hook
  (setq-local lsp-enable-folding t
              lsp-folding-range-limit 100))
```

5.9 Data.toml files

For `DataToolkit.jl`-formatted TOML files, I've made a major mode.

```
(package! conf-data-toml :recipe (:local-repo "lisp/conf-data-toml"))
```

Since the major mode is autoloaded, all we need to do is register an appropriate magic command for it to be used in `Data.toml` files.

```
(use-package! conf-data-toml
  :magic ("\\`data_config_version = [0-9]" . conf-data-toml-mode))
```

5.10 Graphviz

Graphviz is a nice method of visualising simple graphs, based on plaintext `.dot` / `.gv` files.

```
(package! graphviz-dot-mode :pin "8ff793b13707cb511875f56e167ff7f980a31136")
```

```
(use-package! graphviz-dot-mode
  :commands graphviz-dot-mode
  :mode ("\\.dot\\'" . graphviz-dot-mode)
  :init
  (after! org
    (setcdr (assoc "dot" org-src-lang-modes)
            'graphviz-dot)))
```

5.11 Markdown

Most of the time when I write markdown, it's going into some app/website which will do it's own line wrapping, hence we *only* want to use visual line wrapping. No hard stuff.

```
(add-hook! (gfm-mode markdown-mode) #'visual-line-mode #'turn-off-auto-fill)
```

Since markdown is often seen as rendered HTML, let's try to somewhat mirror the style or markdown renderers.

Most markdown renders seem to make the first three headings levels larger than normal text, the first two much so. Then the fourth level tends to be the same as body text, while the fifth and sixth are (increasingly) smaller, with the sixth greyed out. Since the sixth level is so small, I'll turn up the boldness a notch.

```
(custom-set-faces!
  '(markdown-header-face-1 :height 1.25 :weight extra-bold :inherit
  ↪  markdown-header-face)
  '(markdown-header-face-2 :height 1.15 :weight bold       :inherit
  ↪  markdown-header-face)
  '(markdown-header-face-3 :height 1.08 :weight bold       :inherit
  ↪  markdown-header-face)
  '(markdown-header-face-4 :height 1.00 :weight bold       :inherit
  ↪  markdown-header-face)
  '(markdown-header-face-5 :height 0.90 :weight bold       :inherit
  ↪  markdown-header-face)
  '(markdown-header-face-6 :height 0.75 :weight extra-bold :inherit
  ↪  markdown-header-face))
```

5.12 Beancount

There are a number of rather compelling advantages to plain text accounting, with ledger being the most obvious example. However, beancount, a more recent implementation of the idea is ledger-compatible (meaning I can switch easily if I change my mind) and has a gorgeous front-end — fava.

Of course, there's an Emacs mode for this.

```
(package! beancount :recipe (:host github :repo "beancount/beancount-mode")
  :pin "ddd4b8725703cf17a665b56cc26a3f9f95642424")
```

```
(use-package! beancount
  :mode ("\\.beancount\\'" . beancount-mode)
  :init
  (after! nerd-icons
    (add-to-list 'nerd-icons-extension-icon-alist
                 '("beancount" nerd-icons-faicon "nf-fa-dollar" :face
                 ↪  nerd-icons-lblue))
    (add-to-list 'nerd-icons-mode-icon-alist
                 '(beancount-mode nerd-icons-faicon "nf-fa-dollar" :face
                 ↪  nerd-icons-lblue)))
  :config
  (setq beancount-electric-currency t)
  (defun beancount-bal ()
    "Run bean-report bal."
    (interactive)
    (let ((compilation-read-command nil))
      (beancount--run "bean-report"
                      (file-relative-name buffer-file-name) "bal")))
  (map! :map beancount-mode-map
        :n "TAB" #'beancount-align-to-previous-number
        :i "RET" (cmd! (newline-and-indent) (beancount-align-to-previous-number))))
```

5.13 GIMP Palette files

I like using colour schemes with Inkscape, and it uses "GIMP Palette" colour scheme definition files. It's easy to edit them by hand, but often a bit annoying as you need to keep the RGB code and hex representation in sync. Let's make that a little easier by writing a little major mode for it.

The major mode doesn't need to do much, just try to turn `rainbow-mode` on for pretty hex colours, turn off `hl-line-mode` (if required) so the `hl-line` face doesn't overshadow them, and then the most crucial part: syncing the RGB/hex colour specifications on every buffer modification.

To catch all relevant modifications, but not trigger more frequently than needed (as would happen if using `post-command-hook`, for example), `after-change-functions` is the perfect option. We can make a buffer-local addition that will sync all colours in the modified region.

```
(define-derived-mode gimp-palette-mode fundamental-mode "GIMP Palette"
  "A major mode for GIMP Palette (.gpl) files that keeps RGB and Hex colors in sync."
  (when (require 'rainbow-mode)
    (rainbow-mode 1))
  (when (bound-and-true-p hl-line-mode)
    (hl-line-mode -1))
  (add-hook 'after-change-functions #'gimp-palette-update-region nil t))
```

Now we need to implement the `gimp-palette-update-region` function. If we plan on implementing a per-line update function, this is simply a matter of calling it on each line with a few quality of life improvements:

- Batching all the changes into a single undo step (via `undo-amalgamate-change-group`)
- Working interactively with a selected region, or the whole buffer.

```
(defun gimp-palette-update-region (beg end &optional _)
  "Update each line between BEG and END with `gimp-palette-update-line'.
If run interactively without a region set, the whole buffer is affected."
  (interactive
   (if (region-active-p)
       (list (region-beginning) (region-end))
     (list (point-min) (point-max))))
  (let ((marker (prepare-change-group)))
    (unwind-protect
        (save-excursion
          (goto-char beg)
          (while (< (point) end)
            (gimp-palette-update-line)
            (forward-line 1)))
      (undo-amalgamate-change-group marker))))
```

Now we need to implement the per-line update function. This won't be a particularly short function, but it isn't complicated either. It should work as follows:

1. Check to see whether the line starts with `R G B #HEX`
2. Check that `point` is within the RGB/hex part of the linen
3. If on the hex part, parse the hex string and update the RGB to match (inserting the RGB component if it does not already exist)
4. If on the RGB part, update the hex part to match

```
(defun gimp-palette-update-line ()
  "Update the RGB and Hex colour codes on the current line.
Whichever `point' is currently on is taken as the source of truth."
  (interactive)
  (let ((column (current-column))
        (ipoint (point)))
    (beginning-of-line)
    (when (and (re-search-forward "\\=\\([0-9 ]*\\)\\(#[0-9A-Fa-f]\\{6\\}\\)" nil t)
               (<= column (length (match-string 0))))
      (cond
       ((>= column (length (match-string 1))) ; Point in #HEX
        (cl-destructuring-bind (r g b) (color-name-to-rgb (match-string 2))
          (replace-match
           (format "%3d %3d %3d "
                   (round (* 255 r))
                   (round (* 255 g))
                   (round (* 255 b)))
           nil t nil 1)))
       ((string-match-p "\\`[0-9]+ +[0-9]+ +[0-9]+\\'" (match-string 1)) ; Valid R G B
        (cl-destructuring-bind (r g b)
            (mapcar #'string-to-number
                    (save-match-data
                      (split-string (match-string 1) " +" t)))
          (replace-match
           (format "%3d %3d %3d " r g b)
           nil t nil 1)
          (replace-match
           (color-rgb-to-hex (/ r 255.0) (/ g 255.0) (/ b 255.0) 2)
           nil t nil 2)))))
    (goto-char ipoint)))
```

The last thing that's needed to make this functionality convenient is to have it automatically activate when appropriate. GIMP palette files re-use the `.gpl` extension, so `auto-mode-alist` isn't a good choice, but we can use the `magic-mode-alist` to use this mode in any file that begins with `GIMP Palette`, which is perfect for our needs.

```
(add-to-list 'magic-mode-alist (cons "\\`GIMP Palette\n" #'gimp-palette-mode))
```

5.14 Snippets

5.14.1 Latex mode

File template

```
# -*- mode: snippet -*-
# name: LaTeX template
# --
\documentclass${1:[${2:opt1,...}]}{`(tec/yas-latex-get-class-choice)`}

\title{${3:`(s-titleized-words (file-name-base (or buffer-file-name "new buffer")))`}}
\author{${4:`(user-full-name)`}}
\date{${5:`(format-time-string "%Y-%m-%d")`}}
`(if (tec/yas-latex-preamble-if) tec/yas-latex-template-preamble "")`
\begin{document}

\maketitle

$0

\end{document}
```

Deliminators

```
# name: _deliminators
# --
\left`(tec/tex-open-delim-from-char)` `%`$1 \right`(tec/tex-close-delim-from-char)` $0
```

Aligned equals

```
# key: ==
# name: aligned equals
# --
&=
```

Begin alias

```
# -*- mode: snippet -*-
# name: begin-alias
# key: beg
# type: command
# --
(doom-snippets-expand :name "begin")
```

Cases

```
# -*- mode: snippet -*-
# key: cs
# name: cases
# group: math
# condition: (texmathp)
# --
```

```
\begin{cases}
  `%`$1
\end{cases}$0
```

Code

```
# -*- mode: snippet -*-
# name: code
# --
\begin{minted}{${1:language}}
${0:`%`}
\end{minted}
```

Corollary

```
# -*- mode: snippet -*-
# name: corollary
# key: clr
# group: theorems
# --
\begin{corollary}${1:[${2:name}]}
  `%`$0
\end{corollary}
```

Definition

```
# -*- mode: snippet -*-
# name: definition
# key: def
# group: theorems
# --
\begin{definition}${1:[${2:name}]}
  `%`$0
\end{definition}
```

Deliminators

```
# -*- mode: snippet -*-
# name: deliminators
# key: @
# condition: (texmathp)
# type: command
# --
(tec/get-open-delim-char)
(yas-expand-snippet (yas-lookup-snippet "_deliminators" 'latex-mode))
```

Deliminators angle

```
# -*- mode: snippet -*-
# name: deliminators - angle <>
# key: <
# condition: (texmathp)
# type: command
# --
(setq tec/tex-last-delim-char ?\<)
(setq tec/tex-delim-dot-second nil)
(tec/tex-delim-yas-expand)
```

Deliminators bracket

```
# -*- mode: snippet -*-
# name: deliminators - bracket []
# key: [
# condition: (texmathp)
# type: command
# --
(setq tec/tex-last-delim-char ?\[)
(setq tec/tex-delim-dot-second nil)
(tec/tex-delim-yas-expand)
```

Deliminators curly

```
# -*- mode: snippet -*-
# name: deliminators - curley {}
# key: {
# condition: (texmathp)
# type: command
# --
(setq tec/tex-last-delim-char ?\{)
(setq tec/tex-delim-dot-second nil)
(tec/tex-delim-yas-expand)
```

Deliminators paren

```
# -*- mode: snippet -*-
# name: deliminators - paren ()
# key: (
# condition: (texmathp)
# type: command
# --
(setq tec/tex-last-delim-char ?\()
(setq tec/tex-delim-dot-second nil)
(tec/tex-delim-yas-expand)
```

Enumerate

```
# -*- mode: snippet -*-
# name: enumerate
# key: en
# --
\begin{enumerate}
`(if % % "  \\item ")`$0
\end{enumerate}
```

Example

```
# -*- mode: snippet -*-
# name: example
# key: eg
# group: theorems
# --
\begin{example}${1:[${2:name}]}
  `%`$0
\end{example}
```

Frac short

```
# -*- mode: snippet -*-
# key: /
# name: frac-short
# group: math
# condition: (texmathp)
# --
\frac{${1:`(or % "")`}}{$2}$0
```

Int ^

```
# -*- mode: snippet -*-
# key: int
# name: int_^
# --
\int${1:$(when (> (length yas-text) 0) "_")
}${1:$(when (> (length yas-text) 1) "{")
}${1:left}${1:$(when (> (length yas-text) 1) "}")
}${2:$(when (> (length yas-text) 0) "^")
}${2:$(when (> (length yas-text) 1) "{")
}${2:right}${2:$(when (> (length yas-text) 1) "}")} $0
```

Itemize

```
# -*- mode: snippet -*-
# name: itemize
# key: it
# uuid: it
```

```
# --
\begin{itemize}
`(if % % "  \\item ")`$0
\end{itemize}
```

Lemma

```
# -*- mode: snippet -*-
# name: lemma
# key: lmm
# group: theorems
# --
\begin{lemma}${1:[${2:name}]}
  `%`$0
\end{lemma}
```

Lim

```
# -*- mode: snippet -*-
# name: lim
# key: lim
# --
\lim_{${1:n} \to ${2:\infty}} $0
```

Mathclap

```
# -*- mode: snippet -*-
# key: mc
# name: mathclap
# group: math
# condition: (texmathp)
# --
\mathclap{`%`$1}$0
```

Prod ^

```
# key: prod
# name: prod_^
# --
\prod${1:$(when (> (length yas-text) 0) "_")
}${1:$(when (> (length yas-text) 1) "{")
}${1:i=1}${1:$(when (> (length yas-text) 1) "}")
}${2:$(when (> (length yas-text) 0) "^")
}${2:$(when (> (length yas-text) 1) "{")
}${2:n}${2:$(when (> (length yas-text) 1) "}")} $0
```

Proof

```
# -*- mode: snippet -*-
# name: proof
# key: prf
# group: theorems
# --
\begin{proof}${1:[${2:name}]}
  `%`$0
\end{proof}
```

Remark

```
# -*- mode: snippet -*-
# name: remark
# key: rmk
# group: theorems
# --
\begin{remark}${1:[${2:name}]}
  `%`$0
\end{remark}
```

Sum ^

```
# key: sum
# name: sum_^
# --
\sum${1:$(when (> (length yas-text) 0) "_")
}${1:$(when (> (length yas-text) 1) "{")
}${1:i=1}${1:$(when (> (length yas-text) 1) "}")
}${2:$(when (> (length yas-text) 0) "^")
}${2:$(when (> (length yas-text) 1) "{")
}${2:n}${2:$(when (> (length yas-text) 1) "}")} $0
```

Theorem

```
# -*- mode: snippet -*-
# name: theorem
# key: thm
# group: theorems
# --
\begin{theorem}${1:[${2:name}]}
  `%`$0
\end{theorem}
```

5.14.2 Markdown mode

File template

```
# -*- mode: snippet -*-
# name: Org template
# --
# ${1:`(s-titleized-words (file-name-base (or buffer-file-name "new buffer")))`}

$0
```

5.14.3 Org mode

File template

```
# -*- mode: snippet -*-
# name: Org template
# --
#+title: ${1:`(s-titleized-words (replace-regexp-in-string
↪  "^[0-9]\\{4\\}-[0-9][0-9]-[0-9][0-9]-" "" (file-name-base (or buffer-file-name
↪  "new buffer"))))`}
#+author: ${2:`(user-full-name)`}
#+date: ${3:`(format-time-string "%Y-%m-%d")`}

$0
```

Display maths

```
# -*- mode: snippet -*-
# name: display math
# key: M
# condition: t
# expand-env: ((yas-after-exit-snippet-hook (lambda () (org-edit-latex-fragment)
↪  (evil-insert-state) (insert "\n  \n") (left-char))))
# --
\\[`%`$0\\]
```

Elisp source

```
# -*- mode: snippet -*-
# name: elisp src
# uuid: src_elisp
# key: <el
# condition: t
# expand-env: ((yas-after-exit-snippet-hook #'org-edit-src-code))
# --
#+begin_src emacs-lisp
`%`$0
#+end_src
```

Global property

```
# -*- mode: snippet -*-
# name: Global property
# key: #+p
# condition: (> 20 (line-number-at-pos))
# --
#+property: $0
```

Header argument dir

```
# -*- mode: snippet -*-
# name: Header arg - dir
# key: d
# condition: (+yas/org-src-header-p)
# --
:dir `(file-relative-name (read-directory-name "Working directory: "))` $0
```

Header argument eval

```
# -*- mode: snippet -*-
# name: Header arg - eval
# key: v
# condition: (+yas/org-src-header-p)
# --
`(let ((out (+yas/org-prompt-header-arg :eval "Evaluate: " '("no" "query" "no-export"
↪  "query-export")))) (if out (concat ":eval " out " ") ""))`
```

Header argument export

```
# -*- mode: snippet -*-
# name: Header arg - export
# key: e
# condition: (+yas/org-src-header-p)
# --
`(let ((out (+yas/org-prompt-header-arg :exports "Exports: " '("code" "results" "both"
↪  "none")))) (if out (concat ":exports " out " ") ""))`
```

Header argument file

```
# -*- mode: snippet -*-
# name: Header arg - file
# key: f
# condition: (+yas/org-src-header-p)
# --
:file $0
```

Header argument graphics

```
# -*- mode: snippet -*-
# name: Header arg - graphics
# key: g
# condition: (+yas/org-src-header-p)
# --
:results file graphics $0
```

Header argument height

```
# -*- mode: snippet -*-
# name: Header arg - height
# key: H
# condition: (+yas/org-src-header-p)
# --
:height $0
```

Header argument noweb

```
# -*- mode: snippet -*-
# name: Header arg - noweb
# key: n
# condition: (+yas/org-src-header-p)
# --
`(let ((out (+yas/org-prompt-header-arg :noweb "NoWeb: " '("no" "yes" "tangle"
↪  "no-export" "strip-export" "eval")))) (if out (concat ":noweb " out " ") ""))`
```

Header argument output

```
# -*- mode: snippet -*-
# name: Header arg - output
# key: o
# condition: (+yas/org-src-header-p)
# --
:results output $0
```

Header argument results

```
# -*- mode: snippet -*-
# name: Header arg - results
# key: r
# condition: (+yas/org-src-header-p)
# --
`(let ((out
(string-trim-right
 (concat
  (+yas/org-prompt-header-arg :results "Result collection: " '("value " "output "))
  (+yas/org-prompt-header-arg :results "Results type: " '("table " "vector " "list "
  ↪  "verbatim " "file "))
```

```
  (+yas/org-prompt-header-arg :results "Results format: " '("code " "drawer " "html "
  ↪  "latex " "link " "graphics " "org " "pp " "raw "))
  (+yas/org-prompt-header-arg :results "Result output: " '("silent " "replace "
  ↪  "append " "prepend "))))))
  (if (string= out "") ""
  (concat ":results " out " ")))
`
```

Header argument session

```
# -*- mode: snippet -*-
# name: Header arg - session
# key: S
# condition: (+yas/org-src-header-p)
# --
:session "${1:`(file-name-base (or (buffer-file-name) "unnnamed"))`-session}" $0
```

Header argument silent

```
# -*- mode: snippet -*-
# name: Header arg - silent
# key: s
# condition: (+yas/org-src-header-p)
# --
:results silent $0
```

Header argument tangle

```
# -*- mode: snippet -*-
# name: Header arg - tangle
# key: t
# condition: (+yas/org-src-header-p)
# --
:tangle $0
```

Header argument width

```
# -*- mode: snippet -*-
# name: Header arg - width
# key: W
# condition: (+yas/org-src-header-p)
# --
:width $0
```

Header argument wrap

```
# -*- mode: snippet -*-
# name: Header arg - wrap
```

```
# key: w
# condition: (+yas/org-src-header-p)
# --
`(let ((out (+yas/org-prompt-header-arg :noweb "Wrap: " '("example" "export" "comment"
↪  "src")))) (if out (concat ":wrap " out " ") ""))`
```

Inline math

```
# -*- mode: snippet -*-
# name: inline math
# key: m
# condition: t
# expand-env: ((yas-after-exit-snippet-hook (lambda () (org-edit-latex-fragment)
↪  (evil-insert-state) (goto-char 3))))
# --
\\(`%`$0\\)
```

Property header arguments

```
# -*- mode: snippet -*-
# name: Property - header arg
# key: h
# condition: (or (looking-back "^#\\+PROPERTY:.*" (line-beginning-position))
↪  (looking-back "^#\\+property:.*" (line-beginning-position)))
# --
header-args:${1:`(or (+yas/org-most-common-no-property-lang) "?")`} $0
```

Python source

```
# -*- mode: snippet -*-
# name: python src
# uuid: src_python
# key: <py
# condition: t
# expand-env: ((yas-after-exit-snippet-hook #'org-edit-src-code))
# --
#+begin_src python
`%`$0
#+end_src
```

Source

```
# -*- mode: snippet -*-
# name: #+begin_src
# uuid: src
# key: src
# --
#+begin_src ${1:`(or (+yas/org-last-src-lang) "?")`}
```

```
`%`$0
#+end_src
```