## 2.7. Using Emacs as a Development Environment

### 2.7.1. Emacs

Emacs is a highly customizable editor—indeed, it has been customized to the point where it is more like an operating system than an editor! Many developers and sysadmins do in fact spend practically all their time working inside Emacs, leaving it only to log out.

It is impossible even to summarize everything Emacs can do here, but here are some of the features of interest to developers:

- Very powerful editor, allowing search-and-replace on both strings and regular expressions (patterns), jumping to start/end of block expression, etc, etc.
- Pull-down menus and online help.
- Language-dependent syntax highlighting and indentation.
- Completely customizable.
- You can compile and debug programs within Emacs.
- On a compilation error, you can jump to the offending line of source code.
- Friendly-ish front-end to the `info` program used for reading GNU hypertext documentation, including the documentation on Emacs itself.
- Friendly front-end to `gdb`, allowing you to look at the source code as you step through your program.

And doubtless many more that have been overlooked.

Emacs can be installed on FreeBSD using the *editors/emacs* port.

Once it is installed, start it up and do `C-h t` to read an Emacs tutorial—that means hold down **control**, press **h**, let go of **control**, and then press **t**. (Alternatively, you can use the mouse to select **Emacs Tutorial** from the **Help** menu.)

Although Emacs does have menus, it is well worth learning the key bindings, as it is much quicker when you are editing something to press a couple of keys than to try to find the mouse and then click on the right place. And, when you are talking to seasoned Emacs users, you will find they often casually throw around expressions like “`M-x replace-s RET foo RET bar RET`” so it is useful to know what they mean. And in any case, Emacs has far too many useful functions for them to all fit on the menu bars.

Fortunately, it is quite easy to pick up the key-bindings, as they are displayed next to the menu item. My advice is to use the menu item for, say, opening a file until you understand how it works and feel confident with it, then try doing C-x C-f. When you are happy with that, move on to another menu command.

If you cannot remember what a particular combination of keys does, select **Describe Key** from the **Help** menu and type it in—Emacs will tell you what it does. You can also use the **Command Apropos** menu item to find out all the commands which contain a particular word in them, with the key binding next to it.

By the way, the expression above means hold down the Meta key, press x, release the Meta key, type **`replace-s`** (short for `replace-string`—another feature of Emacs is that you can abbreviate commands), press the return key, type **`foo`** (the string you want replaced), press the return key, type bar (the string you want to replace `foo` with) and press return again. Emacs will then do the search-and-replace operation you have just requested.

If you are wondering what on earth Meta is, it is a special key that many UNIX® workstations have. Unfortunately, PC's do not have one, so it is usually **alt** (or if you are unlucky, the escape key).

Oh, and to get out of Emacs, do `C-x C-c` (that means hold down the control key, press x, press c and release the control key). If you have any unsaved files open, Emacs will ask you if you want to save them. (Ignore the bit in the documentation where it says `C-z` is the usual way to leave Emacs—that leaves Emacs hanging around in the background, and is only really useful if you are on a system which does not have virtual terminals).

### 2.7.2. Configuring Emacs

Emacs does many wonderful things; some of them are built in, some of them need to be configured.

Instead of using a proprietary macro language for configuration, Emacs uses a version of Lisp specially adapted for editors, known as Emacs Lisp. Working with Emacs Lisp can be quite helpful if you want to go on and learn something like Common Lisp. Emacs Lisp has many features of Common Lisp, although it is considerably smaller (and thus easier to master).

The best way to learn Emacs Lisp is to download the Emacs Tutorial

However, there is no need to actually know any Lisp to get started with configuring Emacs, as I have included a sample `.emacs`, which should be enough to get you started. Just copy it into your home directory and restart Emacs if it is already running; it will read the commands from the file and (hopefully) give you a useful basic setup.

### 2.7.3. A Sample `.emacs`

Unfortunately, there is far too much here to explain it in detail; however there are one or two points worth mentioning.

- Everything beginning with a `;` is a comment and is ignored by Emacs.
- In the first line, the `-*- Emacs-Lisp -*-` is so that we can edit `.emacs` itself within Emacs and get all the fancy features for editing Emacs Lisp. Emacs usually tries to guess this based on the filename, and may not get it right for `.emacs`.
- The tab key is bound to an indentation function in some modes, so when you press the tab key, it will indent the current line of code. If you want to put a tab character in whatever you are writing, hold the control key down while you are pressing the tab key.
- This file supports syntax highlighting for C, C++, Perl, Lisp and Scheme, by guessing the language from the filename.
- Emacs already has a pre-defined function called `next-error`. In a compilation output window, this allows you to move from one compilation error to the next by doing `M-n`; we define a complementary function, `previous-error`, that allows you to go to a previous error by doing `M-p`. The nicest feature of all is that `C-c C-c` will open up the source file in which the error occurred and jump to the appropriate line.
- We enable Emacs's ability to act as a server, so that if you are doing something outside Emacs and you want to edit a file, you can just type in

  ```
  % emacsclient filename
  ```

  and then you can edit the file in your Emacs![6]

**Example 2.1. A Sample `.emacs`**

```
;; -*-Emacs-Lisp-*-

;; This file is designed to be re-evaled; use the variable first-time
;; to avoid any problems with this.
(defvar first-time t
  "Flag signifying this is the first time that .emacs has been evaled")

;; Meta
(global-set-key "\M- " 'set-mark-command)
(global-set-key "\M-\C-h" 'backward-kill-word)
(global-set-key "\M-\C-r" 'query-replace)
(global-set-key "\M-r" 'replace-string)
(global-set-key "\M-g" 'goto-line)
(global-set-key "\M-h" 'help-command)

;; Function keys
(global-set-key [f1] 'manual-entry)
(global-set-key [f2] 'info)
(global-set-key [f3] 'repeat-complex-command)
(global-set-key [f4] 'advertised-undo)
(global-set-key [f5] 'eval-current-buffer)
(global-set-key [f6] 'buffer-menu)
```

```
(global-set-key [f7] 'other-window)
(global-set-key [f8] 'find-file)
(global-set-key [f9] 'save-buffer)
(global-set-key [f10] 'next-error)
(global-set-key [f11] 'compile)
(global-set-key [f12] 'grep)
(global-set-key [C-f1] 'compile)
(global-set-key [C-f2] 'grep)
(global-set-key [C-f3] 'next-error)
(global-set-key [C-f4] 'previous-error)
(global-set-key [C-f5] 'display-faces)
(global-set-key [C-f8] 'dired)
(global-set-key [C-f10] 'kill-compilation)

;; Keypad bindings
(global-set-key [up] "\C-p")
(global-set-key [down] "\C-n")
(global-set-key [left] "\C-b")
(global-set-key [right] "\C-f")
(global-set-key [home] "\C-a")
(global-set-key [end] "\C-e")
(global-set-key [prior] "\M-v")
(global-set-key [next] "\C-v")
(global-set-key [C-up] "\M-\C-b")
(global-set-key [C-down] "\M-\C-f")
(global-set-key [C-left] "\M-b")
(global-set-key [C-right] "\M-f")
(global-set-key [C-home] "\M-<")
(global-set-key [C-end] "\M->")
(global-set-key [C-prior] "\M-<")
(global-set-key [C-next] "\M->")

;; Mouse
(global-set-key [mouse-3] 'imenu)

;; Misc
(global-set-key [C-tab] "\C-q\t")       ; Control tab quotes a tab.
(setq backup-by-copying-when-mismatch t)

;; Treat 'y' or <CR> as yes, 'n' as no.
(fset 'yes-or-no-p 'y-or-n-p)
(define-key query-replace-map [return] 'act)
(define-key query-replace-map [?\C-m] 'act)

;; Load packages
(require 'desktop)
(require 'tar-mode)

;; Pretty diff mode
(autoload 'ediff-buffers "ediff" "Intelligent Emacs interface to diff" t)
(autoload 'ediff-files "ediff" "Intelligent Emacs interface to diff" t)
(autoload 'ediff-files-remote "ediff"
  "Intelligent Emacs interface to diff")

(if first-time
    (setq auto-mode-alist
          (append '(("\\.cpp$" . c++-mode)
                    ("\\.hpp$" . c++-mode)
                    ("\\.lsp$" . lisp-mode)
                    ("\\.scm$" . scheme-mode)
                    ("\\.pl$" . perl-mode)
                    ) auto-mode-alist)))

;; Auto font lock mode
(defvar font-lock-auto-mode-list
  (list 'c-mode 'c++-mode 'c++-c-mode 'emacs-lisp-mode 'lisp-mode 'perl-mode 'scheme-mode)
  "List of modes to always start in font-lock-mode")

(defvar font-lock-mode-keyword-alist
  '((c++-c-mode . c-font-lock-keywords)
    (perl-mode . perl-font-lock-keywords))
  "Associations between modes and keywords")

(defun font-lock-auto-mode-select ()
  "Automatically select font-lock-mode if the current major mode is in font-lock-auto-mode-list"
  (if (memq major-mode font-lock-auto-mode-list)
      (progn
        (font-lock-mode t))
    )
  )

(global-set-key [M-f1] 'font-lock-fontify-buffer)

;; New dabbrev stuff
;(require 'new-dabbrev)
(setq dabbrev-always-check-other-buffers t)
(setq dabbrev-abbrev-char-regexp "\\sw\\|\\s_")
(add-hook 'emacs-lisp-mode-hook
          '(lambda ()
             (set (make-local-variable 'dabbrev-case-fold-search) nil)
             (set (make-local-variable 'dabbrev-case-replace) nil)))
(add-hook 'c-mode-hook
          '(lambda ()
             (set (make-local-variable 'dabbrev-case-fold-search) nil)
             (set (make-local-variable 'dabbrev-case-replace) nil)))
(add-hook 'text-mode-hook
          '(lambda ()
             (set (make-local-variable 'dabbrev-case-fold-search) t)
             (set (make-local-variable 'dabbrev-case-replace) t)))

;; C++ and C mode...
(defun my-c++-mode-hook ()
  (setq tab-width 4)
  (define-key c++-mode-map "\C-m" 'reindent-then-newline-and-indent)
  (define-key c++-mode-map "\C-ce" 'c-comment-edit)
  (setq c++-auto-hungry-initial-state 'none)
  (setq c++-delete-function 'backward-delete-char)
  (setq c++-tab-always-indent t)
  (setq c-indent-level 4)
  (setq c-continued-statement-offset 4)
  (setq c++-empty-arglist-indent 4))

(defun my-c-mode-hook ()
  (setq tab-width 4)
  (define-key c-mode-map "\C-m" 'reindent-then-newline-and-indent)
  (define-key c-mode-map "\C-ce" 'c-comment-edit)
  (setq c-auto-hungry-initial-state 'none)
  (setq c-delete-function 'backward-delete-char)
  (setq c-tab-always-indent t)
;; BSD-ish indentation style
  (setq c-indent-level 4)
  (setq c-continued-statement-offset 4)
  (setq c-brace-offset -4)
  (setq c-argdecl-indent 0)
  (setq c-label-offset -4))

;; Perl mode
(defun my-perl-mode-hook ()
  (setq tab-width 4)
  (define-key c++-mode-map "\C-m" 'reindent-then-newline-and-indent)
  (setq perl-indent-level 4)
  (setq perl-continued-statement-offset 4))

;; Scheme mode...
(defun my-scheme-mode-hook ()
  (define-key scheme-mode-map "\C-m" 'reindent-then-newline-and-indent))

;; Emacs-Lisp mode...
(defun my-lisp-mode-hook ()
  (define-key lisp-mode-map "\C-m" 'reindent-then-newline-and-indent)
  (define-key lisp-mode-map "\C-i" 'lisp-indent-line)
  (define-key lisp-mode-map "\C-j" 'eval-print-last-sexp))

;; Add all of the hooks...
(add-hook 'c++-mode-hook 'my-c++-mode-hook)
(add-hook 'c-mode-hook 'my-c-mode-hook)
(add-hook 'scheme-mode-hook 'my-scheme-mode-hook)
(add-hook 'emacs-lisp-mode-hook 'my-lisp-mode-hook)
(add-hook 'lisp-mode-hook 'my-lisp-mode-hook)
(add-hook 'perl-mode-hook 'my-perl-mode-hook)

;; Complement to next-error
(defun previous-error (n)
  "Visit previous compilation error message and corresponding source code."
  (interactive "p")
  (next-error (- n)))

;; Misc...
(transient-mark-mode 1)
(setq mark-even-if-inactive t)
(setq visible-bell nil)
(setq next-line-add-newlines nil)
(setq compile-command "make")
(setq suggest-key-bindings nil)
(put 'eval-expression 'disabled nil)
(put 'narrow-to-region 'disabled nil)
(put 'set-goal-column 'disabled nil)
(if (>= emacs-major-version 21)
        (setq show-trailing-whitespace t))

;; Elisp archive searching
(autoload 'format-lisp-code-directory "lispdir" nil t)
(autoload 'lisp-dir-apropos "lispdir" nil t)
(autoload 'lisp-dir-retrieve "lispdir" nil t)
(autoload 'lisp-dir-verify "lispdir" nil t)

;; Font lock mode
(defun my-make-face (face color &optional bold)
  "Create a face from a color and optionally make it bold"
  (make-face face)
  (copy-face 'default face)
  (set-face-foreground face color)
  (if bold (make-face-bold face))
  )

(if (eq window-system 'x)
    (progn
      (my-make-face 'blue "blue")
      (my-make-face 'red "red")
      (my-make-face 'green "dark green")
      (setq font-lock-comment-face 'blue)
      (setq font-lock-string-face 'bold)
      (setq font-lock-type-face 'bold)
      (setq font-lock-keyword-face 'bold)
      (setq font-lock-function-name-face 'red)
      (setq font-lock-doc-string-face 'green)
      (add-hook 'find-file-hooks 'font-lock-auto-mode-select)

      (setq baud-rate 1000000)
      (global-set-key "\C-cmm" 'menu-bar-mode)
      (global-set-key "\C-cms" 'scroll-bar-mode)
      (global-set-key [backspace] 'backward-delete-char)
                                  ;      (global-set-key [delete] 'delete-char)
      (standard-display-european t)
      (load-library "iso-transl")))

;; X11 or PC using direct screen writes
(if window-system
    (progn
      ;;      (global-set-key [M-f1] 'hilit-repaint-command)
      ;;      (global-set-key [M-f2] [?\C-u M-f1])
      (setq hilit-mode-enable-list
            '(not text-mode c-mode c++-mode emacs-lisp-mode lisp-mode
                  scheme-mode)
            hilit-auto-highlight nil
            hilit-auto-rehighlight 'visible
            hilit-inhibit-hooks nil
            hilit-inhibit-rebinding t)
      (require 'hilit19)
      (require 'paren))
  (setq baud-rate 2400)                 ; For slow serial connections
  )

;; TTY type terminal
(if (and (not window-system)
         (not (equal system-type 'ms-dos)))
    (progn
      (if first-time
          (progn
            (keyboard-translate ?\C-h ?\C-?)
            (keyboard-translate ?\C-? ?\C-h)))))

;; Under UNIX
(if (not (equal system-type 'ms-dos))
    (progn
      (if first-time
          (server-start))))

;; Add any face changes here
(add-hook 'term-setup-hook 'my-term-setup-hook)
(defun my-term-setup-hook ()
  (if (eq window-system 'pc)
      (progn
;;      (set-face-background 'default "red")
        )))

;; Restore the "desktop" - do this as late as possible
(if first-time
    (progn
      (desktop-load-default)
      (desktop-read)))

;; Indicate that this file has been read at least once
(setq first-time nil)

;; No need to debug anything now

(setq debug-on-error nil)

;; All done
(message "All done, %s%s" (user-login-name) ".")
```

### 2.7.4. Extending the Range of Languages Emacs Understands

Now, this is all very well if you only want to program in the languages already catered for in .emacs (C, C++, Perl, Lisp and Scheme), but what happens if a new language called “whizbang” comes out, full of exciting features?

The first thing to do is find out if whizbang comes with any files that tell Emacs about the language. These usually end in .el, short for “Emacs Lisp”. For example, if whizbang is a FreeBSD port, we can locate these files by doing

```
% find /usr/ports/lang/whizbang -name "*.el" -print
```

and install them by copying them into the Emacs site Lisp directory. On FreeBSD, this is /usr/local/share/emacs/site-lisp.

So for example, if the output from the find command was

```
/usr/ports/lang/whizbang/work/misc/whizbang.el
```

we would do

```
# cp /usr/ports/lang/whizbang/work/misc/whizbang.el /usr/local/share/emacs/site-lisp
```

Next, we need to decide what extension whizbang source files have. Let us say for the sake of argument that they all end in .wiz. We need to add an entry to our .emacs to make sure Emacs will be able to use the information in whizbang.el.

Find the auto-mode-alist entry in .emacs and add a line for whizbang, such as:

```
…
("\\.lsp$" . lisp-mode)
("\\.wiz$" . whizbang-mode)
("\\.scm$" . scheme-mode)
…
```

This means that Emacs will automatically go into whizbang-mode when you edit a file ending in .wiz.

Just below this, you will find the font-lock-auto-mode-list entry. Add whizbang-mode to it like so:

```
;; Auto font lock mode
(defvar font-lock-auto-mode-list
  (list 'c-mode 'c++-mode 'c++-c-mode 'emacs-lisp-mode 'whizbang-mode 'lisp-mode 'perl-mode 'scheme-mode)
  "List of modes to always start in font-lock-mode")
```

This means that Emacs will always enable font-lock-mode (ie syntax highlighting) when editing a .wiz file.

And that is all that is needed. If there is anything else you want done automatically when you open up .wiz, you can add a whizbang-mode hook (see my-scheme-mode-hook for a simple example that adds auto-indent).

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[6] Many Emacs users set their EDITOR environment to emacsclient so this happens every time they need to edit a file.

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