

NAME

clisp – [ANSI](#)^[38] [Common Lisp](#)^[1] compiler, interpreter and debugger.

SYNOPSIS

```
clisp [[-h] | [--help]] [--version] [--license] [--help-image] [-B lisp-lib-dir] [-b] [-K linking-set]
      [-M mem-file] [-m memory-size] [-L language] [-N locale-dir] [-E domain encoding] [[-q] |
      [--quiet] | [--silent] | [-v] | [--verbose]] [--on-error action] [-repl] [-w] [-I]
      [--disable-readline] [[-ansi] | [--traditional]] [--modern] [-p package] [-C] [--norc]
      [-lp directory...] [-i init-file...] [-c [-I] lisp-file [-o output-file...] [-x expressions...]
      [lisp-file [argument...]]
```

DESCRIPTION

Invokes the [Common Lisp](#)^[1] interpreter and compiler.

Interactive Mode

When called without arguments, executes the [read-eval-print loop](#)^[2], in which expressions are in turn

- [READ](#)^[3] from the standard input,
- [EVAL](#)^[4]uated by the lisp interpreter,
- and their results are [PRINT](#)^[5]ed to the standard output.

Non-Interactive (Batch) Mode

Invoked with `-c`, compiles the specified lisp files to a platform-independent bytecode which can be executed more efficiently.

Invoked with `-x`, executes the specified lisp expressions.

Invoked with `lisp-file`, runs the specified lisp file.

OPTIONS

`-h`

`--help`

Displays a help message on how to invoke [CLISP](#)^[6].

`--version`

Displays the [CLISP](#)^[6] version number, as given by the function

[LISP-IMPLEMENTATION-VERSION](#)^[7], the value of the variable `*FEATURES*`, as well some other information.

`--license`

Displays a summary of the licensing information, the [GNU](#)^[8] [GPL](#)^[9].

`--help-image`

Displays information about the memory image being invoked: whether is it suitable for scripting as well as the `:DOCUMENTATION` supplied to `EXT:SAVEINITMEM`.

`-B lisp-lib-dir`

Specifies the installation directory. This is the directory containing the linking sets and other data files. This option is normally not necessary, because the installation directory is already built-in into the `clisp` executable. Directory `lisp-lib-dir` can be changed dynamically using the [SYMBOL-MACRO](#)^[10] `CUSTOM:*LIB-DIRECTORY*`.

`-b`

Print the installation directory and exit immediately. The namestring of `CUSTOM:*LIB-DIRECTORY*` is printed without any quotes. This is mostly useful in module Makefiles, see, e.g., `modules/syscalls/Makefile.in` (file in the CLISP sources).

`-K linking-set`

Specifies the linking set to be run. This is a directory (relative to the `lisp-lib-dir`) containing at least a main executable (runtime) and an initial memory image. Possible values are

`base`

the core [CLISP](#)^[6]

full

core plus all the modules with which this installation was built, see Section 32.2, “External Modules”.

The default is **base**.

-M *mem-file*

Specifies the initial memory image. This must be a memory dump produced by the

EXT:SAVEINITMEM function by this **clisp** runtime. It may have been compressed using **GNU**^[8] **gzip**^[11].

-m *memory-size*

Sets the amount of memory **CLISP**^[6] tries to grab on startup. The amount may be given as

n

nB

measured in bytes

n

nW

measured in machine words (4×*n* on 32-bit platforms, 8×*n* on 64-bit platforms)

nK

nKB

measured in kilobytes

nKW

measured in kilowords

nM

nMB

measured in megabytes

nMW

measured in megawords

The default is 3 megabytes. The argument is constrained above 100 KB.

This version of **CLISP**^[6] is not likely to actually use the entire *memory-size* since garbage-collection will periodically reduce the amount of used memory. It is therefore common to specify 10 MB even if only 2 MB are going to be used.

-L *language*

Specifies the language **CLISP**^[6] uses to communicate with the user. This may be one of **english**, **german**, **french**, **spanish**, **dutch**, **russian**, **danish**. Other languages may be specified through the **environment variable**^[12] **LANG**, provided the corresponding message catalog is installed. The language may be changed dynamically using the **SYMBOL-MACRO**^[10] **CUSTOM: *CURRENT-LANGUAGE***.

-N *locale-dir*

Specifies the base directory of locale files. **CLISP**^[6] will search its message catalogs in *locale-dir/language/LC_MESSAGES/clisp.mo*. This directory may be changed dynamically using the **SYMBOL-MACRO**^[10] **CUSTOM: *CURRENT-LANGUAGE***.

-E *domain encoding*

Specifies the encoding used for the given domain, overriding the default which depends on the **environment variable**^[12] **LC_ALL**, **LC_CTYPE**, **LANG**. *domain* can be

file

affecting **CUSTOM: *DEFAULT-FILE-ENCODING***

pathname

affecting *CUSTOM: *PATHNAME-ENCODING**

terminal

affecting *CUSTOM: *TERMINAL-ENCODING**

foreign

affecting *CUSTOM: *FOREIGN-ENCODING**

misc

affecting *CUSTOM: *MISC-ENCODING**

blank

affecting all of the above.

Warning

Note that the values of these **SYMBOL-MACRO**^[10]s that have been saved in a memory image are ignored: these **SYMBOL-MACRO**^[10]s are reset based on the OS environment **after** the memory image is loaded.

You have to use the RC file, *CUSTOM: *INIT-HOOKS** or init function to set them on startup, but it is best to set the aforementioned **environment variable**^[12]s appropriately for consistency with other programs. See Section 31.1, “Customizing CLISP Process Initialization and Termination”.

-q

--quiet

--silent

-v

--verbose

Change verbosity level: by default, **CLISP**^[6] displays a banner at startup and a good-bye message when quitting, and initializes **LOAD-VERBOSE**^[13] and **COMPILE-VERBOSE**^[14] to **T**^[15], and **LOAD-PRINT**^[13] and **COMPILE-PRINT**^[14] to **NIL**^[16], as per [ANSI CL standard]. The first **-q** removes the banner and the good-bye message, the second sets variables **LOAD-VERBOSE**^[13], **COMPILE-VERBOSE**^[14] and *CUSTOM: *SAVEINITMEM-VERBOSE** to **NIL**^[16]. The first **-v** sets variables *CUSTOM: *REPORT-ERROR-PRINT-BACKTRACE**, **LOAD-PRINT**^[13] and **COMPILE-PRINT**^[14] to **T**^[15], the second sets *CUSTOM: *LOAD-ECHO** to **T**^[15]. These settings affect the output produced by **-i** and **-c** options. Note that these settings persist into the **read-eval-print loop**^[2]. Repeated **-q** and **-v** cancel each other, e.g., **-q -q -v -v -v** is equivalent to **-v**.

-on-error action

Establish global error handlers, depending on *action*: PP appease

continuable^[17] **ERROR**^[18]s are turned into **WARNING**^[19]s (with **EXT:APPEASE-CERRORS**) other **ERROR**^[18]s are handled in the default way

debug

ERROR^[18]s **INVOKE-DEBUGGER**^[20] (the normal **read-eval-print loop**^[2] behavior), disables batch mode imposed by **-c**, **-x**, and *lisp-file*,

abort

continuable^[17] **ERROR**^[18]s are appeased, other **ERROR**^[18]s are **ABORT**^[21]ed with **EXT:ABORT-ON-ERROR**

exit

continuable^[17] **ERROR**^[18]s are appeased, other **ERROR**^[18]s terminate **CLISP**^[6] with **EXT:EXIT-ON-ERROR** (the normal batch mode behavior).

See also **EXT:SET-GLOBAL-HANDLER**.

-repl

Start an interactive **read-eval-print loop**^[2] after processing the **-c**, **-x**, and *lisp-file* options and on any **ERROR**^[18] **SIGNAL**^[22]ed during that processing.

Disables batch mode.

-w

Wait for a keypress after program termination.

-I

Interact better with **Emacs**^[23] (useful when running **CLISP**^[6] under **Emacs**^[23] using **SLIME**^[24], **ILISP**^[25] et al). With this option, **CLISP**^[6] interacts in a way that **Emacs**^[23] can deal with:

- unnecessary prompts are not suppressed.
- The **GNU**^[8] **readline**^[26] library treats TAB (see TAB key) as a normal self-inserting character (see Q: A.4.6).

-disable-readline

Do not use **GNU**^[8] **readline**^[26] even when it has been linked against. This can be used if one wants to paste non-**ASCII**^[27] characters, or when **GNU**^[8] **readline**^[26] misbehaves due to installation (different versions on the build and install machines) or setup (bad **TERM environment variable**^[12] value) issues.

-ansi

Comply with the [ANSI CL standard] specification even where **CLISP**^[6] has been traditionally different by setting the **SYMBOL-MACRO**^[10] **CUSTOM: *ANSI*** to **T**^[15].

-traditional

Traditional: reverses the residual effects of **-ansi** in the saved memory image.

-modern

Provides a modern view of symbols: at startup the ***PACKAGE***^[28] variable will be set to the "CS-COMMON-LISP-USER" package, and the ***PRINT-CASE***^[29] will be set to **:DOWNCASE**. This has the effect that symbol lookup is case-sensitive (except for keywords and old-style packages) and that keywords and uninterned symbols are printed with lower-case preference. See Section 11.5, "Package Case-Sensitivity".

-p package

At startup the value of the variable ***PACKAGE***^[28] will be set to the package named *package*. The default is the value of ***PACKAGE***^[28] when the image was saved, normally **"COMMON-LISP-USER"**^[30].

-C

Compile when loading: at startup the value of the variable **CUSTOM: *LOAD-COMPILING*** will be set to **T**^[15]. Code being **LOAD**^[31]ed will then be **COMPILE**^[32]d on the fly. This results in slower loading, but faster execution.

-norc

Normally **CLISP**^[6] loads the user **"run control" (RC)**^[33] file on startup (this happens **after** the **-C** option is processed). The file loaded is .clisprc.lisp or .clisprc.fas in the home directory **USER-HOMEDIR-PATHNAME**^[34], whichever is newer. This option, **-norc**, prevents loading of the RC file.

-lp directory

Specifies directories to be added to **CUSTOM: *LOAD-PATHS*** at startup. This is done **after** loading the RC file (so that it does not override the command-line option) but **before** loading the init-files specified by the **-i** options (so that the init-files will be searched for in the specified directories). Several **-lp** options can be given; all the specified directories will be added.

-i init-file

Specifies initialization files to be **LOAD**^[31]ed at startup. These should be lisp files (source or compiled). Several **-i** options can be given; all the specified files will be loaded in order.

-c lisp-file

Compiles the specified *lisp-files* to bytecode (*.fas). The compiled files can then be **LOAD**^[31]ed instead of the sources to gain efficiency.

Imposes batch mode.

-o *outputfile*

Specifies the output file or directory for the compilation of the last specified *lisp-file*.

-l

Produce a bytecode **DISASSEMBLE**^[35] listing (*.lis) of the files being compiled. Useful only for debugging. See Section 24.1, “Function COMPILE-FILE” for details.

-x *expressions*

Executes a series of arbitrary expressions instead of a **read-eval-print loop**^[2]. The values of the expressions will be output to ***STANDARD-OUTPUT***^[36]. Due to the argument processing done by the shell, the *expressions* must be enclosed in double quotes, and double quotes and backslashes must be escaped with backslashes.

Imposes batch mode.

lisp-file [*argument* ...]

Loads and executes a *lisp-file*, as described in Section 32.6.2, “Scripting with CLISP”. There will be no **read-eval-print loop**^[2]. Before *lisp-file* is loaded, the variable **EXT: *ARGS*** will be bound to a list of strings, representing the *arguments*. The first line of *lisp-file* may start with **#!**, thus permitting **CLISP**^[6] to be used as a script interpreter. If *lisp-file* is **-**, the ***STANDARD-INPUT***^[36] is used instead of a file.

This option is *disabled* if the memory image was created by **EXT:SAVEINITMEM** with **NIL**^[16] **:SCRIPT** argument. In that case the **LIST**^[37] **EXT: *ARGS*** starts with *lisp-file*.

This option must be the last one.

No RC file will be executed.

Imposes batch mode.

As usual, **--** stops option processing and places all remaining command line arguments into **EXT: *ARGS***.

LANGUAGE REFERENCE

The language implemented is **ANSI**^[39]^[38] **Common Lisp**^[1]. The implementation mostly conforms to the ANSI Common Lisp standard, see Section 31.10, “Maximum ANSI CL compliance”. [ANSI CL] ANSI CL standard 1994. ANSI INCITS 226-1994 (R1999)

Information Technology – Programming Language – Common Lisp^[40]
[formerly ANSI X3.226-1994 (R1999)].

COMMAND LINE USER ENVIRONMENT

help

get context-sensitive on-line help, see Chapter 25, Environment.

(APROPOS *name*)

list the **SYMBOL**^[41]s matching *name*.

(DESCRIBE *symbol*)

describe the *symbol*.

(exit)

(quit)

(bye)

quit **CLISP**^[6].

EOF (Control+D on **UNIX**^[42])

leave the current level of the **read-eval-print loop**^[2] (see also Section 1.1, “Special Symbols”).

arrow keys

for editing and viewing the input history, using the **GNU**^[8] **readline**^[26] library.

TAB key

Context sensitive:

- If you are in the “function position” (in the first symbol after an opening paren or in the first symbol after a `#`^[44]), the completion is limited to the symbols that name functions.
- If you are in the “filename position” (inside a string after `#P`^[45]), the completion is done across file names, **GNU**^[8] **bash**^[46]–style.
- If you have not typed anything yet, you will get a help message, as if by the **help** command.
- If you have not started typing the next symbol (i.e., you are at a whitespace), the current function or macro is **DESCRIBED**.
- Otherwise, the symbol you are currently typing is completed.

USING AND EXTENDING CLISP

Common Lisp^[1] is a *programmable* programming language. —**John Foderaro**^[47].PP When **CLISP**^[6] is invoked, the runtime loads the initial memory image and outputs the prompt; at which one can start typing **DEFVAR**^[48]s, **DEFUN**^[49]s and **DEFMACRO**^[50]s.

To avoid having to re–enter the same definitions by hand in every session, one can create a lisp file with all the variables, functions, macros, etc.; (optionally) compile it with **COMPILE-FILE**^[51]; and **LOAD**^[31] it either by hand or from the RC file; or save a memory image to avoid the **LOAD**^[31] overhead.

However, sometimes one needs to use some functionality implemented in another language, e.g., call a **C**^[52] library function. For that one uses the Foreign Function Interface and/or the External Modules facility. Finally, the truly adventurous ones might delve into Extending the Core.

FILES

clisp**clisp.exe**

startup driver (an executable or, rarely, a shell script) which remembers the location of the runtime and starts it with the appropriate arguments

lisp.run

lisp.exe

main executable (runtime) – the part of **CLISP**^[6] implemented in **C**^[52].

lispinit.mem

initial memory image (the part of **CLISP**^[6] implemented in lisp)

config.lisp

site–dependent configuration (should have been customized before **CLISP**^[6] was built); see Section 31.12, “Customizing CLISP behavior”

*.lisp

lisp source

*.fas

lisp code, compiled by **CLISP**^[6]

*.lib

lisp source library information, generated by **COMPILE-FILE**, see Section 24.3, “Function REQUIRE”.

*.c

C code, compiled from lisp source by **CLISP**^[6] (see Section 32.3, “The Foreign Function Call Facility”)

For the **CLISP**^[6] source files, see Chapter 34, The source files of CLISP.

ENVIRONMENT

All **environment variable**^[12]s that **CLISP**^[6] uses are read at most once.

CLISP_LANGUAGE

specifies the language **CLISP**^[6] uses to communicate with the user. The legal values are identical to those of the **-L** option which can be used to override this **environment variable**^[12].

LC_CTYPE

specifies the locale which determines the character set in use. The value can be of the form *language* or *language_country* or *language_country.charset*, where *language* is a two-letter ISO 639 language code (lower case), *country* is a two-letter ISO 3166 country code (upper case). *charset* is an optional character set specification, and needs normally not be given because the character set can be inferred from the language and country. This **environment variable**^[12] can be overridden with the **-Edomain encoding** option.

LANG

specifies the language **CLISP**^[6] uses to communicate with the user, unless it is already specified through the **environment variable**^[12] **CLISP_LANGUAGE** or the **-L** option. It also specifies the locale determining the character set in use, unless already specified through the **environment variable**^[12] **LC_CTYPE**. The value may begin with a two-letter ISO 639 language code, for example **en**, **de**, **fr**.

HOME

USER

used for determining the value of the function **USER-HOMEDIR-PATHNAME**^[34].

SHELL

COMSPEC

is used to find the interactive command interpreter called by **EXT:SHELL**.

TERM

determines the screen size recognized by the pretty printer.

ORGANIZATION

for **SHORT-SITE-NAME**^[53] and **LONG-SITE-NAME**^[53] in **config.lisp**.

CLHSROOT

for **CUSTOM:CLHS-ROOT** in **config.lisp**.

IMPNOTES

for **CUSTOM:IMPNOTES-ROOT** in **config.lisp**.

EDITOR

for **editor-name** in **config.lisp**.

LOGICAL_HOST_host_FROM

LOGICAL_HOST_host_TO

LOGICAL_HOST_host

for **CUSTOM:*LOAD-LOGICAL-PATHNAME-TRANSLATIONS-DATABASE***

INPUT AND OUTUT

See Section 21.1.1, “Initialization of Standard Streams”.

SEE ALSO

CLISP impnotes
clisp-link(1)
CMU CL^[54] – **cmucl**(1)
Emacs^[23] – **emacs**(1)
XEmacs^[55] – **xemacs**(1)

BUGS

When you encounter a bug in **CLISP**^[6] or in its documentation (this manual page or CLISP impnotes), please report it to the **CLISP**^[6] **SourceForge bug tracker**^[56].

Before submitting a bug report, please take the following basic steps to make the report more useful:

1. Please do a clean build (remove your build directory and build **CLISP**^[6] with **./configure --cbc build** or at least do a **make distclean** before **make**).
2. If you are reporting a “hard crash” (segmentation fault, bus error, core dump etc), please do **./configure --with-debug --cbc build-g ; cd build-g; gdb lisp.run**, then load the appropriate linking set by either **base** or **full gdb**^[57] command, and report the backtrace (see also Q: A.1.1.10).
3. If you are using pre-built binaries and experience a hard crash, the problem is likely to be in the incompatibilities between the platform on which the binary was built and yours; please try compiling the sources and report the problem if it persists.

When submitting a bug report, please specify the following information:

1. What is your platform (**uname -a** on a **UNIX**^[42] system)? Compiler version? **GNU**^[8] **libc**^[58] version (on **GNU**^[8]/**Linux**^[59])?
2. Where did you get the sources or binaries? When? (Absolute dates, e.g., “2006-01-17”, are preferred over the relative ones, e.g., “2 days ago”).
3. How did you build **CLISP**^[6]? (What command, options &c.)
4. What is the output of **clisp --version**?
5. Please supply the full output (copy and paste) of all the error messages, as well as detailed instructions on how to reproduce them.

PROJECTS

- Enhance the compiler so that it can inline local functions.
- Embed **CLISP**^[6] in **VIM**^[60].

AUTHORS

Bruno Haible <<http://www.haible.de/bruno/>>

The original author and long-time maintainer.

Michael Stoll <<http://www.faculty.iu-bremen.de/mstoll/>>

The original author.

Sam Steingold <<http://sds.podval.org/>>

Co-maintainer since 1998.

Others

See *COPYRIGHT (file in the CLISP sources)* for the list of other contributors and the license.

COPYRIGHT

Copyright © 1992-2010 Bruno Haible

Copyright © 1998-2010 Sam Steingold

NOTES

1. **Common Lisp**
<http://www.lisp.org>
2. read-eval-print loop
[set \$man.base.url.for.relative.links]/sec_25-1-1
3. **READ**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_readcm_re_g-whitespace.html
4. **EVAL**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_eval.html
5. **PRINT**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_writcm_p_rintcm_princ.html

6. **CLISP**
<http://clisp.cons.org>
7. **LISP-IMPLEMENTATION-VERSION**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_lisp-impl_tion-version.html
8. GNU
<http://www.gnu.org>
9. GPL
<http://www.gnu.org/copyleft/gpl.html>
10. SYMBOL-MACRO
[set \$man.base.url.for.relative.links]/mac_define-symbol-macro
11. **gzip**
<http://www.gzip.org/>
12. environment variable
[set \$man.base.url.for.relative.links]/basedefs/xbd_chap08.html
13. **LOAD-VERBOSE**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/var_stload-pr_ad-verboseest.html
14. **COMPILE-VERBOSE**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/var_stcompile_le-verboseest.html
15. **T**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/convar_t.html
16. **NIL**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/convar_nil.html
17. continuable
[set \$man.base.url.for.relative.links]/clhs/glo
18. ERROR
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/contyp_error.html
19. WARNING
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/contyp_warning.html
20. **INVOKE-DEBUGGER**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_invoke-debugger.html
21. **ABORT**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_abortcm_c_cm_use-value.html
22. **SIGNAL**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_signal.html
23. Emacs
<http://www.gnu.org/software/emacs/>
24. SLIME
<http://common-lisp.net/project/slime/>
25. ILISP
<http://sourceforge.net/projects/ilisp/>
26. readline
<http://tiswww.case.edu/php/chet/readline/readline.html>
27. ASCII
<http://en.wikipedia.org/wiki/ASCII>
28. **PACKAGE**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/var_stpackageest.html

- 29. **PRINT-CASE**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/var_stprint-casest.html
- 30. “COMMON-LISP-USER”
[set \$man.base.url.for.relative.links]/sec_11-1-2-2
- 31. **LOAD**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_load.html
- 32. **COMPILE**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_compile.html
- 33. “run
control” (RC)
<http://www.faqs.org/docs/artu/ch10s03.html>
- 34. **USER-HOMEDIR-PATHNAME**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_user-homedir-pathname.html
- 35. **DISASSEMBLE**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_disassemble.html
- 36. **STANDARD-OUTPUT**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/var_stdebug-i_ace-outputst.html
- 37. **LIST**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/syscla_list.html
- 38. **ANSI**
<http://www.ansi.org/>
- 39. The American National Standards Institute
- 40. Information Technology - Programming Language - Common Lisp
[http://webstore.ansi.org/RecordDetail.aspx?sku=ANSI+INCITS+226-1994+\(R1999\)](http://webstore.ansi.org/RecordDetail.aspx?sku=ANSI+INCITS+226-1994+(R1999))
- 41. **SYMBOL**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/syscla_symbol.html
- 42. **UNIX**
<http://www.unix.org/online.html>
- 43. *Win32*
<http://winehq.org/>
- 44. **#’**
[set \$man.base.url.for.relative.links]/sec_2-4-8-2
- 45. **#P**
[set \$man.base.url.for.relative.links]/sec_2-4-8-14
- 46. **bash**
<http://www.gnu.org/software/bash/>
- 47. John Foderaro
<http://www.franz.com/~jkf/>
- 48. **DEFVAR**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/mac_defparametercm_defvar.html
- 49. **DEFUN**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/mac_defun.html
- 50. **DEFMACRO**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/mac_defmacro.html
- 51. **COMPILE-FILE**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_compile-file.html

- 52. **C**
<http://c-faq.com/>
- 53. **SHORT-SITE-NAME**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_short-sit_ng-site-name.html
- 54. **CMU CL**
<http://www.cons.org/cmuc/>
- 55. **XEmacs**
<http://www.xemacs.org>
- 56. **SourceForge bug tracker**
http://sourceforge.net/tracker/?func=add&group_id=1355&atid=101355
- 57. **gdb**
<http://sources.redhat.com/gdb/>
- 58. **libc**
<http://www.gnu.org/software/libc/>
- 59. **Linux**
<http://www.linux.org/>
- 60. **VIM**
<http://www.vim.org>