Software Manual
for
Windows Z/EVES Version 2.1

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Contents

1   Introduction

This document describes the procedure for installing Version 2.1 of the Z/EVES verification system on a Windows 95, Windows 98, or Windows NT system. The distribution format for Windows Z/EVES is a self-extracting zip archive, normally downloaded using ftp.

This version of Z/EVES can be used in two ways, in server mode and in Z/LaTeX mode. In server mode, it runs as a server, providing parsing, type checking, and proof service which is accessed through a graphical user interface (GUI). An interface, the Z/EVES GUI, is included in the Z/EVES distribution, and is described in [Saa 99b]. The Z/EVES GUI accepts and displays Z text in Z notation, as described in the Z Reference manual ([Spi 92]).

In Z/LaTeX mode, Z/EVES is accessed directly, through a command-line interface provided by Z/EVES itself. In this mode, Z text is accepted and displayed in Z/LaTeX notation. Also in this mode, Z/EVES can use Version 2.0 of the ALFA Z Browser to display, in Z notation, declarations presented to Z/EVES. This document also describes how to use this Z Browser with Z/EVES. Z Browser is described in a separate report, [Mik 95]. Note that the Z Browser installation instructions (Section 3.3) apply to the 32-bit demonstration version only; this version is available at http://www.ora.on.ca/z-eves/zbrowser.html.

The Z/EVES GUI is written in Python, and requires Python 1.5.2 and Tcl/Tk 8.0 for Windows; an executable file which installs both of these programs is available from http://www.python.org/download/download_windows.html.

The Z/EVES distribution includes the Z font created by Richard Jones, Version 1.0.4; this font is ©Richard Jones, 1995.

2   Release Notes

Several changes have been made since Version 2.0:

- The GUI can export a specification or paragraph in RTF or Postscript format. (Export of Z/LaTeX is planned for the next release.)

- The editor in the GUI has a complete palette, and provides "flyover" help for Z sybols.

- The GUI's import function is more complete, and can now import proof scripts as well as paragraphs. (Proof scripts must appear in a `zproof` environment to be recognized.)

- Many errors in the GUI have been fixed, including a problem that made saving unreliable.

- The `conjunctive` and `disjunctive` commands are faster and more effective.

- Error recovery has been improved.

- The GUI sets colours more carefully, so that its elements are visible even if an unusual desktop theme is used.

The last major public release of Z/EVES was Version 1.5. The following changes were made between versions 1.5 and 2.0 of Z/EVES.

- A new front end was added to Z/EVES, which implements an API for Z/EVES and allows Z/EVES to be used as a server. Communication between the Z/EVES server and a client is over a TCP/IP socket, in XML.

- Save/restore of Z/EVES state has been implemented in the server mode and GUI.

- A GUI, which uses the new Z/EVES API front end, has been implemented.

- Some changes to the underlying EVES prover were made:

  - `if` expressions appearing in function arguments are "lifted" out of the function application. This allows provides the prover with more opportunities for case analysis.

  - Forward rule patterns have been generalized to be the same as rewrite rule patterns. This new generality is not used much now, but will allow future Toolkit improvements.

- A LaTeX command "`\znote`" with one argument has been added; the command and argument are treated like whitespace. This allows informal comments be placed inside formal text.

- The Z/EVES Mathematical Toolkit has been revised. The new Toolkit documentation [Saa 99a] describes the changes.

- Miscellaneous speedups and bug fixes have been made.

3   Installation Procedure

Before installing Z/EVES, you should install Python 1.5.2 and Tcl/Tk 8.0 if you wish to use the Z/EVES GUI. If you wish to use the Z Browser with Z/EVES, the Z Browser may be installed before or after Z/EVES is installed.

3.1   Installing Python and Tcl/Tk

To install Python and Tcl/Tk, do the following:

1. Download the Python 1.5.2 installer (`py152.exe`) at the URL given in Section 1.

2. Run the installer. If you are running Windows NT, log in as Administrator first. This will install Python 1.5.2 and Tcl/Tk 8.0.

3. (Optional.) Add the Tcl binary directory to your execution path. If you don't, when you run the Z/EVES GUI under Windows NT, Python will pop up a window complaining about not being able to find the `Tcl80` DLL file, but when you click on the `OK` button, it will go ahead and find it anyway. The default location of the binary directory is `c:\Program Files\Tcl\bin`. (This behaviour has not been seen in Windows 95/98.)

   On Windows NT, the execution path may be modified in the System applet in the Control Panel, under the Environment tab. It is the `Path` system variable. You must be logged in as Administrator to modify the execution path. On Windows 95/98, use Notepad to edit the file `c:\autoexec.bat`; the execution path is the value of the variable `PATH`. You will have to reboot for this change to take effect.

3.2   Installing Z/EVES

The Z/EVES distribution file is a self-extracting zip archive which contains the Z/EVES installer. To install Z/EVES, do the following:

1. Download the Z/EVES distribution file via ftp, to some temporary directory. Make sure that you download the correct version for your system, and that you download the file in binary mode. (For more specific instructions on how to download Z/EVES, please contact us at the address given in Section 6.)

2. In Windows Explorer, double-click on the distribution file to unpack it. Then, double-click the `setup.exe` file and follow the instructions.

There are a few notes about the installation:

- You can choose the directory in which Z/EVES will be installed, but spaces in the path name will cause lots of problems. Don't use spaces in the installation directory name, or put the installation directory below a directory whose name contains spaces.

- The Z/EVES installer checks for the existence of a Python installation directory. If the directory it finds is incorrect or does not contain the correct version of Python (1.5.2), enter the correct directory. If you don't want to run the Z/EVES GUI, and you don't have Python installed on your machine, accept the default and continue.

- The Z/EVES installer checks for the presence of the Jones Z font, and will not install the font again if it is found. If the installer has to install the font, the font may not be completely installed until the next reboot.

- This version of Z/EVES is implemented in Allegro Common Lisp For Windows (ACL). Z/EVES consists of a Lisp interpreter, `lisp.exe`, and an image file, `z-eves.img`. Both of these files are found in the `system\` subdirectory of the installation directory. When starting up, ACL looks for a file named `allegro.ini` in the `system\` directory. This file contains some system-dependent memory and tuning parameters; copy one of the files `allegro.16`, `allegro.32`, or `allegro.64` to `allegro.ini`, depending on the size of memory on your machine (16, 32, or 64 MB). This amount is also the approximate amount of swap space that will be required to run Z/EVES; you may have to increase the size of your Windows swap file. The default `allegro.ini` file is the one for 64 MB of memory (`allegro.64`). Insufficient swap space can prevent Z/EVES from running, or can cause failure to find and load required DLL files.

After you have installed Z/EVES, you can delete the files unpacked from the Z/EVES distribution file.

Z/EVES may be uninstalled from the Add/Remove Programs applet in the Control Panel.

3.3   Installing Z Browser

To install the 32-bit version of the Z Browser, unzip the Z Browser distribution file into another directory, and run the `setup.exe` program from the zip file. This will install the Z Browser executable and fonts. After installation, the contents of the zip file are no longer needed and may be deleted.

4   Running Z/EVES

After you have installed Z/EVES, a Z/EVES program group will now appear in your Start Menu, and, in Windows 95/98, on your desktop. This program group contains two shortcuts, `Z-EVES` and `Z-EVES GUI`.

To use Z/EVES effectively, you will need to have a good knowledge of the Z language and the syntax of Z/EVES input. The Z reference manual [Spi 92] describes the former, and the Z/EVES reference manual [Mei 97] describes the latter. When proving theorems and domain checking conditions, you will find the theorems described in the documentation for the Z/EVES Mathematical Toolkit [Saa 99a] useful.

4.1   Running the Z/EVES GUI

Double-clicking the `Z-EVES GUI` shortcut will start the Z/EVES GUI, and the GUI will start the Z/EVES server. When the Z/EVES server is started, it will pop up a small window to let you know it is running. This window can be minimized. *Don't* try to exit Z/EVES by clicking the `X` button on this window; use the `File|Exit` command in the GUI or the `X` button on the GUI window.

NOTE: The GUI will wait for the Z/EVES server to start up, but on slower machines, or if this is the first time the Z/EVES server is run and has to be read from disk, the GUI might not wait long enough. In this case, the GUI will pop up a dialog box, and you can tell it to try connecting to the server again.

See [Saa 99b] for more information on how to use the Z/EVES GUI.

4.2   Running Z/EVES in Z/LaTeX Mode

Double-clicking the `Z-EVES` shortcut will start Z/EVES in Z/LaTeX mode. Z/EVES will pop up a main window and interaction window for user input and Z/EVES output. Windows may be created for editing files; they become subwindows of the Z/EVES main window. See Section 5 for more information about using Z/EVES in Z/LaTeX mode.

4.3 The Toolkit and Section Directories

NOTE: Sections are fully implemented only in Z/LaTeX mode. The Z/EVES server starts up with the Toolkit section loaded, and it is not possible to replace this section or load other sections.

The `system\` subdirectory of the Z/EVES installation directory contains the source and section files for the Z/EVES Mathematical Toolkit, `toolkit.tex` and `toolkit.sct`. Z/EVES starts with the Toolkit section already loaded, but if Z/EVES needs to load the Toolkit again, it must know where to find the section file.

Z/EVES looks for section files in the following directories, in the following order:

1. The directory which contains the Z/EVES image `z-eves.img` (the "system" directory).

2. Directories specified in the Z/EVES command line, with the `-libs` option. The value of this option is a semicolon-separated list of directories. This option may be added to the command line in the `Z-EVES` shortcut, after the `z-eves.img` part.

3. Directories specified in the `zsection path` command, in the order specified (the "user" directories).

In the second and third cases, directory names must end in a backslash (`\`).

If the `zsection path` command is given with no arguments, the current system directory and user directory list are printed.

The Z Browser can be used to view the Toolkit declarations, by telling Z/EVES to connect to the browser with the `Browser|Reconnect w/toolkit` menu command. Z/EVES expects the Toolkit source file to be in the directory which contains the Z/EVES image.

5   Using Windows Z/EVES in Z/LATEX Mode

The interaction window, and windows created to edit files, provide a number of Emacs-like keystroke commands for moving around in the window and for editing text. These commands are described in following sections.

If the Z Browser is running when Z/EVES is started, Z/EVES will automatically connect to it. If the Z browser is started after Z/EVES, Z/EVES can be made to connect to it with a menu command (Section 5.1). When Z/EVES is connected to the browser, declarations presented to Z/EVES can be browsed by switching to the browser window. As well, the browser is synchronized with Z/EVES, so declarations undone in Z/EVES are also undone in the browser.

To abort a proof command that is taking too long or to stop Z/EVES when printing a too-long formula, use the Windows interrupt key `Break`. Z/EVES will stop whatever it is doing and return to the top level. Unfortunately, because Windows 95/98 multitasking is cooperative rather than preemptive, interrupting Z/EVES isn't as reliable as it should be. You may have to hit `Break` several times before Z/EVES notices it.

5.1 The Windows Z/EVES Menu Bar

The Windows Z/EVES menu bar provides four menus: File, Edit, Window, and Browser. These menus provide access to the following commands:

Menu Item	Action
`File|New`	Open a new editor window, not associated with any file.
`File|Open`	Open an editor window on an existing file.
`File|Save`	Save the contents of an editor window to its associated file.
`File|Save As`	Save the contents of an editor window to a specified file.
`File|Revert`	Read the contents of a file into its associated editor window, discarding the current contents of the window.
`File|Read`	Read a file in batch mode.
`File|Read Script`	Read a file in interactive mode.
`File|Check File`	Typecheck a file (in batch mode).
`File|Quit`	Exit Z/EVES.
`Edit|Cut`	Copy a marked region of text in a window to the Windows Clipboard, and delete the text from the window.
`Edit|Copy`	Copy a marked region of text in a window to the Windows Clipboard.
`Edit|Paste`	Insert the contents of the Windows Clipboard at the current location in the selected window.
`Window|Show`	Pop up a menu of Z/EVES windows and bring the selected one to the front.
`Window|Default Font`	Change the font for text in all windows.
`Window|Current Font`	Change the font for text in the current window.
`Browser|Reconnect`	Connect to the Z Browser. Sends the declarations in the current history to the browser.
`Browser|Reconnect w/toolkit`	Connect to the Z Browser, and also cause it to browse a file containing the Toolkit definitions.
`Browser|Disconnect`	Disconnect from the Z Browser.

Some of the menu items described above require a filename and pop up a "file dialog" to request it. The first file dialog begins in the Z/EVES installation directory, and subsequent dialogs begin in the directory of the file selected by the previous file dialog.

For the `Read`, `Read Script`, and `Check File` menu items, if the file being read contains read commands, the default directory for these commands is the directory of the "top-level" source file, i.e., the one chosen in the file dialog. If, however, the corresponding commands are typed in the interaction window (e.g., `check "foo.tex";`), the default directory is always the initial directory specified when installing Z/EVES.

5.2   The Z/EVES Interaction Window

All output from Z/EVES appears in this window. A declaration or command may be given to Z/EVES by typing it at the prompt and typing `Enter`; the resulting output will then appear. When `Enter` is typed in the interaction window, and the current point is after the last prompt, if there is a complete command or declaration between the last prompt and the end of the window, all text between the last prompt and the end of the window is sent to Z/EVES. If there isn't, Z/EVES just inserts a newline. To insert a newline in either case, type `C-j` (linefeed). Also, the command `C-S-n` will move the current location to the end of the window and print a new prompt.

5.3   Editing Files with Windows Z/EVES

Windows Z/EVES provides a number of keystroke commands for editing text in both the interaction window and the editor windows, and for interacting with Z/EVES. The mouse may also be used to bring a window to the front, move the current editing location, and mark text for copying or deletion. In the command descriptions that follow, the commands are available in both the interaction and editor windows unless otherwise specified.

At any time, there is a current window and current location in that window (often called "point"). Most editing commands have an effect in the current window, at point. Point is denoted by a flashing vertical bar (the "cursor"). Each window also has a special location called the "mark," which is set by some commands and is used along with point to select a region of text.

In the descriptions of the keystroke commands, the following notation is used:

> `C-x`   hold down the Ctrl key, and type `x`
> `M-x`   hold down the Alt key, and type `x`
> `S-x`   hold down the Shift key, and type `x`

These may be combined, e.g., `C-M-x` means hold down both the Ctrl and Alt keys, and type `x`.

5.3.1   Z/EVES-specific Commands

The following commands are available only in editor windows.

Keystroke	Action
`C-c C-b`	Previous declaration or command
`C-c C-e`	Send to Z/EVES
`C-c C-f`	Next declaration or command
`C-c C-s`	Insert proof summary

If there is a marked region of text, the `C-c C-e` command will send the entire region to Z/EVES. Otherwise, the declaration or command which begins at or before point will be sent.

For a Z paragraph to be recognized by the editor, the `\begin` and `\end` text must start in the first column of a line. The text of a command must also start in the first column of a line.

5.3.2   Mouse Actions

Clicking the left button in a window brings that window to the front, and moves point as close as possible to the location where the click occurred. If there is a marked region of text, the mark disappears.

Holding down the left button and moving the mouse while the button is held down ("click and drag") marks a region of text. The marked text appears in a colored background. Clicking the left button will unmark the region.

Double clicking the left button marks the word (longest sequence of nonblank characters) around or before the location where the click occurred.

5.3.3 Cursor Motion

The following commands move point. A "sexp" is a parenthesized expression.

Keystroke	Action
`C-b`, `Left`	Backward character
`C-M-Left`, `C-M-b`	Backward sexp
`C-M-Down`, `C-M-u`	Backward up list
`M-Left`, `M-b`	Backward word
`S-M-,`	Beginning of file
`C-a`	Beginning of line
`C-M-d`	Down list
`S-M-.`	End of file
`C-e`	End of line
`C-x C-x`	Exchange to mark
`C-f`	Forward character
`C-M-n`	Forward list
`C-M-Right`, `C-M-f`	Forward sexp
`C-M-)`	Forward up list
`M-Right`, `M-f`	Forward word
`C-n`, `Down`	Next line
`C-v`	Next page
`C-p`, `Up`	Previous line
`M-v`	Previous page
`C-r`	Search backward
`C-s`	Search forward

5.3.4 Window and Text Selection

The following commands make a window current, or mark a region of text.

Keystroke	Action
`C-Tab`, `C-F6`	Select next window
`C-Spc`	Select to mark
`C-2`	Set mark

5.3.5 Text Insertion and Deletion

The following commands insert and delete text. When text is "killed," it is removed from the buffer and copied to the Windows Clipboard. "Deleted" text is not saved. "Yanking" copies text from the Windows Clipboard to the current buffer, starting at point.

Keystroke	Action
M-k	Backward kill line
C-M-Bksp	Backward kill sexp
C-Bksp, M-Bksp, M-h	Backward kill word
M-w	Copy marked text to Windows Clipboard
C-/	Delete horizontal space
C-6	Delete indentation
C-d	Delete next character
C-h	Delete previous character
Tab	Indent line
M-9	Insert empty list
S-M-2	Insert empty string
C-m	Insert newline
Ret	Insert newline (editor window only)
C-j	Insert newline and indent
C-k	Kill line
C-M-k	Kill sexp
M-d	Kill word
C-w	Kill marked text
C-o	Open line
S-M-5	Replace text
C-y	Yank from Windows Clipboard

5.3.6 File Operations

The following commands duplicate commands available from the File menu.

Keystroke	Action
C-x C-f	Edit file
C-x C-r	Load file (editor window only)
C-x C-s	Save (editor window only)
C-x C-w	Save as (editor window only)

5.3.7 Miscellaneous

Keystroke	Action
C-F4	Exit Z/EVES
C-g, C-x C-g, M-g, C-M-g	Illegal operation
C-S-n	New prompt (interaction window only)
Ret	Send to Z/EVES (interaction window only)
C-t	Transpose characters

6   Contact

If you have any problems with the system, contact us at:

Postal mail:

```
Z/EVES
c/o ORA Canada
One Nicholas St., Suite 1208
Ottawa, Ontario K1N 7B7
Canada
```

Electronic mail:

```
eves@ora.on.ca
```

World Wide Web:

```
http://www.ora.on.ca/
```

There is a mailing list (email) for Z/EVES-related announcements and news, and for general discussion about Z/EVES and Z. The list is a good way to keep in touch with the Z/EVES developers and with Z/EVES users.

- To subscribe to the list, send an email message to `zeves-request@ora.on.ca`, with no subject and the word `subscribe` in the message body.

- To unsubscribe from the list, send an email message to `zeves-request@ora.on.ca`, with no subject and the word `unsubscribe` in the message body.

- To post a message to the list, email the message to `zeves@ora.on.ca`. *Please* don't send subscription/unsubscription requests to this address.

- The Z/EVES mailing list is implemented with Majordomo. For general information on Majordomo functionality, send an email message to `majordomo@ora.on.ca`, with no subject and the word `help` in the message body.

- For help with problems, send an email message to `postmaster@ora.on.ca`.

References

[Mei 97]   Irwin Meisels and Mark Saaltink. *The Z/EVES Reference Manual*. ORA Canada Technical Report TR-97-5493-03d, September 1997.

[Mik 95]   L. Mikusiak et al. *Z Browser — A Tool for Visualization of Z Specifications*, Proceedings of the 9th International Conference of Z Users, Springer-Verlag, Lecture Notes in Computer Science, Volume 967, September 1995.

[Saa 99a]   Mark Saaltink. *The Z/EVES 2.0 Mathematical Toolkit*. ORA Canada Technical Report TR-97-5493-05b, October 1999.

[Saa 99b]   Mark Saaltink. *The Z/EVES 2.0 User's Guide*. ORA Canada Technical Report TR-99-5493-06a, October 1999.

[Spi 92]   J.M. Spivey. *The Z Notation: A Reference Manual*, 2nd Ed. Prentice Hall, 1992