

Zsh

Features Tour

A brownbag workshop at



by Seth House

@whiteinge
seth@eseth.com

History

- Written in 1990 by Paul Falstad at Princeton University.
- Named for the login of a teaching assistant, Zhong Shao.
- Implements many of the features of `bash`, `ksh`, and `csk`
(tries to emulate *sh* or *ksh* when invoked as `sh` or `ksh`).

Niche

IMO, Zsh is a good fit if you:

- Want Granular control & customization over the *UI/UX* of your shell.
- Want a large standard-library of functionality.
- Want a POSIX subset (and are ok with a superset).
- Don't mind fiddling.

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Others

- Dash/Ash/mksh/Busybox:
 - Strict POSIX compatibility.
 - Minimal feature-set.
- Bash:
 - Often the default interactive shell.
 - Medium feature-set.
 - POSIX subset (and Bash superset).
 - Don't mind fiddling.
- Fish:
 - (Mostly) out-of-box pre-configured.
 - Large feature-set.
 - Want to avoid POSIX.

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- *Very* popular.
- Complex.
- ~325 Plugins of varying quality
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- Fish — 130k SLOC (C++, Rust, Fish)
- Zsh — 114k SLOC (C & Zsh)

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A comparison?

- Bash & Readline — 182k SLOC (C, Bash)
- Fish — 130k SLOC (C++, Rust, Fish)
- Zsh — 114k SLOC (C & Zsh)
- Oh My Zsh — 23k SLOC (Zsh, Bash, Python)

Heavily documented

```
% man 1 zshall | wc -w  
209447
```

```
% man -k . | grep '^zsh'
```

zsh (1)	- the Z shell
zshbuiltins (1)	- zsh built-in commands
zshcalsys (1)	- zsh calendar system
zshcompctl (1)	- zsh programmable completion
zshcompsys (1)	- zsh completion system
zshcompwid (1)	- zsh completion widgets
zshcontrib (1)	- user contributions to zsh
zshexpn (1)	- zsh expansion and substitution
zshmisc (1)	- everything and then some
zshmodules (1)	- zsh loadable modules
zshoptions (1)	- zsh options
zshparam (1)	- zsh parameters
zshroadmap (1)	- informal introduction to the zsh manual
zshtcpsys (1)	- zsh tcp system
zshzftpsys (1)	- zftp function front-end
zshzle (1)	- zsh command line editor

Modules

Modules

```
man 1 zshmodules  
man 1 zshcontrib
```

Module: Interactive setup

```
autoload -Uz zsh-newuser-install  
zsh-newuser-install -f
```

Module: Colors

```
autoload -U colors && colors
echo \
    ${fg[yellow]}Hello${reset_color}, \
    ${fg[red]}world${reset_color}.

# ...or wrap colors in %{ and %} in prompts:
PS1='%{$fg[green]%}%~%{$reset_color}% %# '
```

Module: Themeable prompts

```
autoload -U promptinit && promptinit  
prompt -p
```

Module: Tetris

```
autoload -U tetriscurses  
tetriscurses
```

Module: Completions

In the `zshcompwid(1)` manpage.

(Can also use bash completion definitions.)

```
autoload -U compinit && compinit -C  
  
curl -<tab>  
curl <tab>  
kill -<tab>  
kill <tab>  
cd <tab>  
cd -<tab>
```


Module: Completions

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curl -<tab>  
curl <tab>  
kill -<tab>  
kill <tab>  
cd <tab>  
cd -<tab>
```

Associate existing completion for an alias:

```
compdef c=curl  
compdef ll=ls  
compdef la=ls
```

Module: Completions (custom)

```
zstyle -e ':completion:*(ssh|scp|sshfs):*' hosts 'reply=(  
    ${=${${(M)${(f)"}$(  
        cat ~/.ssh/config ~/.ssh/*.conf  
    )"}:#Host*}#Host }:#*\**}  
)'
```

Module: Completions (custom)

```
zstyle -e ':completion:*(ssh|scp|sshfs):*' hosts 'reply=(  
    ${=}${${(M)${(f)"$(  
        cat ~/.ssh/config ~/.ssh/*.conf  
    )"}:#Host*}#Host }:#*\**}  
)'
```

(Brutal syntax for newcomers, but well-documented and highly consistent.)

Module: Completions (custom)

```
zstyle -e ':completion:*(ssh|scp|sshfs):*' hosts 'reply=(
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    )"}:#Host*}#Host }:#*\**}
    )'
```

(Brutal syntax for newcomers, but well-documented and highly consistent.)

1. Read SSH config files: `$(cat ~/.ssh/config ~/.ssh/*.conf)`
2. Split string into array by newlines: `${(f)foo}`
3. Remove non-matching array values: `${(M)foo:#Host*}`
4. Remove matching string prefix from each array value: `${foo#Host }`
5. Remove wildcard (*) SSH hosts: `${foo:#***}`
6. Join array back into string using word splitting rules: `${=foo}`.

Module: Completions (behavior)

```
# :completion:function:completer:command:argument:tag
zstyle ':completion:*:*:ls:*' menu yes select
zstyle ':completion:*:*:ls:*' menu yes select=long
zstyle ':completion:*:*:ls:*' menu yes select interactive
zstyle ':completion:*:*:ls:*' menu yes select search
zstyle ':completion:*:*:ls:*' file-sort time
zstyle ':completion:*:*:ls:*' file-sort name
zstyle ':completion:*:*:ls:*' file-sort size
zstyle ':completion:*:*:ls:*' file-sort size reverse
zstyle ':completion:*:*:ls:*' file-list all
zstyle ':completion:*' format '%F{green}-- completing --%d'
zstyle ':completion:*:warnings' \
    format '%F{red}-- no matches found --%f'
zstyle ':completion:*:*:-command-*:*' \
    group-order alias builtins functions commands
zstyle ':completion:*' complete-options true
zstyle ':completion:*' matcher-list ' ' 'm:{a-zA-Z}={A-Za-z}'
zstyle ':completion:*' matcher-list ' ' \
    'm:{a-zA-Z}={A-Za-z}' 'r:[._-]* r:|=* ' 'l:|=* r:|=*'
```

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zstyle ':completion:*' matcher-list ' ' \
    'm:{a-zA-Z}={A-Za-z}' 'r:[._-]* r:|=* ' 'l:|=* r:|=*'
```

```
zle -C foo complete-word _generic
bindkey '^f' foo
zstyle ':completion:foo:*' completer _expand_alias
```

Module: Completion options

In manpage `zshoptions (1)` (search for "Completion").

`setopt` MENU_COMPLETE

- `ALWAYS_TO_END` — Place cursor to end of word completed.
- `LIST_PACKED` — The completion menu takes less space.
- `AUTO_MENU` — Display the completion menu after two `<tab>` presses.
- `AUTO_COMPLETE` — Select first match given by the completion menu.
- `AUTO_PARAM_SLASH` — Add trailing slash instead of space for dir completion.
- `COMPLETE_IN_WORD` — Don't move cursor to end of word on completion.
- `GLOB_COMPLETE` — Trigger completion after a glob `*`.
- `LIST_ROWS_FIRST` — Matches are sorted in rows instead of columns.

Module: zparseopts

Short, long, mandatory, optional, multiple occurrences, defaults, allow unknown flags.

```
autoload -U compinit
set -- -a -b -c --long
zparseopts a=array_foo b=array_bar c=array_baz -long=array_long
echo ${array_foo}
# -a
echo ${array_long}
# --long
```


Module: zmv

```
autoload -U zmv  
zmv ' (*) - (*) .mpeg3' '$2_$1.mp3'
```

Module: vcs_info

```
autoload -Uz vcs_info
zstyle ':vcs_info:*' enable bzr cdv cvs darcs \
    fossil git tla hg mtn p4 svn svk

vcs_info
echo ${vcs_info_msg_0_}
```

Shell options

```
man 1 zshoptions
```

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```

- `auto_cd` — Change dirs without `cd`
- `auto_pushd` — Automatically retain the directory stack.
- `chase_links` — `cd` to the target of a symlink
- `correct` — Run spelling correct on typed commands
- `extended_history` — Store timestamps in shell history
- `hist_ignore_all_dups` — Expire duplicate commands in history
- `hist_ignore_dups` — Avoid multiple history entries for repeat runs
- `hist_ignore_space` — Don't add command to history if begins with space
- `hist_reduce_blanks` — Trim command before saving to history
- `hist_save_no_dups` — Remove duplicate commands when saving history file
- `hist_verify` — Edit command from history before re-executing
- `ignore_eof` — Don't exit shell on `ctrl-d`
- `list_types` — Show file type markers when completing files
- `noclobber` — Don't accidentally overwrite files with `>`
- `noflowcontrol` — Disable `ctrl-s/ctrl-q` in ZLE
- `prompt_percent` — Enable expansion of many prompt escapes
- `prompt_subst` — Allow command substitution in prompts
- `rm_star_wait` — Confirm before running `rm path/*`
- `share_history` — Read/write commands from history file immediately

Shell parameters

- `CDPATH` — Set search path for the `cd` command
- `REPORTTIME` — Automatically output timing info for long commands
- `WATCH` — Automatically report log-ins/outs on the system

Prompts

- PS1
- RPPROMPT
- Excellent multi-line prompt support

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- Excellent multi-line prompt support

```
d.. ~/src/eseth.org/project ..... shouse
... (git) ac00a7b53290 $ master [origin/master ]
... % cd ../../presentations
... ~/src/presentations ..... shouse
.d. (hg)[^15 default mq():0/1 ]
... % hg id -n -i -b -t
2f94b1375043 15 default tip
```

Alias suffixes

Define default handlers for file types.

```
alias -s php=code  
alias -s sh=vim  
touch foo.php bar.sh  
foo.php  
bar.sh
```


Global aliases

Define aliases that can appear anywhere in a command.

```
alias -g IN='..@{u}'
alias -g OUT='@{u}..'
alias -g UP='@{u}'

# Choose the last item in the filename glob.
alias -g LAST='*([-1])'

# Selects a random file: `mpv RANDOM`
alias -g RANDOM='$(shuf -e -n1 *)'

# Output stderr in red. Usage: somecomand RED
alias -g RED='2> >(while read line
do echo -e "\e[01;31m$line\e[0m" >&2; done)'
```

Glob Qualifiers

`zshexpn(1)` manpage under "Glob Qualifiers"

```
touch foo
mkdir bar
ln -s bar baz
ln -s qux quux
mkfifo quuz
touch corge-{1..10}
touch grault
chmod +x grault
dd if=/dev/zero of=garply bs=11000 count=1
touch waldo
chmod u-w waldo
```

Globs: File types

```
ls *(.) # regular Files  
ls *(^.) # irregular Files  
ls */ # directories  
ls *(*) # executable files  
ls *(@) # symlinks  
ls *(-) # follow symlinks
```

Note:

```
ls **/ # recursive search
```

Globs: File sizes and permissions

```
ls *-<1-5> # files matching a range
ls *(mm-1) # files modified less than 1 minute ago
ls *(Lk+10) # files greater than 10 KB
ls *(r) # readable by you
ls *(w) # writable by you
ls *(U) # owned by you
```

Globs: Combinations

Combinations:

```
ls *(-@) # broken symlinks  
ls *(r^w) # readable but not writable for you  
ls *(^u:root:) # files not owned by root
```

Disable globbing

```
% curl https://example.com?foo=Foo  
% noglob curl https://example.com?foo=Foo  
alias c='noglob curl'
```

Hooks

`zshmisc(1)` manpage under "SPECIAL FUNCTIONS"

- `chpwd` — When the current directory changes
- `periodic` — On an interval, before prompt is drawn
- `precmd` — Before each prompt
- `preexec` — After command is entered, before command is executed
- `zshaddhistory` — After history is recalled, before command is executed
- `zshexit` — When shell exits

Arrays

- `zshexpn(1)` manpage under "PARAMETER EXPANSION"
- `zshparam(1)` manpage under "ARRAY PARAMETERS"
- Numerical arrays or associative arrays (very PHP-like)
- `sort`, `join`, `split`, `map`, `filter`, iterate over keys or values, or keys and values, `index`, `slice`, (some) set operations.

```
extra_path=(  
    $HOME/bin \  
    $HOME/.nodejs/nodejs/bin \  
    $HOME/.cabal/bin \  
    $HOME/.cargo/bin \  
    $HOME/.local/bin \  
    $HOME/.luarocks/bin/ \  
    /sbin \  
    /usr/sbin \  
    /usr/local/bin \  
    /usr/local/sbin \  
)  
export PATH="${(j|:|)extra_path}:$PATH"
```


vi-mode

```
bindkey -v

bindkey "^?" backward-delete-char
bindkey -M viins '^p' history-beginning-search-backward
bindkey -M vicmd '^p' history-beginning-search-backward
bindkey -M viins '^n' history-beginning-search-forward
bindkey -M vicmd '^n' history-beginning-search-forward

# Edit command with an external editor
zle -N edit-command-line
bindkey -M vicmd "v" edit-command-line
```

(The `zle-keymap-select` function is called when the mode changes.)

Widgets

In the `zshcompwid(1)` manpage.

```
foo-thing() {  
  zle -M "I'm doing a thing..."  
  zle -R  
  sleep 2 # the thing  
  
  LBUFFER="${LBUFFER} with an addition."  
  
  zle reset-prompt  
  zle -R  
}  
  
zle -N foo-thing  
bindkey '^F' foo-thing
```

A robust, minimal `~/ .zshrc`

```
autoload -U compinit && compinit -C
autoload -U colors && colors
autoload -Uz vcs_info
precmd_functions=( vcs_info )

setopt hist_save_no_dups list_types \
    prompt_percent prompt_subst share_history

zstyle ':completion:*' list-colors "$LS_COLORS"
zstyle ':vcs_info:*' enable git

# Cur dir, background jobs?, prev command fail?, prompt.
promptseg=( \
    '%{$fg[green]%%}%~%{$reset_color%%}' ' \
    '%(1j.%j .) ' \
    '%(0?.%{$fg[white]%%}.%{$fg[red]%%})' \
    '%#%{$reset_color%%}' ' \
)
PS1=${(j::)promptseg}
RPPROMPT='${vcs_info_msg_0_}'

alias ls='ls --color=auto -F'
alias ll='ls -l'
alias la='ls -a'
```

Slightly less minimal

```
autoload -U promptinit && promptinit
prompt adam2 grey green cyan white

zstyle ':vcs_info:git*' check-for-changes true
zstyle ':vcs_info:git*' check-for-staged-changes true
zstyle ':vcs_info:git*' get-revision true
zstyle ':vcs_info:git*' formats '(%s) %12.12i %c%u %b %m'
zstyle ':vcs_info:git*' actionformats '(%s|%a) %12.12i %c%u %b %m'
zstyle ':vcs_info:git*+set-message:*' hooks git-st
function +vi-git-st() {
    local ahead_and_behind=(
        ${=${(M)${(f)"$(
            git --no-optional-locks status --porcelain=v2 --branch
        )"}:#\# branch.ab*}\#\# branch.ab }
    )
    hook_com[misc]+=${(j::)ahead_and_behind}
}
```