Efficient use of a text editor for HDL coding

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Editors

- **Vim/NeoVim**
- **VSCode** + TerosHDL
- **Emacs** + verilog-mode/vhdl-mode
- **Notepad++**, **Sublime Text**, **Eclipse**, ...

What we will be using

- NeoVim + numerous plugins
- VSCode + TerosHDL + Python(Microsoft)
  see https://terostechnology.github.io

Basic functions

General

- Fast file navigation
- Fast buffers/files switching
- Fast navigation through the file
- Fast search/replace
- Folding
- Window splitting
- Multi-cursor editing
- Git integration

Language specific

- Syntax highlighting
- Code formatting
- Snippets/Templates
- Syntax checking
- Pop-up documentation
- Go to definition
- Tags

HDL specific

- Automatic generation of entity/module instantiations
- Automatic generation of the testbenches

Fast navigation through file and editing

- Fast search – Vim built-in.
- Sessions – remember opened files, splits, settings, etc (mksession).
- Window splitting.
- Multiple cursor editing https://github.com/terryma/vim-multiple-cursors
- Vim easymotion https://github.com/easymotion/vim-easymotion

Files navigation

Files browsing

- Vim native way :Explore, :Sex, :Vex
- **NerdTree**
  https://github.com/preservim/nerdtree
- **nnn** https://github.com/mcchrish/nnn.vim

Fuzzy find

An extremely fast way to open files, navigate buffers, and so on.

- **CtrlP** – minimalistic fuzzy-find
  https://github.com/ctrlpvim/ctrlp.vim
- **fzf.vim** – based on fzf program
  https://github.com/junegunn/fzf.vim
- **Telescope** (NeoVim only) – utilizes most modern NeoVim features, super extensible and powerful.
  https://github.com/nvim-telescope/telescope.nvim

Other fuzzy find features

fzf.vim and **Telescope** can do:

- Fast windows/buffers switching.
- Fast navigation between language objects(functions/entities/classes) with help of ctags.
- Browse syntax check diagnostics.
- Search commands history.
- List/search Git branches/commits.

Syntax checking

Vim/NeoVim syntax checkers

Provide syntax check, autocompletion, diagnostics, go to definition, show documentation, etc.

- **CoC** – a little slow, great autocompletion, not easy to configure.
  https://github.com/neoclide/coc.nvim
- **ALE** – minimum configuration needed, fast linting, not good autocompletion.
  https://github.com/dense-analysis/ale
- **Syntastic** – no longer maintained
  https://github.com/vim-syntastic/syntastic
- **NeoVim** builtin LSP – fast, nice looking error notifications, difficult to configure.

hdl_checker

- HDL language server for VHDL/Verilog/SystemVerilog
- Supports Modelsim/Questa, GHDL, Vivado Simulator
- https://github.com/suoto/hdl_checker

Snippets

Vim plugins

- Vim-snippets https://github.com/honza/vim-snippets
- Ultinsips https://github.com/SirVer/ultisnips
- Snipmate https://github.com/garbas/vim-snipmate
- Neosnippet https://github.com/Shougo/neosnippet.vim

Templates

- TerosHDL has templates for entity instances, testbenches, and cocotb tests.
- For Vim this plugin can generate entity/components instances: https://github.com/vim-scripts/VIP .
- There are a number of testbench generators on Github for instance:
  https://github.com/phillbush/tbgen
  https://github.com/JC-LL/vhdl_tb
  https://github.com/connorcl/testbench-gen

CTags

Ctags is a programming tool that generates an index (or tag) file of names found in source and header files of various programming languages to aid code comprehension. (c)Wikipedia

- Exuberant ctags https://ctags.sourceforge.net
- Universal ctags https://github.com/universal-ctags/ctags

Vim plugins

- vim-tagbar https://github.com/universal-ctags/ctags
- Vista.vim https://github.com/liuchengxu/vista.vim

:BTags – fast navigation through *tags* with fzf.vim!

Git integration

- https://github.com/airblade/vim-gitgutter
  Marks modified lines of the current buffer.
- https://github.com/tpope/vim-fugitive
  "it's so awesome, it should be illegal"
  (c) it's GitHub page.

Show last changes, diff with a given commit, show logs and more.

Fugitive

:Git	Gives an **interactive**(!) version of the git status: can add/reset specific file, open file, undo changes and everything.
:Gwrite	Stage the current file to the index.
:Gread	Revert current file (git checkout).
:Gremove	Delete the current file and vim buffer.
:Gllog	Git log.
:Gvdiffsplit	Open line by line diff in a vertical split.

Git integration with Fuzzy Find

:GBranches	Open fzf-preview window with a list of branches where one can switch, create, merge, delete branches interactively
:Commits	Show commits with fuzzy find through them and preview of the changes
:BCommits	Show commits log for the current buffer
:GTags	List of git tags
:GFiles	List of tracked files

Integration with terminal

Vim

- :terminal – open built-in terminal
- !command – execute command and put output into the quickfix window
- :new | r ! command – execute command and put output into a new buffer
- AsyncRun – https://github.com/skywind3000/asyncrun.vim
  Run shell comand in the background. E.g. :
  :AsyncRun make – do make in the background.
  :AsyncRun git push – git push.
  :AsyncRun −mode=term −pos=tab ./% – run current buffer and show output in the new tab
  :AsyncRun −mode=term −pos=right ./% – run current buffer and show output on the right split

VSCode

- VSCode has a built-in terminal window.
- Can run commands asynchronously as well.

TerosHDL amazing features

See https://terostechnology.github.io/terosHDLdoc/ for the full list of features with gif previews.

- State machine viewer
- Templates : components/entities/testbenches/cocotb
- Hierarchy view/dependencies graph
- Schematic viewer (synthesis with YoSys)
- Automatic documentation (with wavedrom/bitfield integration)
  Wavedrom (https://wavedrom.com) is a powerful tool to draw timing diagrams.
  It has online editor: https://wavedrom.com/editor.html.
- Integration with Modelsim, Quartus, Vivado, Radiant, and everything.

Some links

Vim

- https://www.vim.org/
- https://vimawesome.com/
- Introduction to Vim in Russian https://www.youtube.com/watch?v=jkxLIFVGfd4

VsCode

- https://www.youtube.com/@terostechnology5520
- Presentation “TerosHDL: an open source IDE for FPGA developers” https://www.youtube.com/watch?v=_wxTjOSO5oY