# GHDL in the FOSS EDA ecosystem

Tristan Gingold
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# GHDL as a simulator

- Standard supported:
  - vhdl-93: full,
  - vhdl-08: mostly,
  - vhdl-2019: planned
- Compiled simulation (generation of CPU opcodes)
- Multiple backends: GCC, LLVM, mcode (internal)
- Fast translation
- But simulation speed varies…
- Better error messages
- Bugs can be fixed quickly

# The simulation ecosystem

- Waveform generation for gtkWave
- VCD output (lowest common denominator)

- Limited debugging with gdb

- Coverage (with gcov)
  - Need something better

- Support of FOSS verification frameworks

# Missing pieces

- Mixed languages simulation
  - FOSS Verilog/SystemVerilog exists
- IDE
  - Improve gtkWave to interface with simulators
  - Integration of waveform viewers within IDE
- Graphical design with blocks
  - Reuse schematic editors of PCB tools (like KiCad)
- Schematic viewer
- SystemVerilog: full support of UVM (wip)

# GHDL for Editors

- `ghdl-ls` is a language server for VHDL
- Support for vs-code (but not in the market place)
- Navigation
  - jump to declaration / definition
  - Hover
- Reformatting
- Instantiation
- Error messages as you type

# Why FOSS EDA tools ?

- For makers
  - Low money, but OK with free versions
- For FOSS activists
- For Industry: prototypes/CI
  - Could be faster than closed tools (no license check)
  - No license restriction (unlimited runs)

# GHDL for synthesis

- Relatively recent feature (~2020)
- Wide support of vhdl features
  - Including at elaboration
- Non-optimized netlist generation (vhdl or verilog)
- Yosys plugin - easy integration
- Support of PSL (for formal proof)

# Multi language support

- Incomplete support with Yosys
  - Can instantiate a design from any language
  - TODO: parameters/generics value
- Need mixed elaboration
- Cross module probing ?
- Cross language type definitions ?

# My rant: vendor position ?

- Vendors are heavy users of FOSS
  - IDE: Eclipse
  - Compilers: LLVM, gcc
  - Languages: TCL, python…
  - Libraries: boost, json/xml parsers, http, tcp/ip stack,…
  - OS: Linux, FreeRTOS, uboot

- But poor openness:
  - No simulation models available
    - Encrypted or vendor specific libraries
  - Proprietary formats
  - Bitstream

# Conclusion

- Long story of FOSS EDA:
  - Just think of Berkeley: Spice, TCL, Risc-V, expresso
- Still continuing
- Some tools are missing
  - In particular for beginners (eg: IDE)
- EDA vendors could be more open!