OpenCPI - Open Component Portability Infrastructure

An Open Source Infrastructure for Heterogeneous/Embedded Component-Based Systems and Applications

HDL Primitives

HDL Primitives

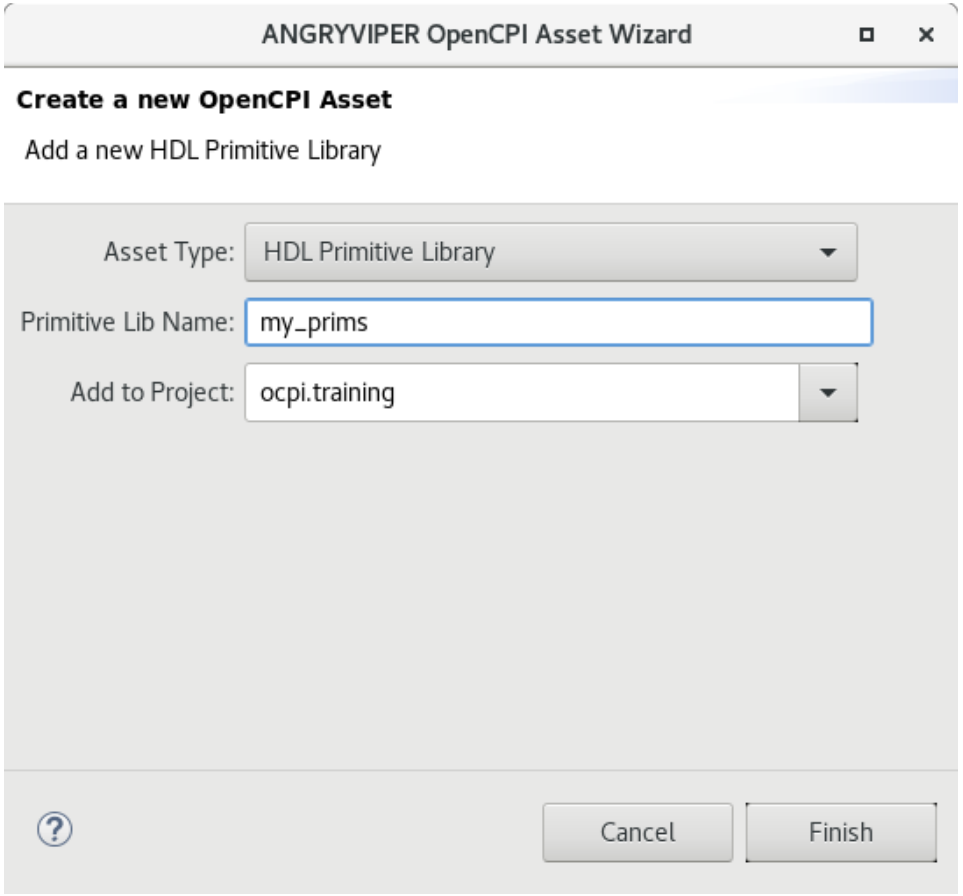
- HDL primitives and primitive libraries are the preferred way in OpenCPI to store/present reusable HDL for use in multiple workers
- Including HDL primitives requires modifying Makefiles
  - As of 1.5, this is not supported by the IDE
  - May be referenced in:
    - Project.mk file using *HdlLibraries*=,
    - Component library Makefile using *HdlLibraries*=,
    - HDL Worker Makefiles using *Libraries*=
- Not required, but recommended practice
  - Alternatively, if used in a single worker, source could be added to the worker's directory and to the *SourceFiles*= makefile variable
- Must NOT have the same name as an HDL application worker

HDL Primitives (cont.)

- HDL Primitive Library
  - Collection of modules
  - Built from HDL source code (ex: FIR, CIC, etc.)
- HDL Primitive Core
  - Single modules built from HDL source code or generated by vendor tools
    - Vendor Dependent (ex. Xilinx/Coregen or Vivado, Altera/MegaWizard)
  - Prebuilt Cores from third party (.qxp/.edf/.ngc)
- Primitives may depend on each other
  - But *circular* dependencies are NOT supported
  - Primitive libraries depend on primitive libraries
    - use *PrimitiveLibraries*= to define the build order in the hdl/primitives/Makefile
    - use *Libraries*= when one primitive depends on another in the hdl/primitives/<my_prim>/Makefile
  - The Core project depends on primitive libraries

HDL Primitive Libraries

- Library creation supported in IDE, but population not supported yet
  - Makefile editing still required
- Directory for the primitive library created at hdl/primitives/<my_prims>/
- Makefile contains, at a minimum:
  - include $(OCPI_CDK_DIR)/include/hdl/hdl-library.mk
- Libraries build in per-target directories named
  - target-<hdl-target>
- Library must include the VHDL file <libname>_pkg.vhd used for component declarations and unique type declarations
- Can have multiple *_pkg.vhd files and separate package body *-body.vhd files



HDL Primitive Libraries (cont.)

- VHDL package name doesn't have to be the same as the library's name
- Ex: Single package for a primitive library mylib
  - library mylib; use mylib.mylib.all;
- Ex: Multiple packages in the primitive library mylib; different package names
  - library mylib; use mylib.mypkg.all;
- SourceFiles=
  - used to define build dependency order within a primitive library
  - required when a multilevel directory structure is used within the primitive library
- Log output of tools found in target-<hdl-target>/<libname>-<tool>.out
- Exportable results for all primitive libraries & cores found in hdl/primitives/lib

HDL Primitive Cores

- Directory for the primitive core created at hdl/primitives/<my_core>/
- Makefile contains
  - include $(OCPI_CDK_DIR)/include/hdl/hdl-core.mk
- Can be a mix of source and prebuilt files
  - Pre-synthesized core files (Xilinx Vivado *.edf, Xilinx ISE *.ngc or Altera *.qxp)
- VHDL instantiation must have a package file <corename>_pkg.vhd
- Verilog instantiation must have a "black box" empty module definition file <corename>_bb.v
- Optional Makefile variables
  - *Top*= (ocpidev -M) - Specifies the top module name of core when different than ocpidev name <my_core>
  - *PreBuiltCore*= (ocpidev -B) - Specifies a file that is not source code