

scientific  
analog

# ***XMODEL***

# Setup Guide

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# Outlines

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- This material will explain how to:
  - Install *XMODEL*
  - Setup *XMODEL* environments
  - Run *XMODEL* simulation with provided examples

# Installing *XMODEL*

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- First, download the *XMODEL* installation package from Scientific Analog's website
  - `xmodel_YYYY.MM_x86_64.sh` for Linux 64-bit platforms
  - `xmodel_YYYY.MM_x86.sh` for Linux 32-bit platforms
  - `YYYY.MM` is the release year and month
- Second, make the file executable and execute it:

```
$ chmod +x xmodel_2017.06_x86_64.sh  
$ ./xmodel_2017.06_x86_64.sh
```
- And follow the instructions as prompted

## Installing *XMODEL* (2)

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- The one-step way of installing *XMODEL* is to use ***-b*** and ***-p*** options:

```
$ chmod +x xmodel_2017.06_x86_64.sh  
$ ./xmodel_2017.06_x86_64.sh -b -p <INSTALL_PATH>
```

- ***-b*** option: runs in batch mode without prompting
- ***-p*** option: specifies the installation path  
*<INSTALL\_PATH>*

# Environment Setup for *XMODEL*

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- To use *XMODEL*, you need to define the following environment variables:
  - **\$XMODEL\_HOME**  
: the XMODEL installation path
  - **\$XMODEL\_SIMULATOR**  
: default SystemVerilog simulator (vcs, ncverilog, or modelsim)
  - **\$SALMD\_LICENSE\_FILE**  
: FlexLM license server address or file path
  - **\$PATH**  
: append **\$XMODEL\_HOME/bin** to existing \$PATH

## Environment Setup for *XMODEL* (2)

- Examples

- In bash-like shells:

```
export XMODEL_HOME=/cad/xmodel/xmodel_2017.06
export XMODEL_SIMULATOR=vcs
export PATH=${PATH}:${XMODEL_HOME}/bin
export SALMD_LICENSE_FILE=9524@licserver
```

- In csh-like shells:

```
setenv XMODEL_HOME /cad/xmodel/xmodel_2017.06
setenv XMODEL_SIMULATOR vcs
setenv PATH ${PATH}:${XMODEL_HOME}/bin
setenv SALMD_LICENSE_FILE 9524@licserver
```

\* NOTE: please refer to other sources on the differences between UNIX shells

# Install and Setup SystemVerilog Simulator

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- *XMODEL* can work with Synopsys VCS, Cadence NC-Verilog (i.e. INCISIVE), and MentorGraphics ModelSim (QuestaSim)
  - Please refer to the corresponding vendor's manuals on how to install and setup each simulator
- One example: ModelSim Altera-Starter Edition (ASE)
  - Freely available (with some limitations on speed/capacity)
  - Download site (requires user registration):  
[http://dl.altera.com/?edition=standard&product=modelsim\\_ase#tabs-2](http://dl.altera.com/?edition=standard&product=modelsim_ase#tabs-2)

# ModelSim ASE Setup Example

- To setup ModelSim, define **\$MODELSIM\_HOME** and add **\$MODELSIM\_HOME/bin** to **\$PATH**

```
export MODELSIM_HOME=/cad/modelsim-ASE-16.0/modelsim_ase
export PATH=${PATH}:${MODELSIM_HOME}/bin
```

- And for *XMODEL*, use “**modelsim**” for **\$XMODEL\_SIMULATOR**:

```
export XMODEL_HOME=/cad/xmodel/xmodel_2017.06
export XMODEL_SIMULATOR=modelsim
export PATH=${PATH}:${XMODEL_HOME}/bin
export SALMD_LICENSE_FILE=9524@licserver
```



# ***XMODEL*** Package Organization

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- **/doc**: contains documentation files
- **/bin**: contains executable programs (*xmodel*, *xwave*, ...)
- **/lib**: contains platform-specific run-time libraries
- **/etc**: default configurations, model templates, etc.
- **/function, /stim, /gate, /vdt, /connect, /meas, /circuit**: contains the *XMODEL* primitive modules
- **/cadence**: contains Cadence-related libraries and setup files

## *XMODEL* Package Organization (2)

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- **/block**: contains block-level modeling examples (phase-frequency detector, voltage-controlled oscillators, etc).
- **/example**: contains system-level modeling examples (charge-pump PLL, bang-bang CDR, high-speed links, adaptive DFE equalizer, etc).
- **/tutorial**: contains tutorial materials used for training (*XMODEL*, *GLISTER*, and *MODELZEN* basics and high-speed links)

# About *XMODEL* Examples

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- Examples in **/example** directory showcase various analog/mixed-signal systems modeled using *XMODEL*
- Most models are written in text and simulated via Makefile script (soon to be replaced with *MODELBOX*)
- Examples include:
  - ***cp\_pll***, ***dpll***: charge pump PLL and digitally-controlled PLL
  - ***bb\_cdr***: bangbang controlled CDR
  - ***eq\_adapt***: equalizer adaptation
  - ***hs\_link***: high-speed link
- Refer to the PDF documentation contained in each sub-directory for further information

# Running *XMODEL* Examples

- Copy the example directory to your local directory:

```
$ cp -R $XMODEL_HOME/example ~/example
```

- Change directory into the digital PLL example (*dp11*):

```
$ cd ~/example/dp11
```

- Change directory into the testbench simulating the locking transient of the PLL (*tb\_locking*):

```
$ cd tb/tb_locking
```

- Run simulation and plot waveforms using *XWAVE*:

```
$ make  
$ xwave -a xmodel.jez
```

Find documentations on this example in:  
[\\$XMODEL\\_HOME/doc/Example\\_DPLL.pdf](#)

# Simulation Results

