Lattice Diamond software

Download

- https://www.latticesemi.com/en/Products/DesignSoftwareAndIP/FPGAandLDS/LatticeDiamond
- create an account (account activation may take several days)
- follow “Licensing” link and in section “Request Diamond Free License” select “Request Node-locked License”

Create project

- Start “Lattice Diamond”
- File -> New -> Project
- In ‘Project Name’ step set the Name and Location of the project
- In ‘Add Source’ step add provided `*_top.vhd` file
- In ‘Select Device’ step select ‘MachXO3LF’ family and ‘LCMXO3LF-6900C’ device
- In ‘Select Synthesis Tool’ step select ‘Synplify Pro’
- In ‘File List’ tab (left pane) replace the content of `.lpf` file with provided `top.lpf` file

Compile project

- Select ‘Process’ tab in left pane, and run (double click) ‘Bitstream File’ step

Program device

- Tools -> Programmer
- If necessary - ‘Detect Cable’ and select cable with ‘USB-0’ label
- Click OK and wait for ‘Programmer’ tab to open main window
- Important: modify ‘Operation’ cell (double click) and select ‘Static RAM Cell Mode’ in ‘Access mode:’
- Program device (‘Design’ -> ‘Program’)

Troubleshooting on a Linux OS:

- in case that Tools -> Programmer is grayed out:
  - install `libusb-0.1.so.4` from your package manager
  - OR: link it to your libusb (`ln -s libusb-0.1.so.4 <your_libusb>` in `/usr/lib64`)
  - restart the diamond software, try again
- permission denied error for your usb-device:
  - create file `/etc/udev/rules.d/50-lattice.rules` with the following content:

```
SUBSYSTEM=="usb",ATTRS{idVendor}=="0403",ATTRS{idProduct}=="6010",\
  MODE="0666",GROUP="users",SYMLINK+="ftdi-%n"
SUBSYSTEM=="usb",ATTRS{idVendor}=="0403",ATTRS{idProduct}=="6010",\
  RUN+="/bin/sh -c 'basename %p > /sys/bus/usb/drivers/ftdi_sio/unbind'"
```

  - run `sudo rmmod ftdi_sio` after attaching the usb cable
  - run “sudo udevadm control –reload”
  - run “sudo udevadm trigger”
  - restart diamond software and try again

Troubleshooting on a Windows:

- if device driver could not be found download the FTDI driver from https://ftdichip.com/drivers/.

Simulation

ghdl and gtkwave

- install GHDL and gtkwave (from your package repository)
  - GHDL is a simulator for VHDL, see https://ghdl.github.io/ghdl/getting.html
  - gtkwave is an analysis tool that allows to visualize wave files (e.g. `*.ghw`), see https://gtkwave.sourceforge.net/
- download `sim.sh`, top files (e.g. `ex00_top_tb.vhd`) and run provided testbench script (e.g. `ex00_top_tb.sh`)

Lattice ModelSim

- if necessary, install MS Visual C++ 2013 Redistributable package (x86 version)
- run 'Tools' -> 'Simulation Wizard'
- set 'Project Name' and set 'Process Stage' to 'RTL'
- check 'Source Files' list and make sure that necessary files are present
- select appropriate testbench entity in 'Simulation Top Module'
- run simulation, check output for any 'Error: Assertion violation' entries
- to restart simulation, type `restart` and then `run` in command view

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The lab takes place in [TBD].

Send your solutions through MOODLE (https://moodle.uni-mainz.de).

The solution should include:

- Source code (only **your** `.vhd` files)
- Brief description if applicable, questions, etc.
- Screen shot of the simulation (use simulation range of 1 microsecond)
