**How to Install Vivado for Macro-Placement Evaluation**

We use a special version of Vivado 2021.1 for the MLCAD 2023 Contest to evaluate FPGA macro placements generated by contestants. The instructions of downloading and running the Vivado flow are as follows:

1. **Obtain a** **Vivado License**

* Please ask your team’s advising professor to obtain a Vivado license from Xilinx’s University Program: <https://www.xilinx.com/support/university/donation-program.html>.

**2. Download the Vivado 2021.1 executable**

After obtaining a Vivado license, please do the following:

* Visit http://www.xilinx.com/support/download
* Sign in using UserID/Password. Create a new account if you do not have one.
* Download Vivado HLx 2021
* Save the executable in some directory, say *vivado\_dir*

3. **Download the Vivado 2021.1 MLCAD 2023 Contest Patch**

* Visit http://www.xilinx.com/getlicense
* Sign in using UserID/Password. Create a new account if you do not have one.
* You should see account MLCAD\_2023\_Contest Release in your drop down menu
* Click on the Restricted Downloads tab
* You should see the file *vivado.zip* patch file
* Click the download button to download it

4. **Install Vivado on a linux machine:**

Create a Vivado patch directory (e.g. *vivado\_patch\_dir*)

% mkdir vivado\_patch\_dir

% cp vivado.zip vivado\_patch\_dir

% cd vivado\_patch\_dir

% unzip vivado.zip

5. **Download Benchmark suite and run Vivado**

* Download the benchmark design suite from the following Kaggle website:

<https://www.kaggle.com/datasets/ismailbustany/mlcad-2023-fpga-macro-placement-benchmark-suite>

* The dataset contains 180 designs (Design\_1.tgz, …, Design\_180.tgz)
* It also contains a design specification file, Design\_sepecifications\_key, that lists estimated Vivado place-and-route runtimes for each design as a reference. Observe that designs with the larger clock resources (e.g. 38 clock resources) have the longer runtimes.
* Untar all the files and run Vivado on one of the designs (e.g. Design\_1) as follows:

% tar xvfz Design\*

% cd Design\_1

% setenv MYVIVADO [path-to-vivado-path-dir]/vivado

% [path-to-vivado\_dir]/vivado -mode tcl -so place\_route.tcl

* In case of illegal placement, Vivado will error out with illegal placement information.
* If the placement is legal, Vivado router starts and completes routing, or report unroutable design.
* If routing completes successfully, the following message indicates total routed wirelength:

Total Routed Wirelength: xxxxx (Vertical xxxx, Horizontal xxxx)

* In case of unroutable placement, the following message is issued:

CRITICAL WARNING: [Route 35-162] xxxx signals failed to route due

to routing congestion.

6. If you encounter any issues, please contact mlcad2023contest@gmail.com