**BASIC SETUP TO CONNECT BOARD TO COMPUTER AND RUN JUPYTER NOTEBOOK with GNN**

1. Connect computer to PYNQ-Z2 board with Ethernet cable.
   1. The PYNQ-Z2 board needs to be connected with a USB cable for power and with an Ethernet cable for communication. The PYNQ-Z2 board boots a Linux Ubuntu image in its host ARM processor. The IP address of the board is hardwired to 192.168.0.100.
   2. Make the connections and power on the board. Make sure the supplied micro SDCard has been inserted in the board. The SD card contains the OS/bitstreams etc. A red LED should be visible and after a while some blue LEDs will flash indicating that the boot process has completed.
   3. We need to be able to transfer files to the board. Follow the steps below depending if you are working under Windows and Linux.
      1. Windows: A handy piece of windows software to achieve this is WINSCP. Open WINSCP and create a new site with the pynq details shown in this picture. The user name is xilinx and the password is also xilinx. Click login to connect to the board.

Graphical user interface, application, Word

Description automatically generated

* + 1. Ubuntu Linux:If you are working with Ubuntu Linux you can use the file explorer Nautilus. In the command prompt type nautilus. Then go to +other locations. You should see a network called PYNQ as long as the board and the computer are connected with compatible IP addresses (e.g., computer IP address 192.168.0.10 and board 192.168.0.100). Click on PYNQ then you should see a remote folder called Xilinx and when you clock on it a request to authenticate. Use registered user with username xilinx, domain pynq.local and password xilinx. Click connect and then you should see the contents of the board sd card with directories jupyter\_notebooks and pynq.

A screen shot of a computer

Description automatically generated with medium confidence

* 1. After the connection is established navigate to the overlay directory in the board that is located at /pynq/overlays or using the full path if necessary /usr/local/share/pynq-venv/lib/python3.8/site-packages/pynq/overlays. Use the available mmult-master directory or create it and then transfer two files to this directory: mmult-master.bit and mmult-master.hwh. These are the bitstream file and a hardware definition file that were created in Vivado lab2 and that tell the PYNQ framework the contains of the hardware. If the names of the files do not match these names, please, rename them to mmult-master.bit and mmult-master.hwh. Otherwise the python code will not be able to locate the files. Now navigate to the Jupiter notebooks directory located at jupyter\_notebooks/mmult-master or using the full path /home/xilinx/jupyter\_notebooks/mmult-master. You should see a jupyter notebook with the name mmult-master.ipynb. This is a file with python commands that we will use to control the matrix multiplier accelerator.
  2. Launch notebook and use the accelerator.
  3. In the PC connected to the board open an internet browser such as Firefox in Linux or chrome in Windows. Type in the address window the IP address of the board 192.168.0.100. In the login screen type xilinx as password.

A screenshot of a computer

Description automatically generated with low confidence

* 1. Open the gnn\_all directory and then mmult\_master notebook by clicking on it. Now you can execute the cells of the notebook one at a time. You can select different datasets for this benchmark: citeseer, pubmed, cora. Run the cell for the citeseer dataset initially and bypass the others.

A screenshot of a computer

Description automatically generated with medium confidence

* 1. The hardware runs once you get to the run\_kernel cell. Then you can display some of the results to check that everything looks OK. If you execute the cell that loads the citeseer dataset you should see things like this for line 20:

A screenshot of a computer

Description automatically generated

Now displaying line 0:

A screenshot of a computer

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Once these basics tests are done you can use the rest of the code as reference to compare the results with performing the operations in software, comparing performance, etc,