JOINT INSTITUTE
交大密西根学院

ECE4810J SoC Design

Fall 2024

Lab #0 Getting to know AMD-Xilinx Arty Z7 & Vivado

Due: 11:59pm Saturday Sept. 28, 2024

Please Submit a PDF file on Canvas

1 AMD-Xilinx Arty Z7 Platform

The Arty Z7 is a ready-to-use development platform designed around the Zynq-7000™ All Programmable System-on-Chip (AP SoC) from AMD-Xilinx. It will be used as the main SoC platform for this course throughout the semester. In this assignment, you will be assigned to read several documents about this board and the SoC. Please answer the questions below and submit through canvas. Note that this is an individual lab assignment.

References:

1. Read about Arty Z7 reference manual https://digilent.com/reference/programmable-logic/arty-z7/start
2. Zynq datasheet (go to Canvas > Files > Reading Materials > Zynq > ds187-XC7Z010-XC7Z020-Data-Sheet.pdf
3. The Zynq Book (go to Canvas > Files > Reading Materials > Zynq > The_Zynq_Book_ebook_3.pdf
   or http://www.zynqbook.com/)

Questions:

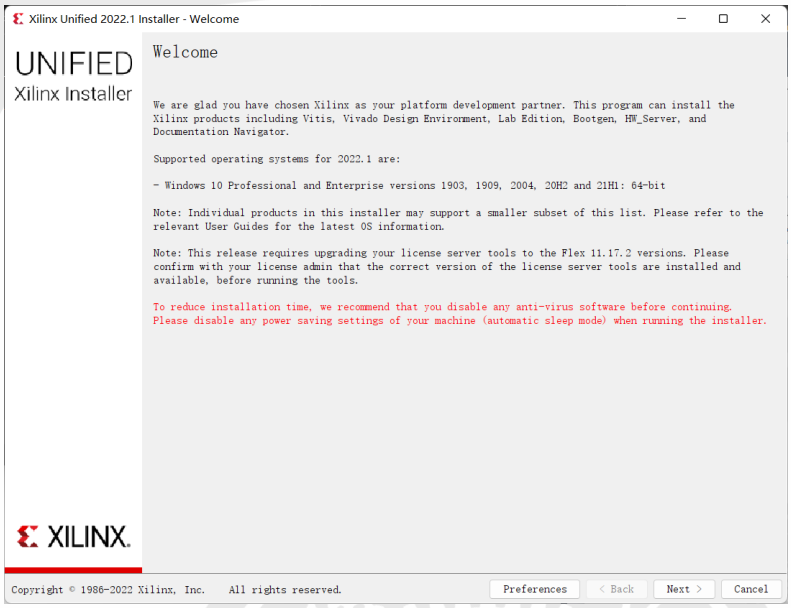
1. (10%)What are the benefits of having Programmable logic on Zynq?
2. (15%) How many cores does Zynq-7000 have? What are the names of those cores? What does the memory hierarchy look like? What is the main CPU frequency?
3. (5%) Besides the Zynq FPGA chip, what are the other chips and their functionalities on this board?
4. (15%) Please list the main interfaces of the Zynq-7000 AP SoC device.
5. (5%) How is the Arty Z7 board powered?
6. (10%) What is the Quad SPI Flash? What is its usage on this board?
7. (10%) What is DDR Memory? What is its usage?
8. (20%) What are the main custom IP blocks creation methods Xilinx provides?

9. (10%) What is High-Level Synthesis (HLS)? What are the motivations behind HLS?

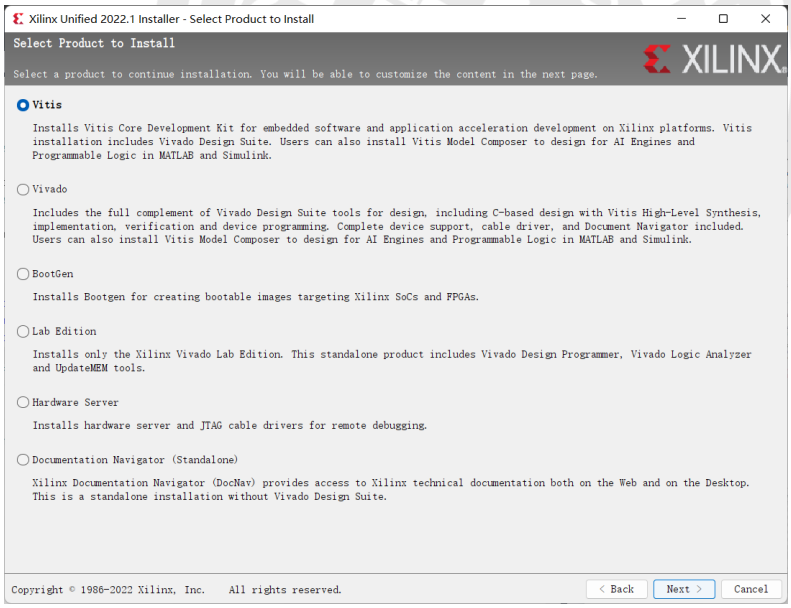
2 Installing Vivado Vitis for the first time (For Windows users)

Xilinx Vitis Installation Guide: Installing Vivado, Vitis, and Digilent Board Files

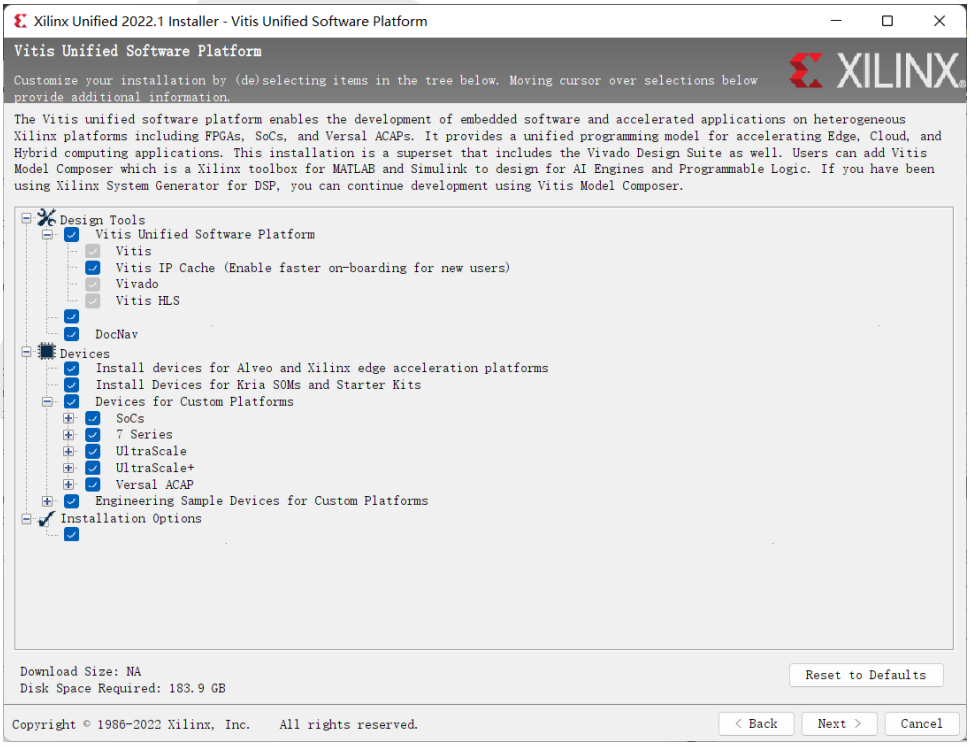
- Visit https://china.xilinx.com/support/download/index.html/content/xilinx/zh/downloadNav/vitis/2022-1.html.
- Uninstall previous versions of Vitis or Vivado. Download Xilinx Unified Installer 2022.1 SFD (TAR/GZIP - 73.81 GB). Extract the zipped file.
- Under folder `Xilinx_Unified_2022.1_0420_0327`, run `xsetup.exe`:



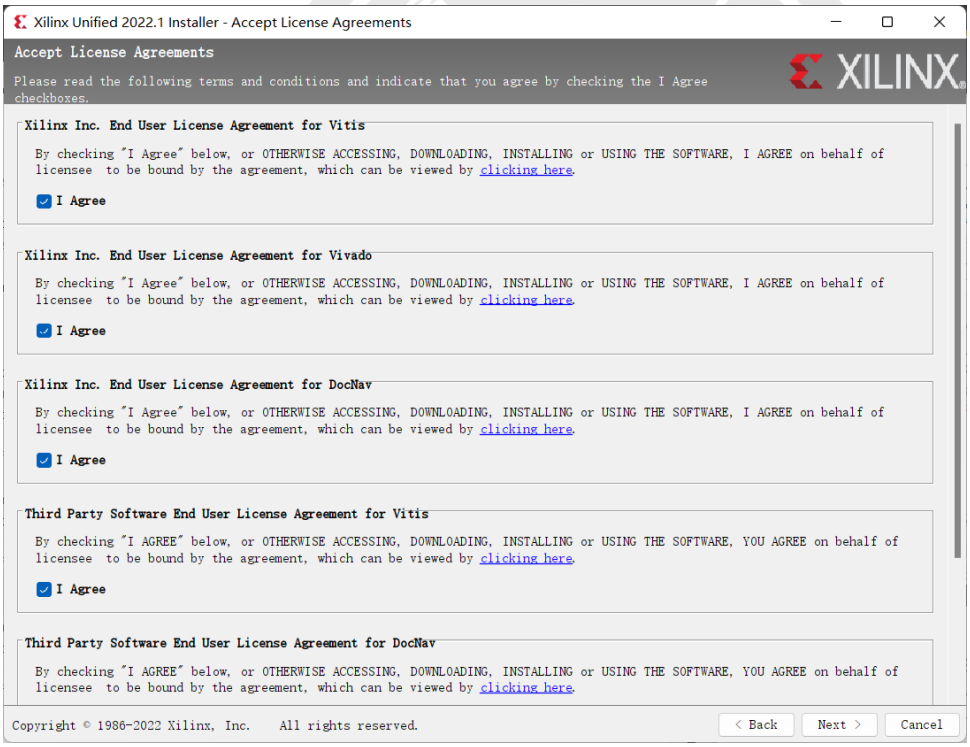
- Click Next:



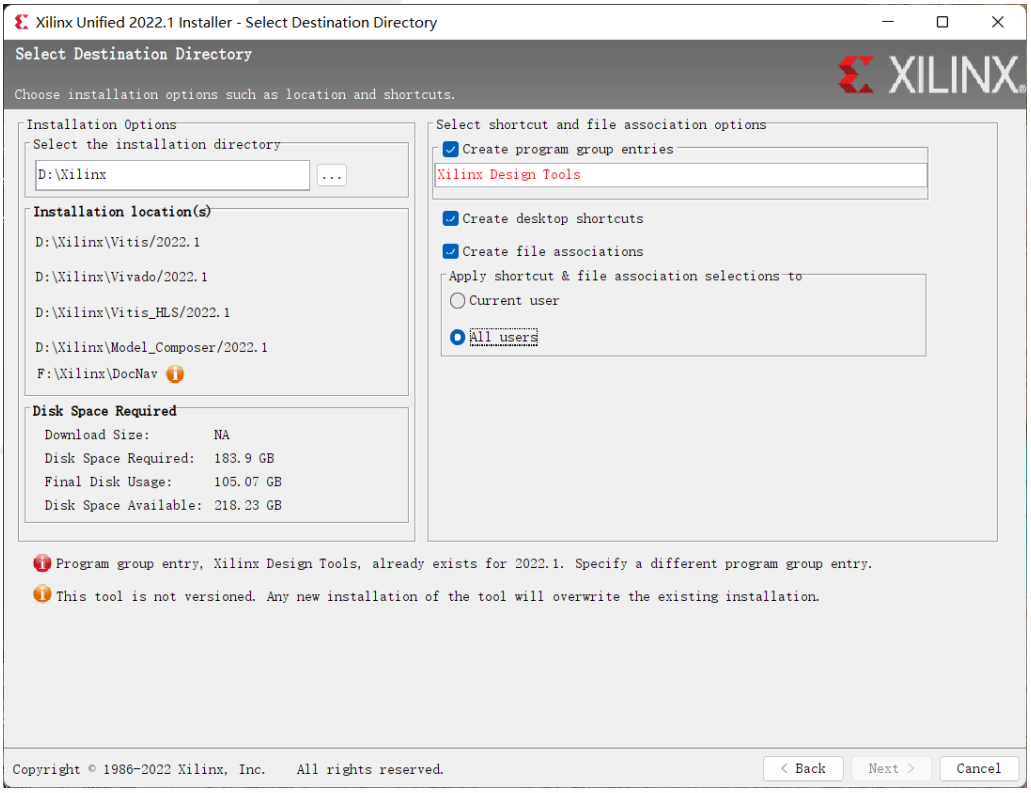
- Click Next. Select all (for Devices for Custom Platforms, at least select SoCs and UltraScale+):



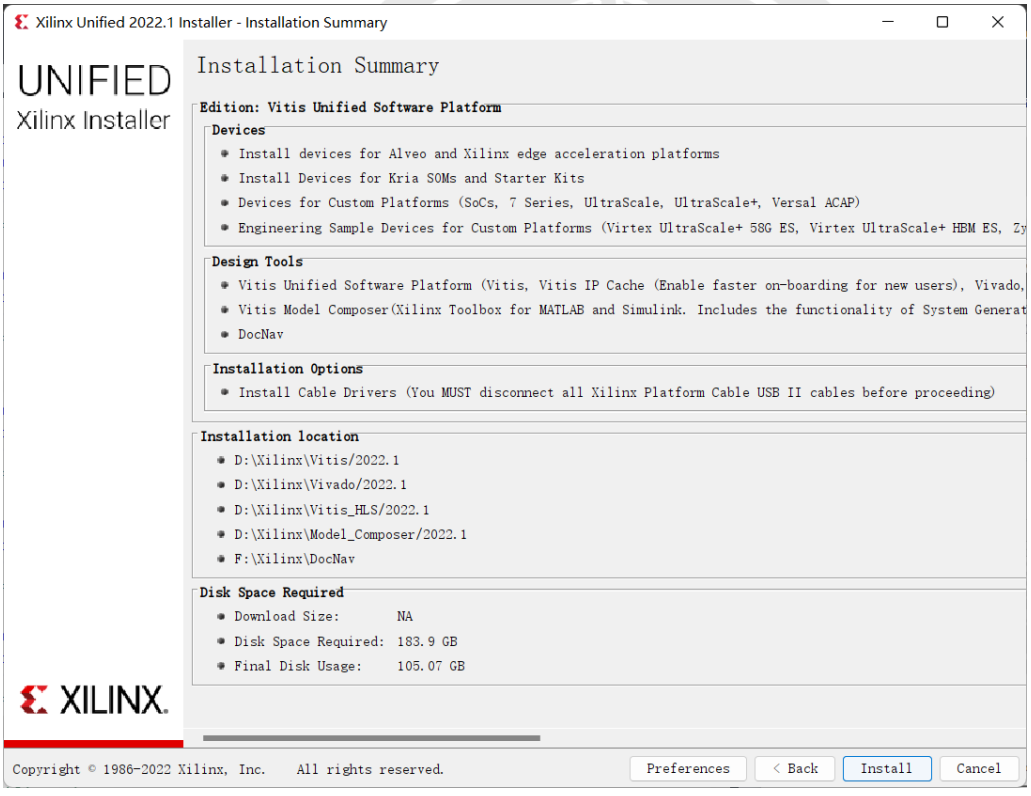
- Click Next. Check "I Agree" for all:



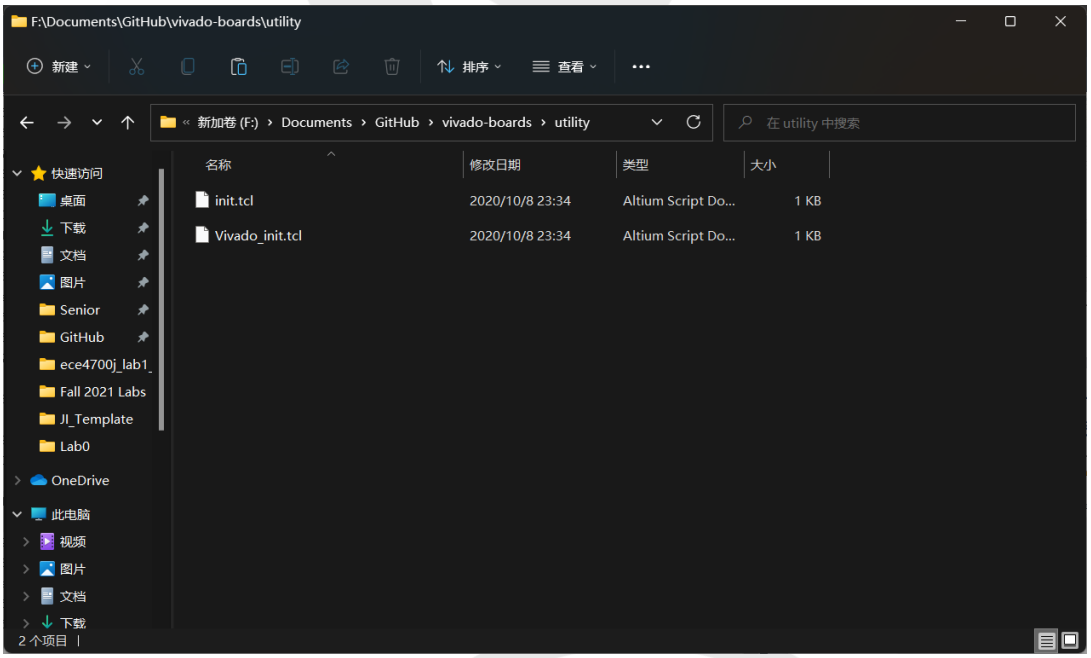
- Select the installation directory:



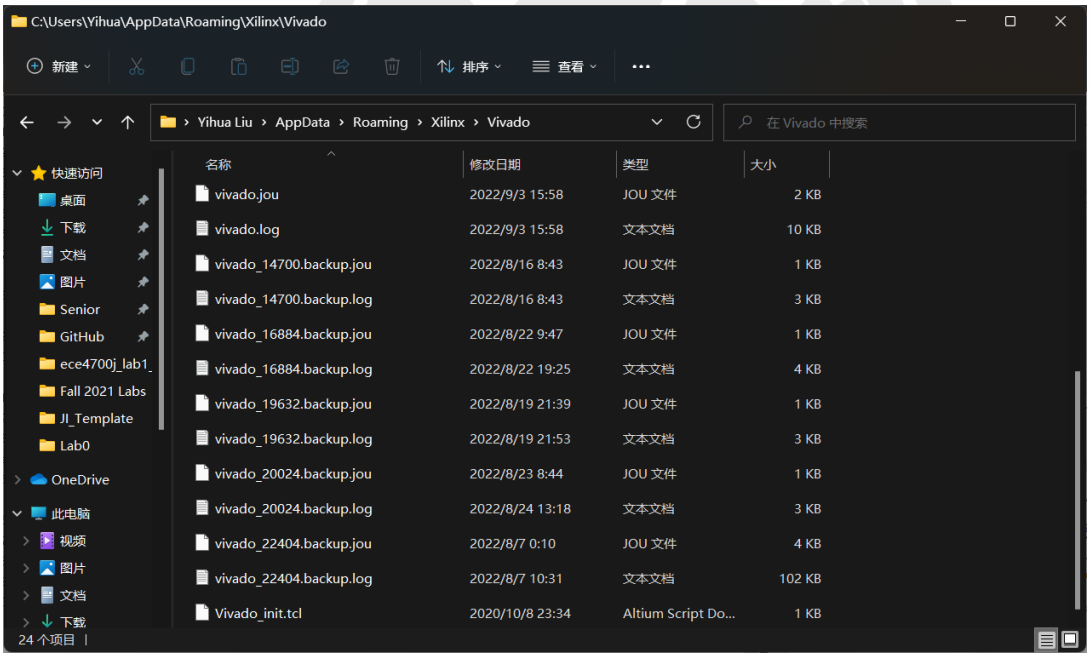
- Click Install:



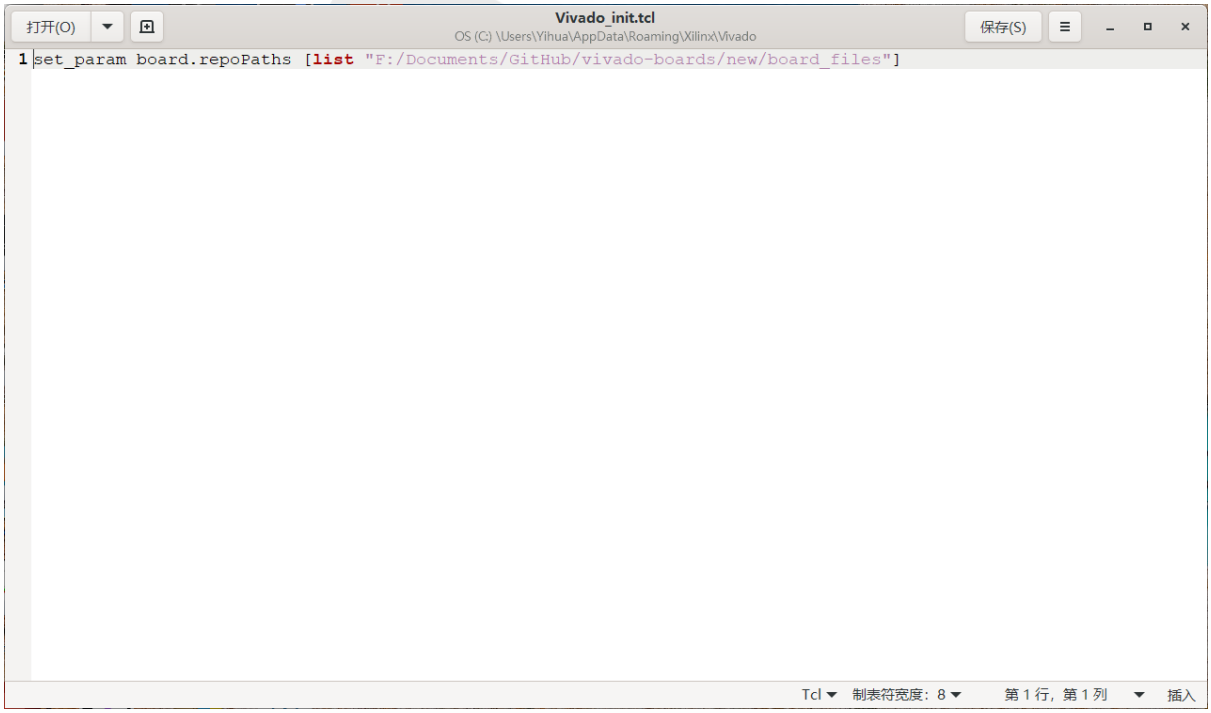
- Scroll down to the end of the webpage and download Xilinx Unified 2022.1.2 : All OS installer Single-File Download (TAR/GZIP - 56.25 GB). Extract the zipped file.
- Under folder `Xilinx_Vivado_Vitis_Update_2022.1.2_0806_0242`, run `xsetup.exe`.
- Install the update.
- Clone the board files repository from Digilent/vivado-boards.



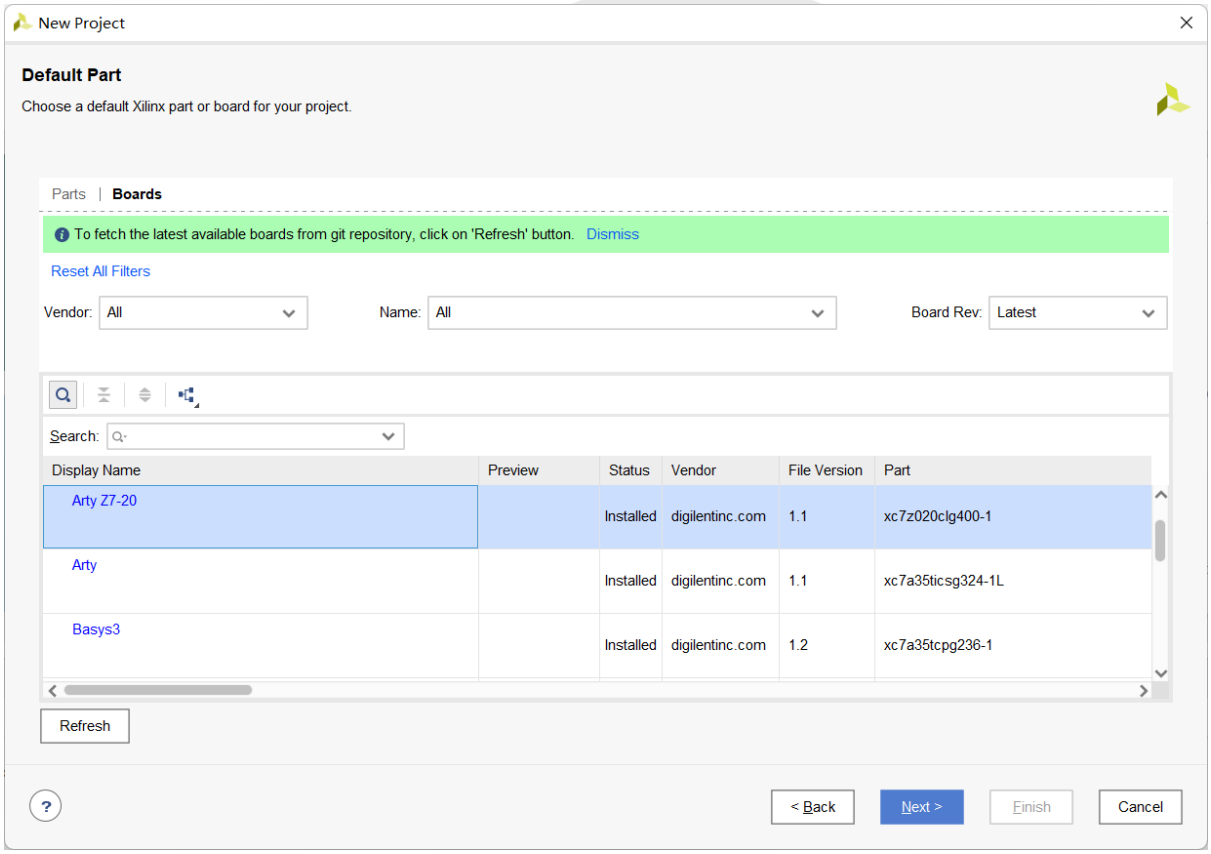
- Copy `vivado-boards/utility/Vivado_init.tcl` and paste it into the `%APPDATA%/Xilinx/Vivado/` directory.



- Open the copied init script in a text editor. Change the text <extracted path> in the script to the path to the extracted vivado-boards folder. Save and close the file.



- Check in Vivado:



3 Using Vivado Vitis through JI virtual desktop (For other users)

It is **strongly** recommended to install Vivado Vitis on your own device, but if you failed to install it for **unsolvable reasons**, you can access the JI virtual desktop for Vivado Vitis. (**Note:** The execution of the virtual desktop can be much slower than your own device, and highly depends on the network quality.)

- Visit `https://vdi.ji.sjtu.edu.cn` (If you are off campus, you need to connect through SJTU VPN).
- Download and install the VMware Horizon Client depend on your own computer system.
- Open VMware Horizon Client and choose the virtual desktop for ECE4810J. (It will be ready before Week 2).