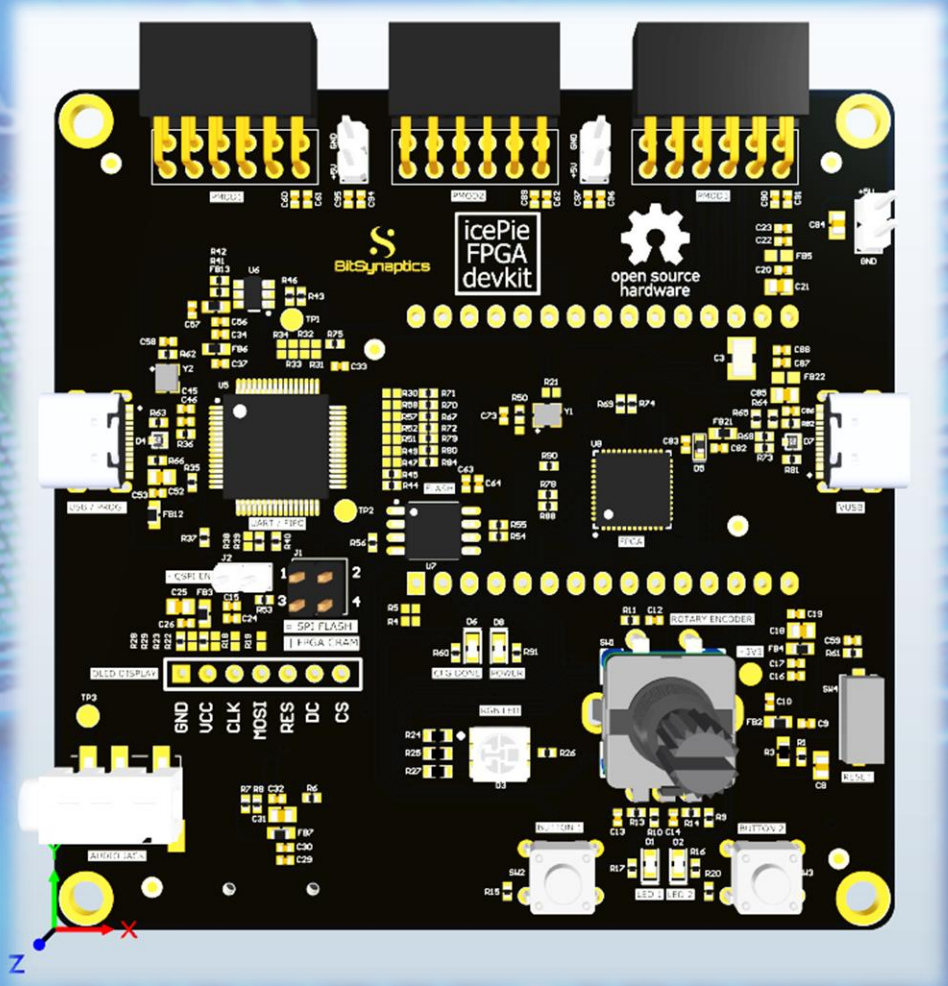
Unravelling the Silicon Revolution

Workshop on FPGAs, Verilog HDL and RISC-V processors

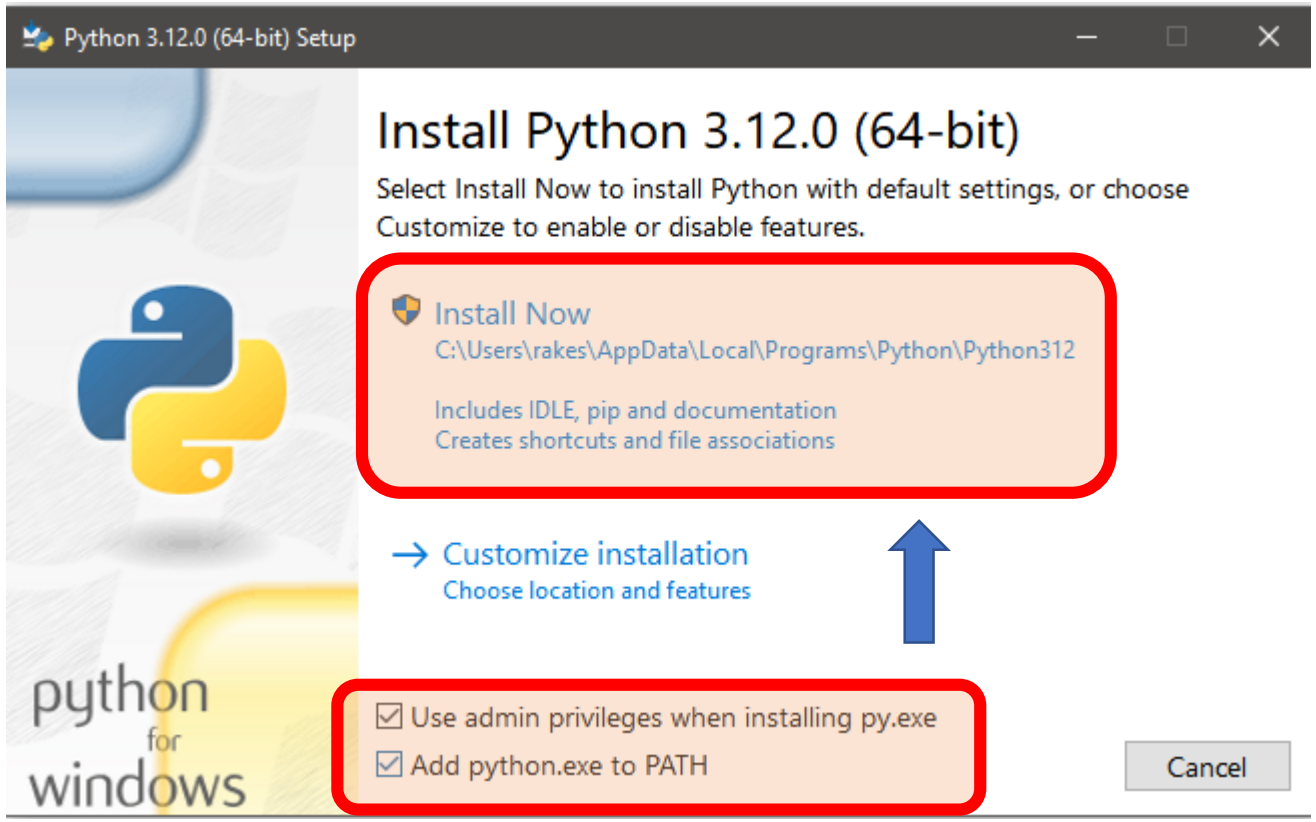


BitSynaptics

THE ONES THAT CONNECT

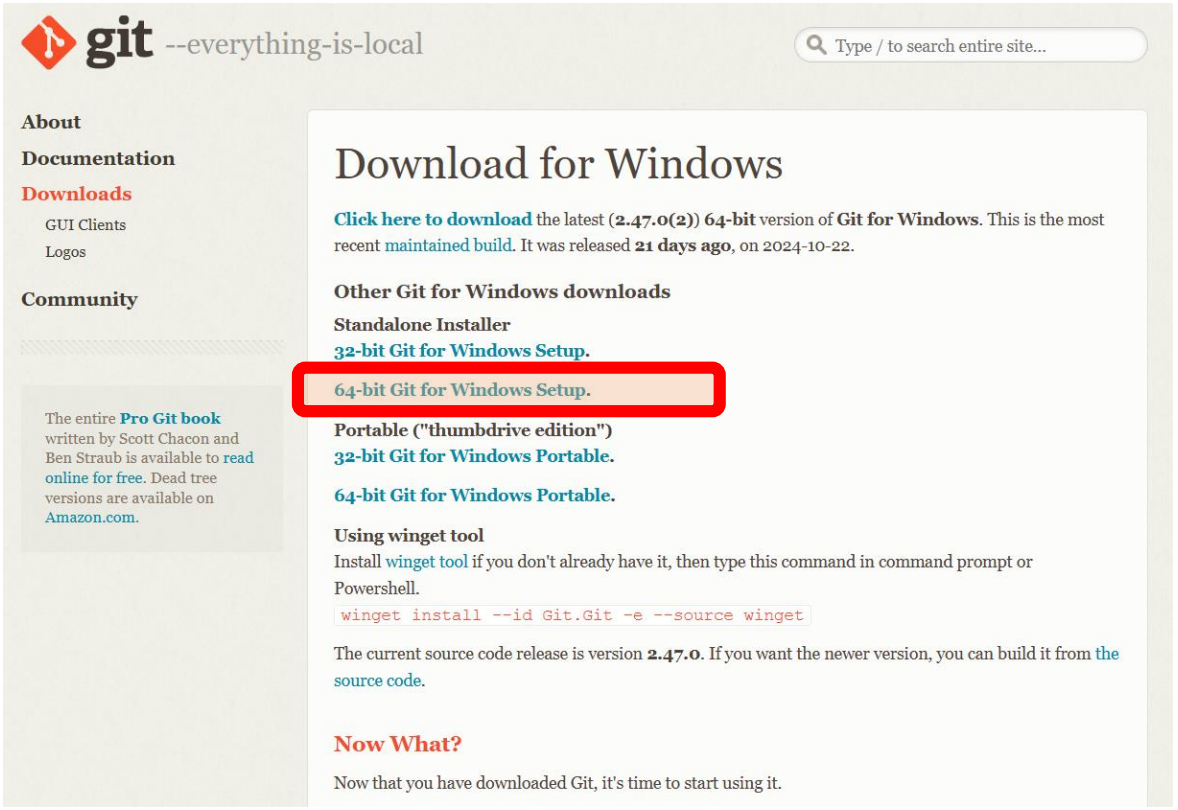
Windows Install Guide for APIO and ice40 Toolchains

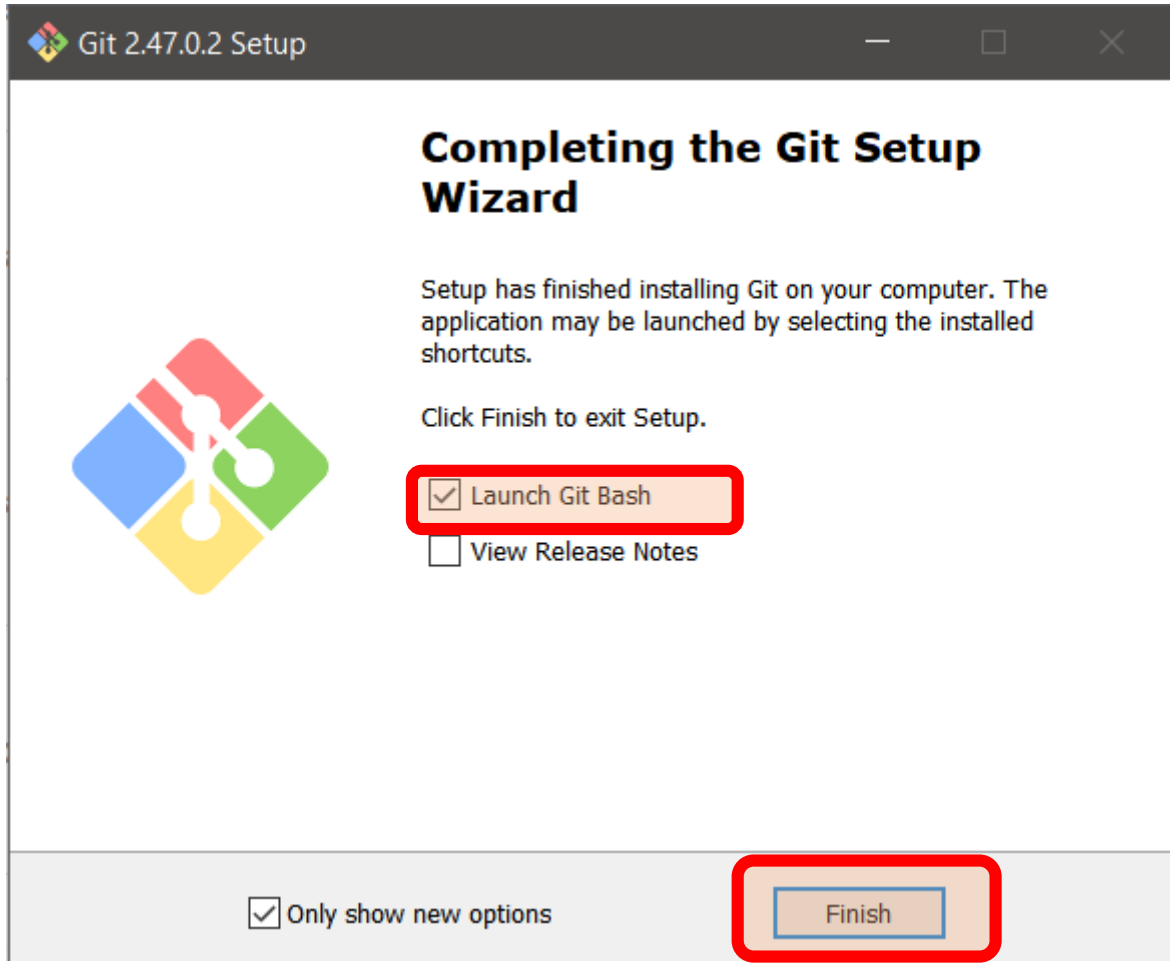
- Step 1: Install Python for Windows
  - https://www.python.org/downloads/

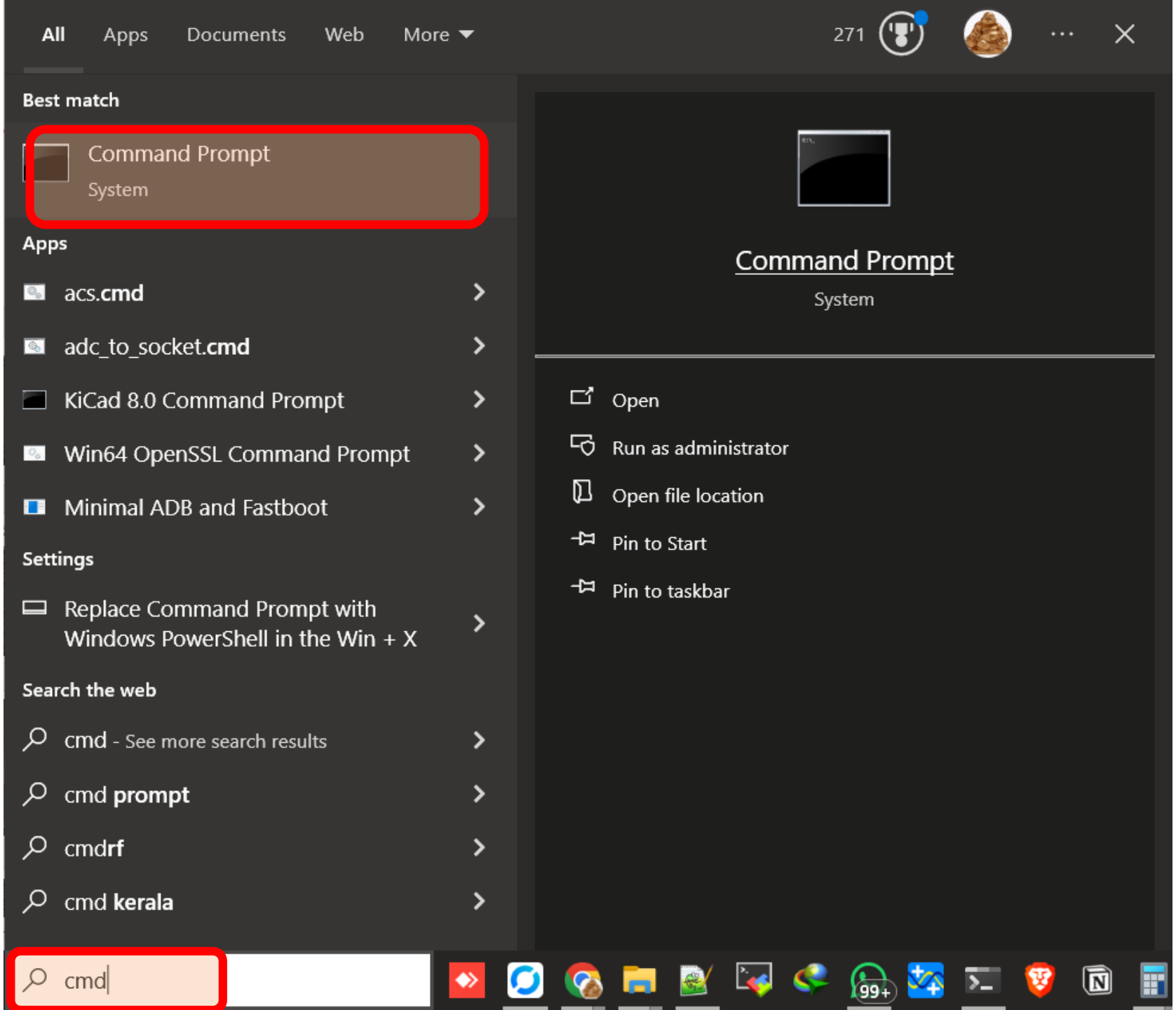


Windows Install Guide for APIO and ice40 Toolchains

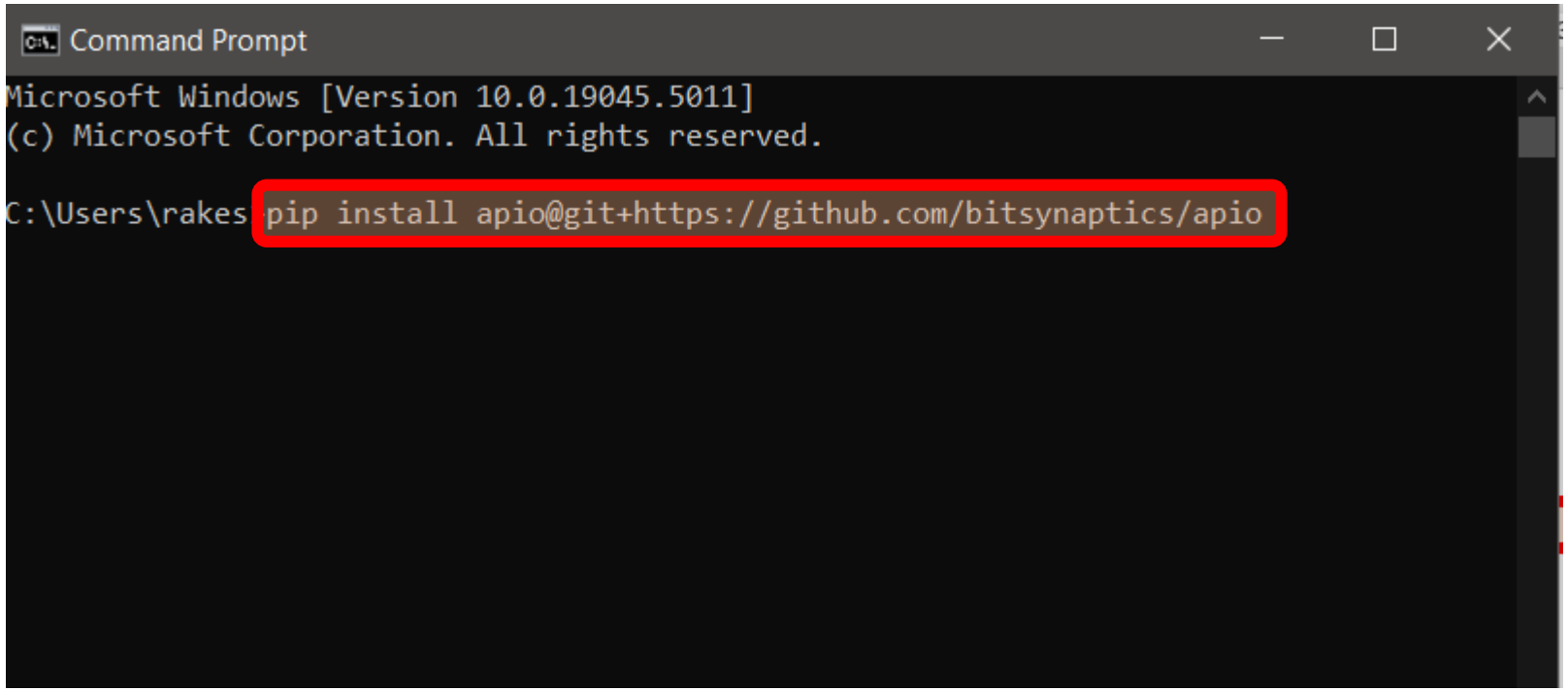
- Step 2: Install Git for Windows
  - https://git-scm.com/downloads/win





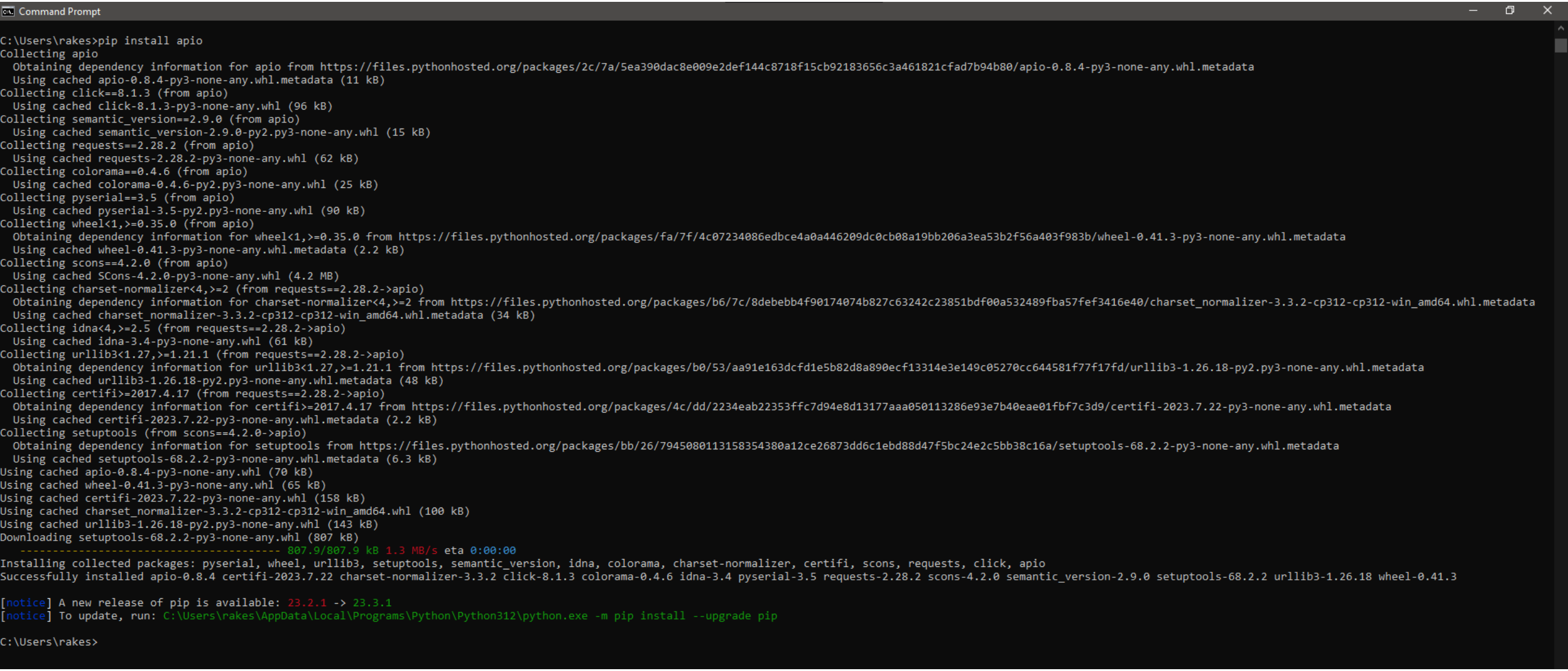

All
Apps
Documents
Web
More
271
Best match
Command Prompt
System
Apps
acs.cmd
adc_to_socket.cmd
KiCad 8.0 Command Prompt
Win64 OpenSSL Command Prompt
Minimal ADB and Fastboot
Settings
Replace Command Prompt with Windows PowerShell in the Win + X
Search the web
cmd - See more search results
cmd prompt
cmdrf
cmd kerala
Command Prompt
System
Open
Run as administrator
Open file location
Pin to Start
Pin to taskbar
cmd
99+

- Step 2: Install apio using pip tool

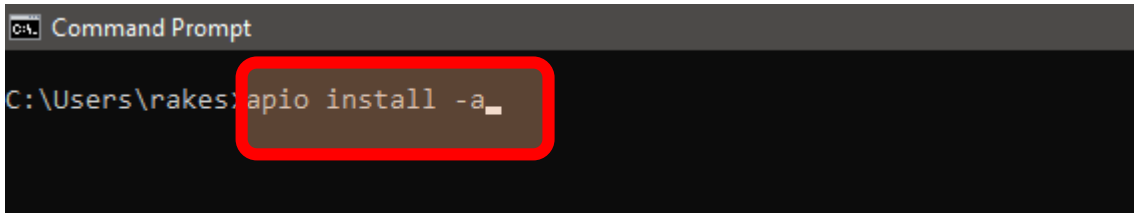


Using pip, install apio toolset

pip install apio@git+https://github.com/bitsynaptics/apio


Command Prompt
C:\Users\rakes>pip install apio
Collecting apio
Obtaining dependency information for apio from https://files.pythonhosted.org/packages/2c/7a/5ea390dac8e009e2def144c8718f15cb92183656c3a461821cfad7b94b80/apio-0.8.4-py3-none-any.whl.metadata
Using cached apio-0.8.4-py3-none-any.whl.metadata (11 kB)
Collecting click==8.1.3 (from apio)
Using cached click-8.1.3-py3-none-any.whl (96 kB)
Collecting semantic_version==2.9.0 (from apio)
Using cached semantic_version-2.9.0-py2.py3-none-any.whl (15 kB)
Collecting requests==2.28.2 (from apio)
Using cached requests-2.28.2-py3-none-any.whl (62 kB)
Collecting colorama==0.4.6 (from apio)
Using cached colorama-0.4.6-py2.py3-none-any.whl (25 kB)
Collecting pyserial==3.5 (from apio)
Using cached pyserial-3.5-py2.py3-none-any.whl (90 kB)
Collecting wheel<1,>=0.35.0 (from apio)
Obtaining dependency information for wheel<1,>=0.35.0 from https://files.pythonhosted.org/packages/fa/7f/4c07234086edbce4a0a446209dc0cb08a19bb206a3ea53b2f56a403f983b/wheel-0.41.3-py3-none-any.whl.metadata
Using cached wheel-0.41.3-py3-none-any.whl.metadata (2.2 kB)
Collecting scons==4.2.0 (from apio)
Using cached SCons-4.2.0-py3-none-any.whl (4.2 MB)
Collecting charset-normalizer<4,>=2 (from requests==2.28.2->apio)
Obtaining dependency information for charset-normalizer<4,>=2 from https://files.pythonhosted.org/packages/b6/7c/8debebb4f90174074b827c63242c23851bdf00a532489fba57fef3416e40/charset_normalizer-3.3.2-cp312-cp312-win_amd64.whl.metadata
Using cached charset_normalizer-3.3.2-cp312-cp312-win_amd64.whl.metadata (34 kB)
Collecting idna<4,>=2.5 (from requests==2.28.2->apio)
Using cached idna-3.4-py3-none-any.whl (61 kB)
Collecting urllib3<1.27,>=1.21.1 (from requests==2.28.2->apio)
Obtaining dependency information for urllib3<1.27,>=1.21.1 from https://files.pythonhosted.org/packages/b0/53/aa91e163dcfd1e5b82d8a890ecf13314e3e149c05270cc644581f77f17fd/urllib3-1.26.18-py2.py3-none-any.whl.metadata
Using cached urllib3-1.26.18-py2.py3-none-any.whl.metadata (48 kB)
Collecting certifi>=2017.4.17 (from requests==2.28.2->apio)
Obtaining dependency information for certifi>=2017.4.17 from https://files.pythonhosted.org/packages/4c/dd/2234eab22353ffc7d94e8d13177aaa050113286e93e7b40eae01fbf7c3d9/certifi-2023.7.22-py3-none-any.whl.metadata
Using cached certifi-2023.7.22-py3-none-any.whl.metadata (2.2 kB)
Collecting setuptools (from scons==4.2.0->apio)
Obtaining dependency information for setuptools from https://files.pythonhosted.org/packages/bb/26/7945080113158354380a12ce26873dd6c1ebd88d47f5bc24e2c5bb38c16a/setuptools-68.2.2-py3-none-any.whl.metadata
Using cached setuptools-68.2.2-py3-none-any.whl.metadata (6.3 kB)
Using cached apio-0.8.4-py3-none-any.whl (70 kB)
Using cached wheel-0.41.3-py3-none-any.whl (65 kB)
Using cached certifi-2023.7.22-py3-none-any.whl (158 kB)
Using cached charset_normalizer-3.3.2-cp312-cp312-win_amd64.whl (100 kB)
Using cached urllib3-1.26.18-py2.py3-none-any.whl (143 kB)
Downloading setuptools-68.2.2-py3-none-any.whl (807 kB)
807.9/807.9 kB 1.3 MB/s eta 0:00:00
Installing collected packages: pyserial, wheel, urllib3, setuptools, semantic_version, idna, colorama, charset-normalizer, certifi, scons, requests, click, apio
Successfully installed apio-0.8.4 certifi-2023.7.22 charset-normalizer-3.3.2 click-8.1.3 colorama-0.4.6 idna-3.4 pyserial-3.5 requests-2.28.2 scons-4.2.0 semantic_version-2.9.0 setuptools-68.2.2 urllib3-1.26.18 wheel-0.41.3
[notice] A new release of pip is available: 23.2.1 -> 23.3.1
[notice] To update, run: C:\Users\rakes\AppData\Local\Programs\Python\Python312\python.exe -m pip install --upgrade pip
C:\Users\rakes>

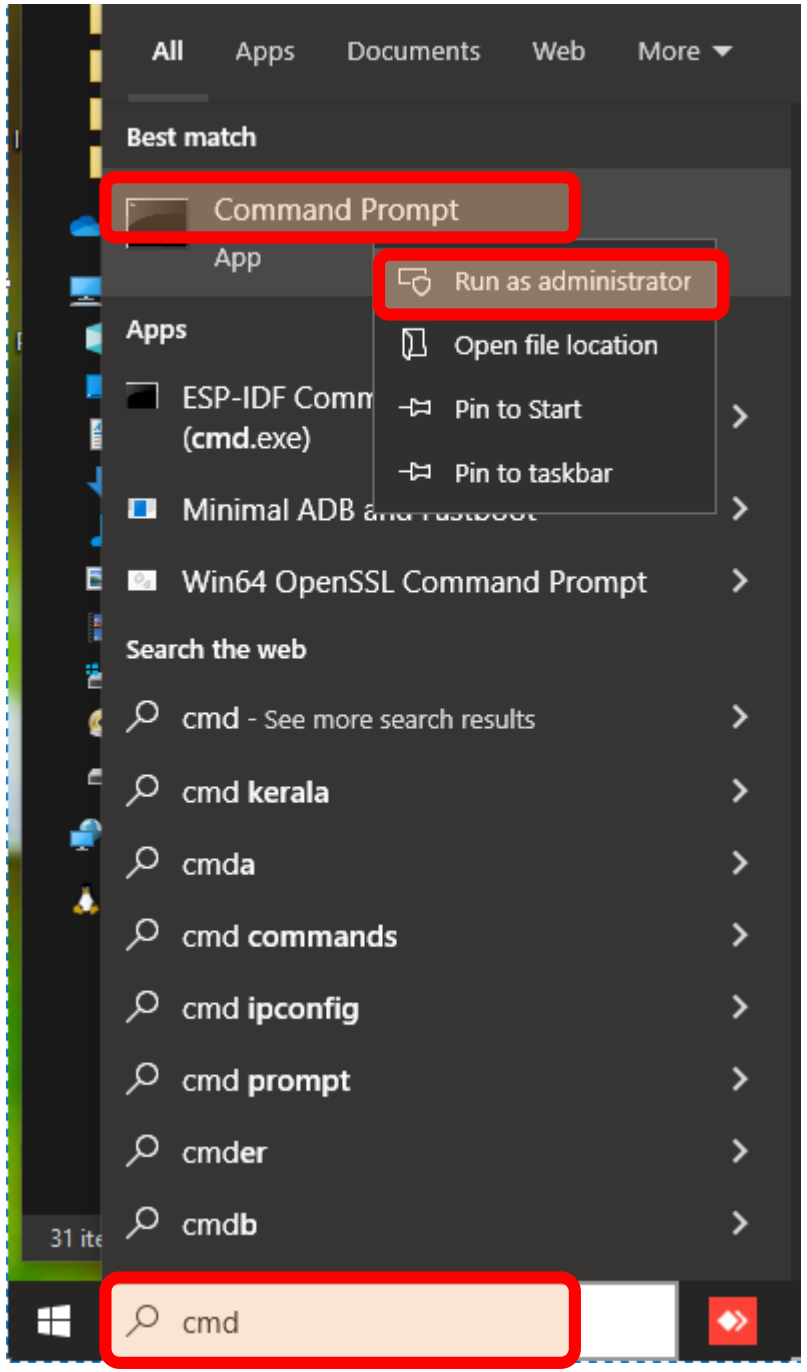
- Step 3: Install drivers and toolchains using apio



Command Prompt

```
C:\Users\rakes>apio install -a
(DEBUG) Profile path: C:\Users\rakes\.apio\profile.json
(DEBUG) Home_dir: C:\Users\rakes\.apio
File version.txt downloaded!
Version: 1.1.0
Installing drivers package:
platform_download_url: https://github.com/FPGAwars/tools-drivers/releases/download/v1.1.0/tools-drivers-windows_amd64-1.1.0.tar.gz
Already installed. Version 1.1.0
(DEBUG) Profile path: C:\Users\rakes\.apio\profile.json
(DEBUG) Home_dir: C:\Users\rakes\.apio
File version.txt downloaded!
Version: 0.0.35
Installing examples package:
platform_download_url: https://github.com/FPGAwars/apio-examples/releases/download/0.0.35/apio-examples-0.0.35.zip
Download apio-examples-0.0.35.zip
Downloading  [####################################]  100%
Unpacking  [####################################]  100%
Package 'examples' has been successfully installed!
(DEBUG) Profile path: C:\Users\rakes\.apio\profile.json
(DEBUG) Home_dir: C:\Users\rakes\.apio
File version.txt downloaded!
Version: 3.3.77
Installing gtkwave package:
platform_download_url: https://github.com/FPGAwars/tool-gtkwave/releases/download/v3.3.77/tool-gtkwave-windows_amd64-3.3.77.tar.gz
Already installed. Version 3.3.77
(DEBUG) Profile path: C:\Users\rakes\.apio\profile.json
(DEBUG) Home_dir: C:\Users\rakes\.apio
File version.txt downloaded!
Version: 0.0.8
Installing oss-cad-suite package:
platform_download_url: https://github.com/FPGAwars/tools-oss-cad-suite/releases/download/v0.0.8/tools-oss-cad-suite-windows_amd64-0.0.8.tar.gz
Already installed. Version 0.0.8

C:\Users\rakes>
```



- Step 4: Enable FTDI Driver Configuration using Zadig tool

1) Type ‘cmd’ in the Windows Search Box
2) Right click on Command Prompt
3) Select ‘**Run as Administrator**’
4) Run ‘**apio drivers –ftdi-enable**’

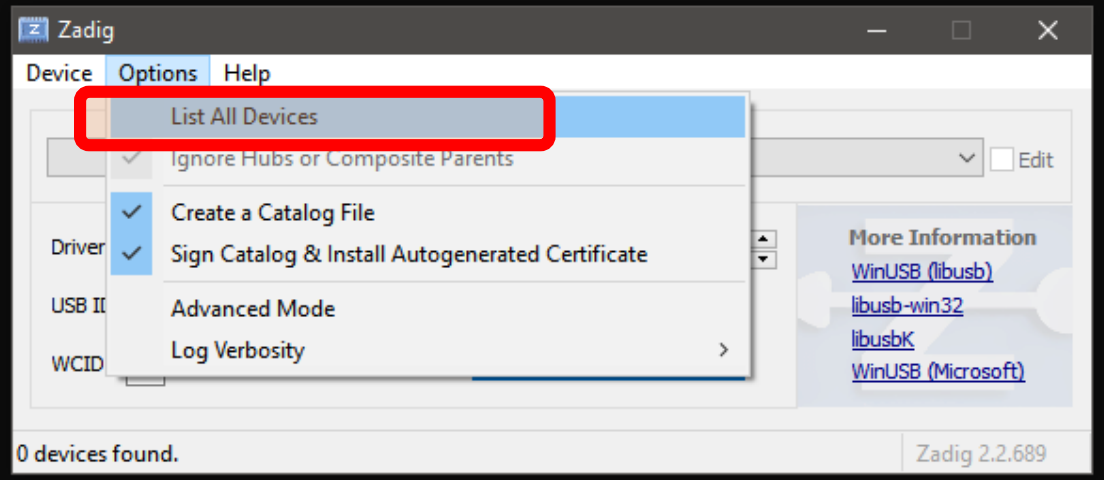
- icePie FPGA board needs to be connected to the USB port for running this step
- You may skip this step and continue to the next step if icePie FPGA board is not present

Administrator: Command Prompt - apio drivers --ftdi-enable

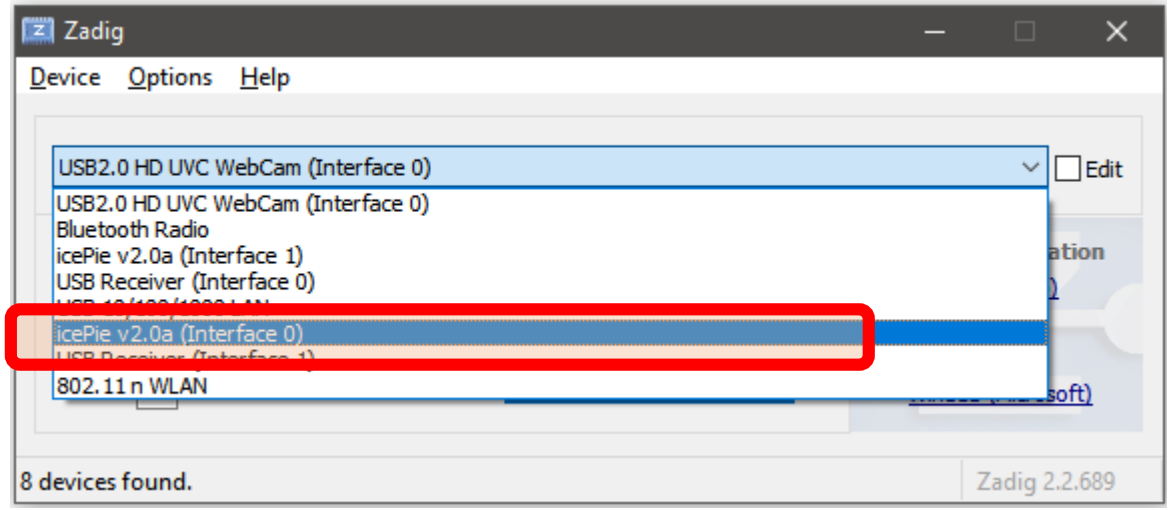
```
C:\WINDOWS\system32>apio drivers --ftdi-enable
(DEBUG) Profile path: C:\Users\rakes\.apio\profile.json
(DEBUG) Home_dir: C:\Users\rakes\.apio
Launch drivers configuration tool

   FTDI driver installation:
   Usage instructions

      1. Connect the FTDI FPGA board
      2. Select (Interface 0)
      3. Replace driver by "libusbK"
      4. Reconnect the board
      5. Check `apio system --lsftdi`
```

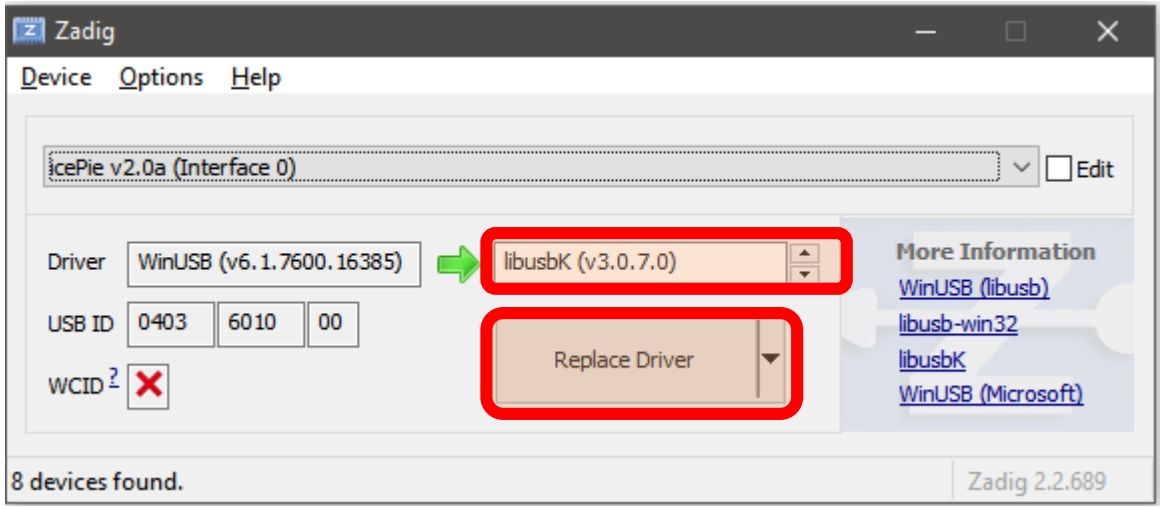


- icePie FPGA board needs to be connected to the USB port for running this step
- You may skip this step and continue to the next step if icePie FPGA board is not present

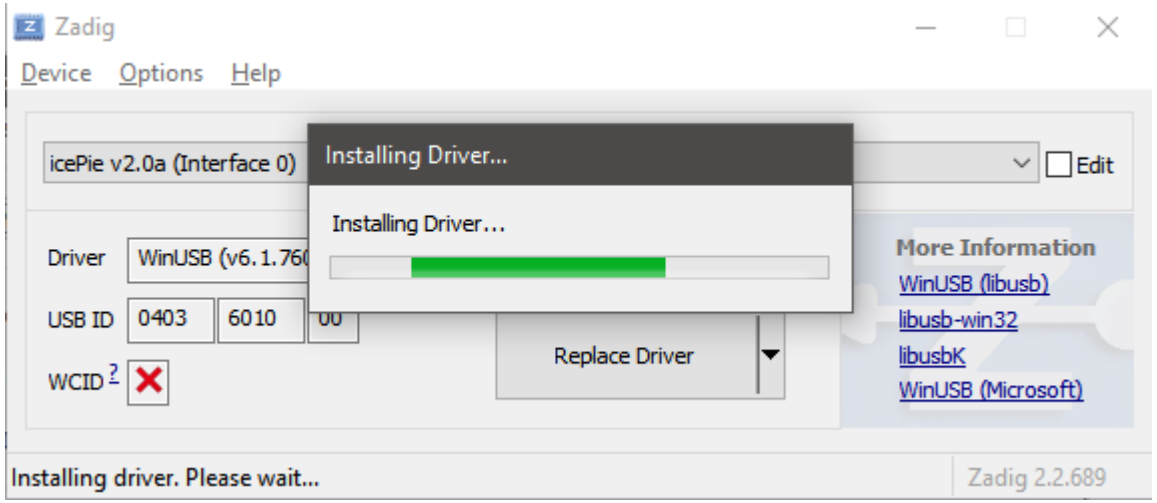


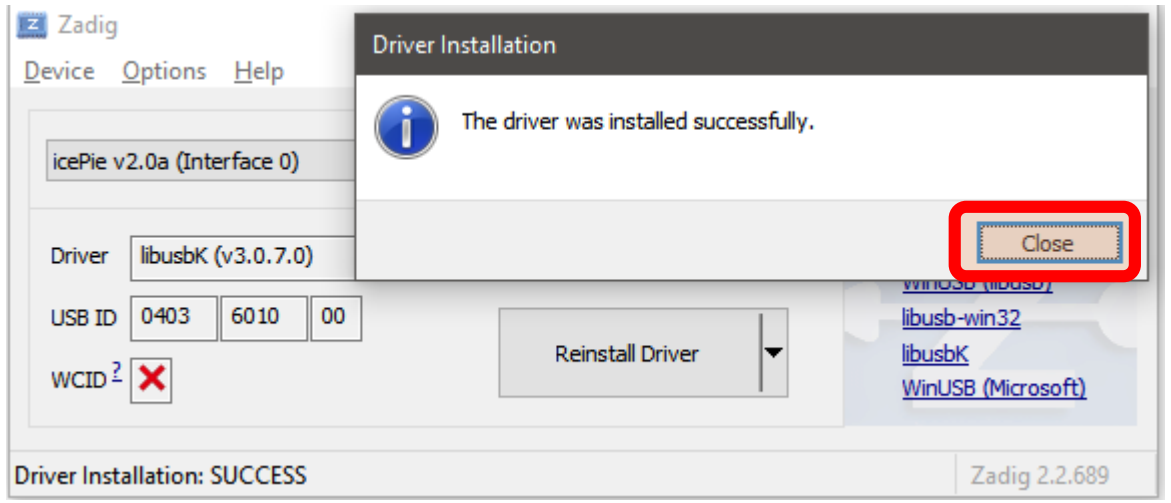
icePie v2.0a **(Interface 0)**

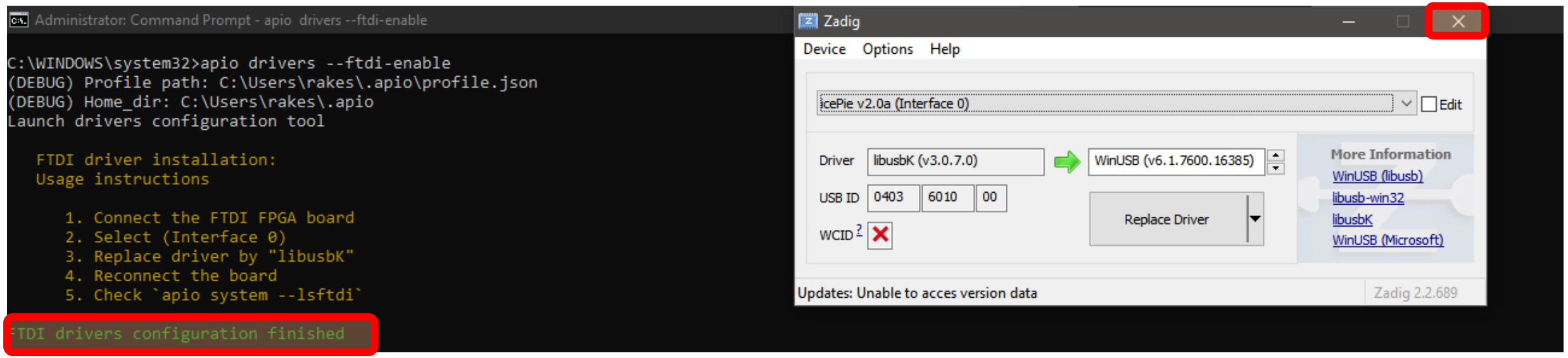
X not (Interface 1)



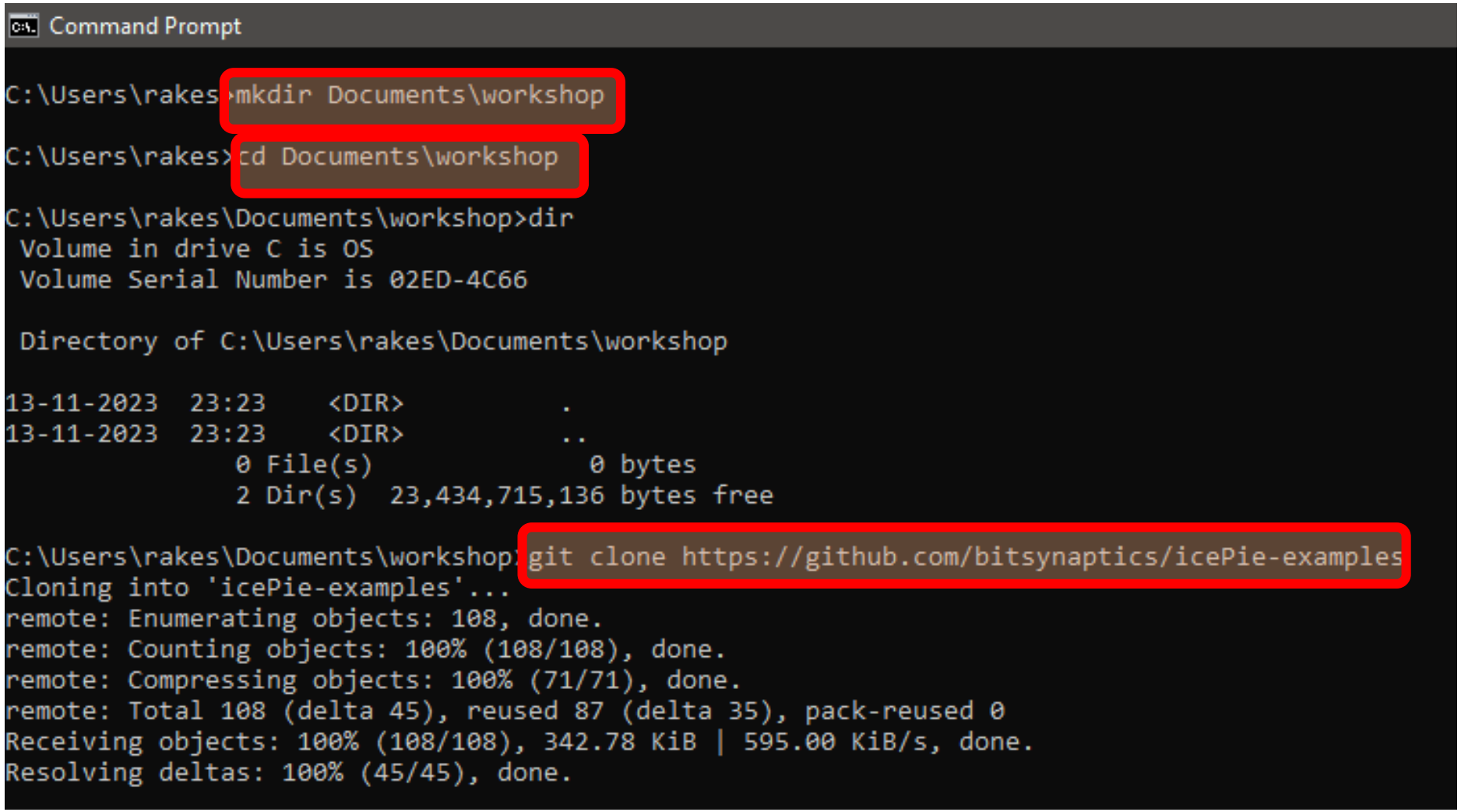
1) Select **libusbK (v3.0.7.0)**
2) Click **Replace Driver**


Zadig
Device Options Help
icePie v2.0a (Interface 0)
Edit
Installing Driver...
Installing Driver...
Driver WinUSB (v6.1.760
USB ID 0403 6010 00
WCID ?
Replace Driver
More Information
WinUSB (libusb)
libusb-win32
libusbK
WinUSB (Microsoft)
Installing driver. Please wait...
Zadig 2.2.689


Zadig
Device Options Help
Driver Installation
The driver was installed successfully.
Close
icePie v2.0a (Interface 0)
Driver libusbK (v3.0.7.0)
USB ID 0403 6010 00
WCID ?
Reinstall Driver
libusb-win32
libusbK
WinUSB (Microsoft)
Driver Installation: SUCCESS
Zadig 2.2.689


Administrator: Command Prompt - apio drivers --ftdi-enable
C:\WINDOWS\system32>apio drivers --ftdi-enable
(DEBUG) Profile path: C:\Users\rakes\.apio\profile.json
(DEBUG) Home_dir: C:\Users\rakes\.apio
Launch drivers configuration tool
FTDI driver installation:
Usage instructions
1. Connect the FTDI FPGA board
2. Select (Interface 0)
3. Replace driver by "libusbK"
4. Reconnect the board
5. Check `apio system --lsftdi`
FTDI drivers configuration finished
Zadig
Device Options Help
icePie v2.0a (Interface 0)
Edit
Driver libusbK (v3.0.7.0)
WinUSB (v6.1.7600.16385)
USB ID 0403 6010 00
WCID ?
Replace Driver
More Information
WinUSB (libusb)
libusb-win32
libusbK
WinUSB (Microsoft)
Updates: Unable to acces version data
Zadig 2.2.689

- Step 6: Downloading icepie-examples…



- Create **Documents\workshop** directory
- Clone icepie-examples repository:

git clone https://github.com/bitsynaptics/icePie-examples

- Step 7: Running Blinky

```
Command Prompt

C:\Users\rakes\Documents\workshop\icePie-examples>cd 1-blink

C:\Users\rakes\Documents\workshop\icePie-examples\1-blink>apio build
(DEBUG) Profile path: C:\Users\rakes\.apio\profile.json
(DEBUG) Home_dir: C:\Users\rakes\.apio
[Mon Nov 13 23:31:15 2023] Processing icePie
------------------------------------------------------------------------------------------------------------------------

yosys -p "synth_ice40 -json hardware.json" -q blink.v
nextpnr-ice40 --up5k --package sg48 --json hardware.json --asc hardware.asc --pcf icePie.pcf -q
icepack hardware.asc hardware.bin
======================================================================================================== [SUCCESS] Took 3.81 seconds ====


C:\Users\rakes\Documents\workshop\icePie-examples\1-blink>apio upload
(DEBUG) Profile path: C:\Users\rakes\.apio\profile.json
(DEBUG) Home_dir: C:\Users\rakes\.apio
(DEBUG) Profile path: C:\Users\rakes\.apio\profile.json
[Mon Nov 13 23:31:30 2023] Processing icePie
------------------------------------------------------------------------------------------------------------------------

iceprog -d i:0x0403:0x6010:0 hardware.bin
init..
cdone: high
reset..
cdone: low
flash ID: 0xEF 0x40 0x18 0x00
file size: 104090
erase 64kB sector at 0x000000..
erase 64kB sector at 0x010000..
programming..
reading..
VERIFY OK
cdone: high
Bye.
======================================================================================================== [SUCCESS] Took 15.38 seconds ====

C:\Users\rakes\Documents\workshop\icePie-examples\1-blink>
```