Cosmos+ OpenSSD Board Quick Start Guide

Revision 1.1
2021. 02. 26

CRZ Technology

Document History

Revision	Date	Change note
1.0	2020.04.23	First draft
1.1	2021.02.26	Supported Toshiba Nand

Table of Contents

1. Introduction

1.1. Aboud this guide

This document provides an introduction to using the Cosmos+ OpenSSD platform board.

This guide describes the steps to test the Cosmos+ OpenSSD platform board and check list.

It contains the following chapters:

- Chapter 1, provides general overview.
- Chapter 2, describes HW setup.
- Chapter 3, describes SW setup.
- Chapter 4, provides the steps to test the Cosmos+ OpenSSD platform board

1.2. Before starting, check list

1.2.1 Gears

- Cosmos+ OpenSSD platform board
- External PCIe Adaptor
- External PCIe cable
- USB type A to USB type micro B cable (for JTAG digilent module)
- USB type A to USB type A cable (for UART)
- 1+ NAND flash modules
- 12V DC power adaptor

2. HW Setup

2.1. Cosmos+ OpenSSD Environment

- **1 Development PC**
    - Downloading hardware/software design (JTAG)
    - Monitoring Cosmos+ OpenSSD internals (UART)
- **1 Host PC**
    - Executing applications such as a benchmark (PCIe)
- **1 Platform board with 1+ NAND flash modules installed**
   - Working as a storage device to the host PC
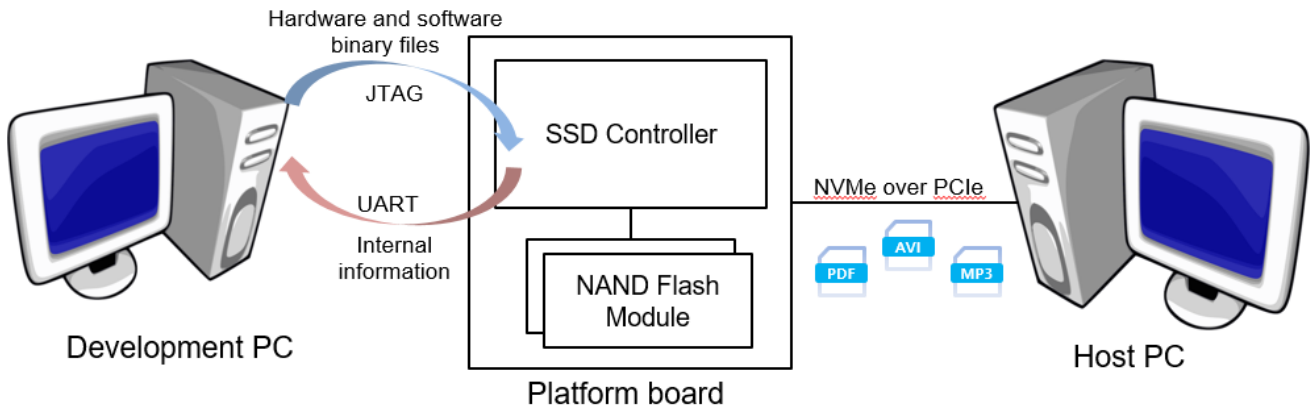
2.2. Hardware Componets

■ **Cosmos+ OpenSSD platform board**
  ● Consists of a Zynq FPGA and other peripherals
■ **NAND flash modules**
  ● Configured as multi-channel and multi-way flash array
  ● Inserted into Cosmos+ OpenSSD platform board
■ **External PCIe adapter and cable**
  ● Connected with host PC
■ **USB cables for JTAG and UART**
  ● Connected with development PC
■ **Power cable and adapter**
  ● 12V supply voltage
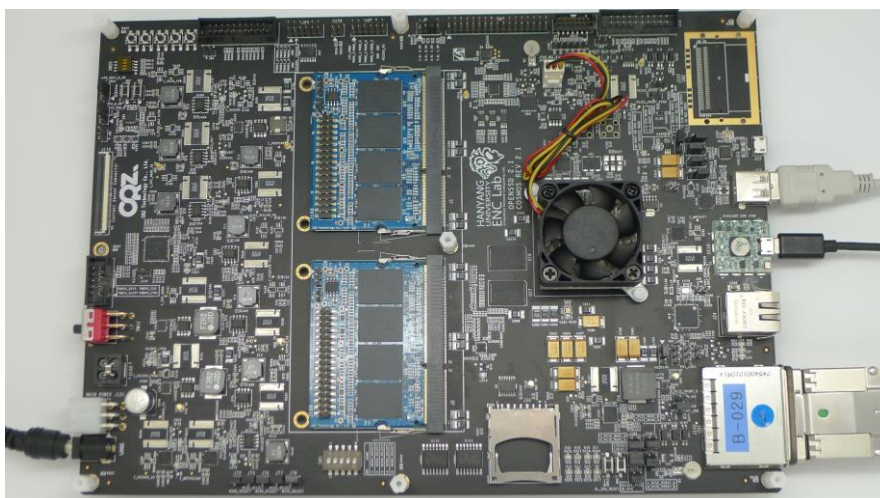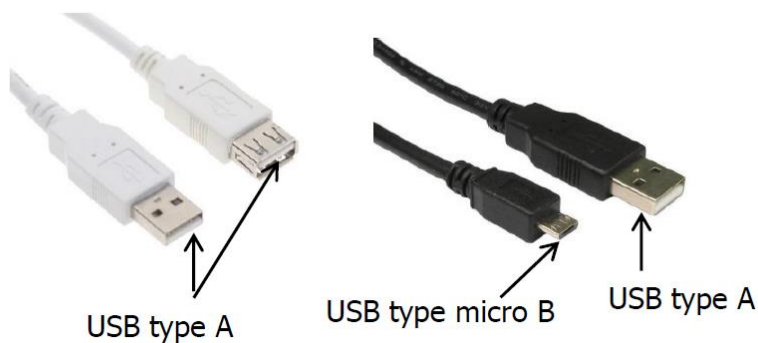
2.3. Steps to connect HW components

- Turn off Host PC
- Insert NAND Flash Modules
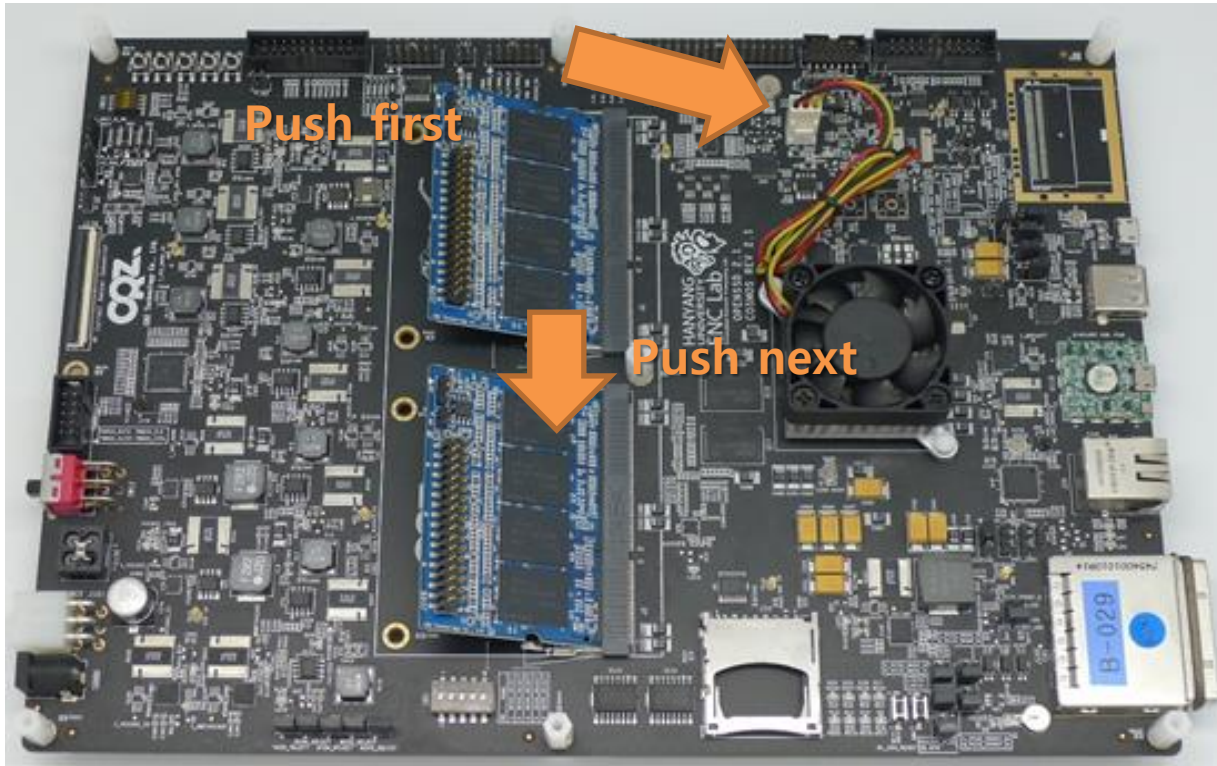
- Connect PCIe Adaptor to Host PC

- Connect PCIe Cable between Cosmos+ OpenSSD platform board and PCIe Adaptor

Push

Hold here
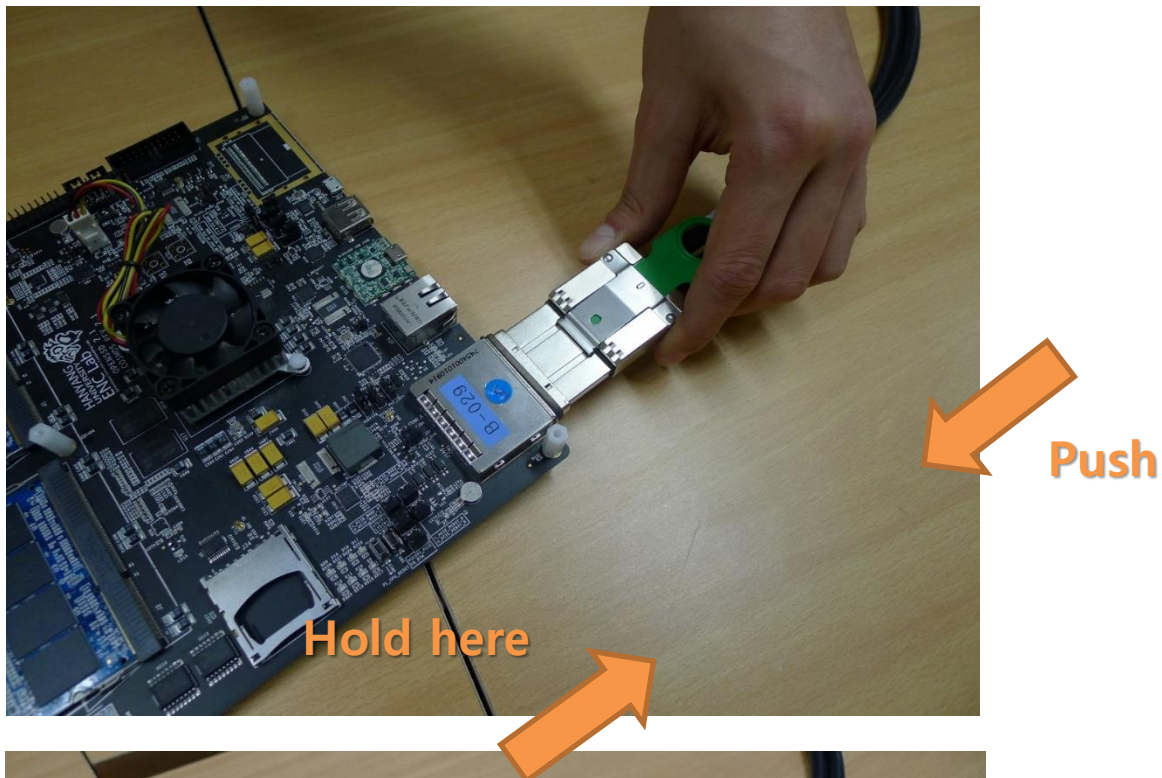
- Make sure that jumper pins on board are set as default below
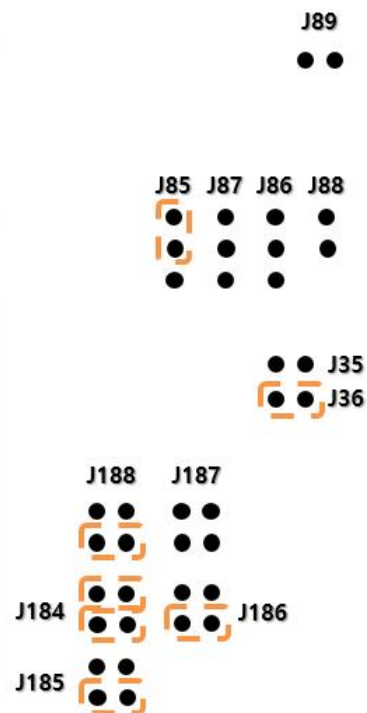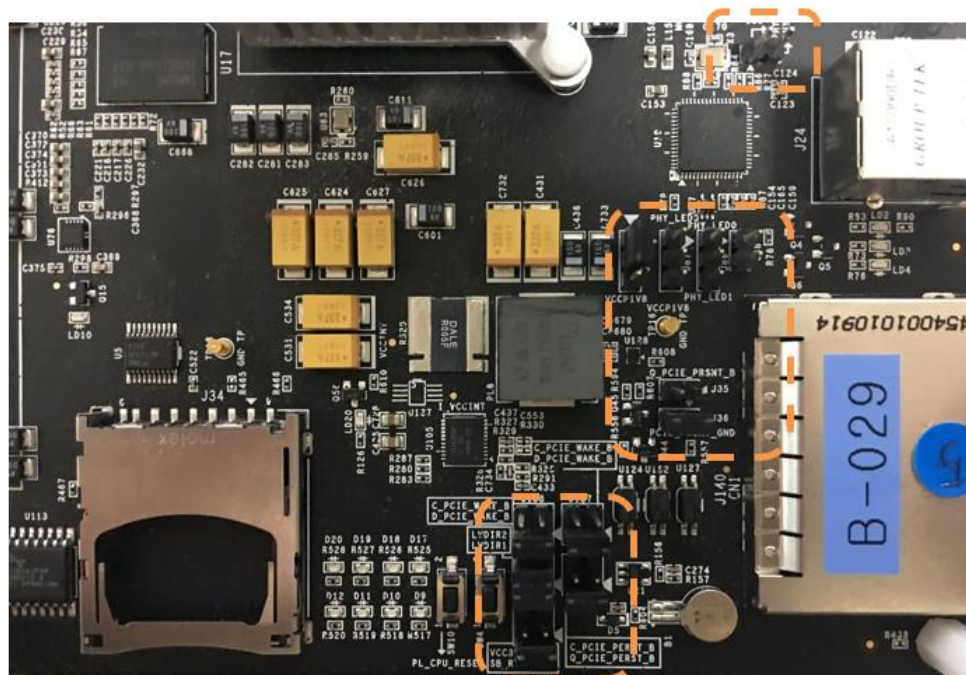
- Connect USB type A to USB type micro B cable to development PC
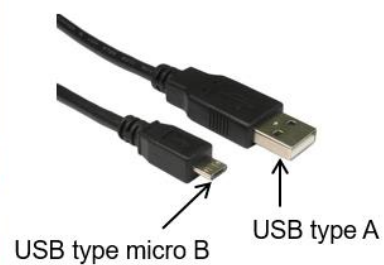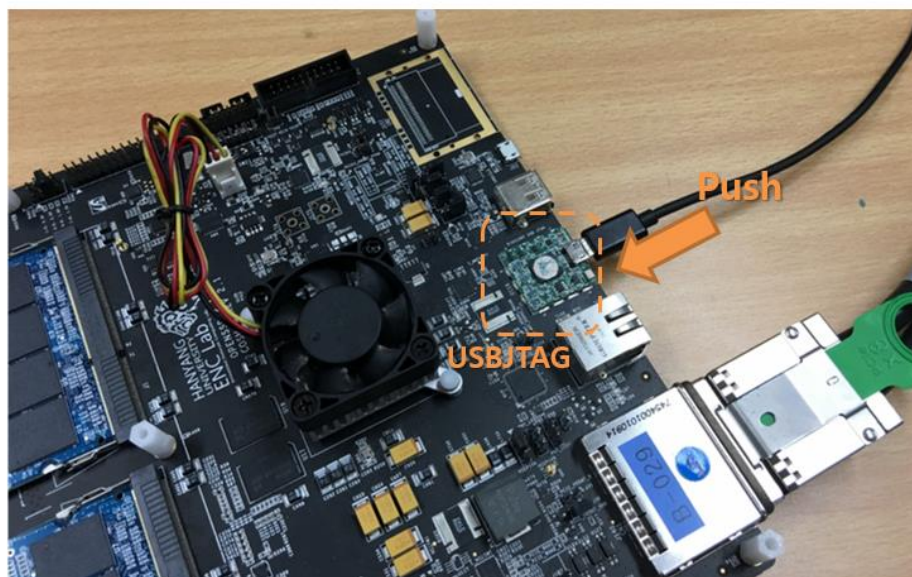
- Connect USB type A to USB type A cable to development PC
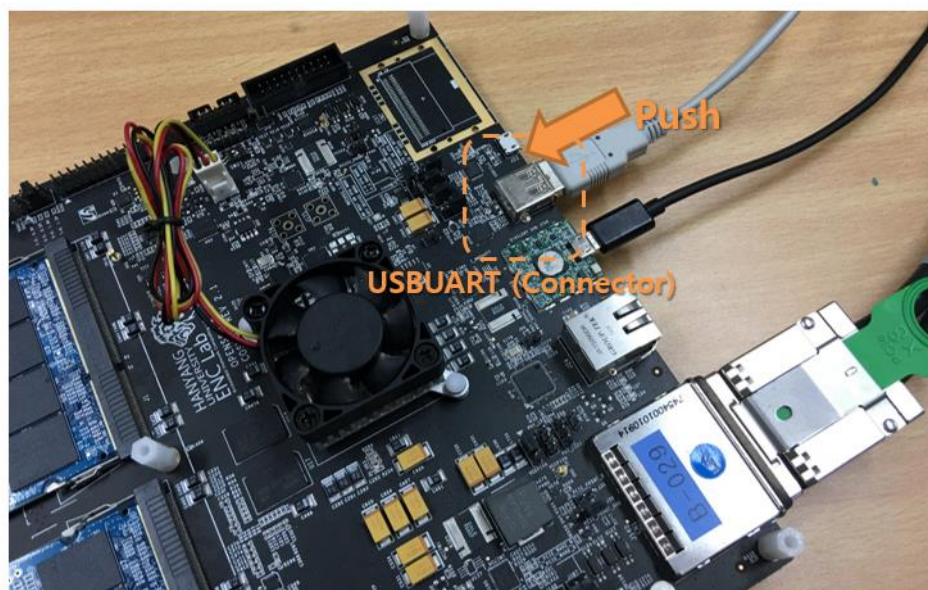
- Connect 12V DC power adaptor to Cosmos+ OpenSSD platform board(J182)
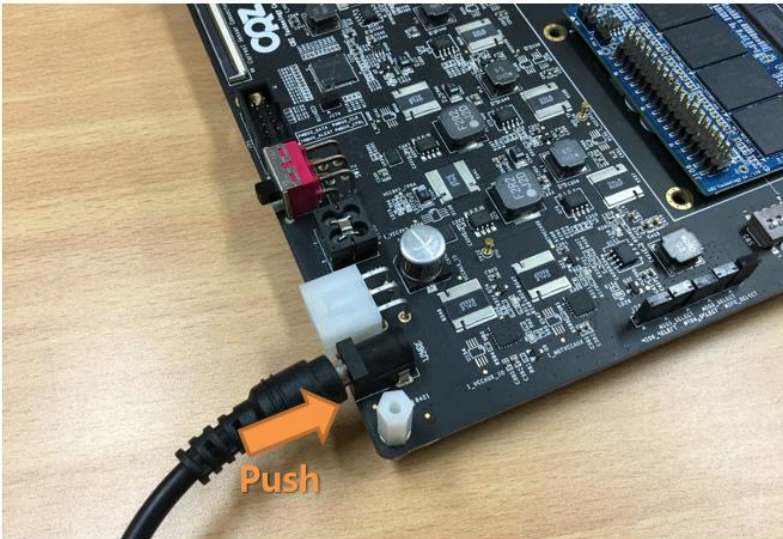
- Turn on the power of Cosmos+ OpenSSD platform board(SW12)
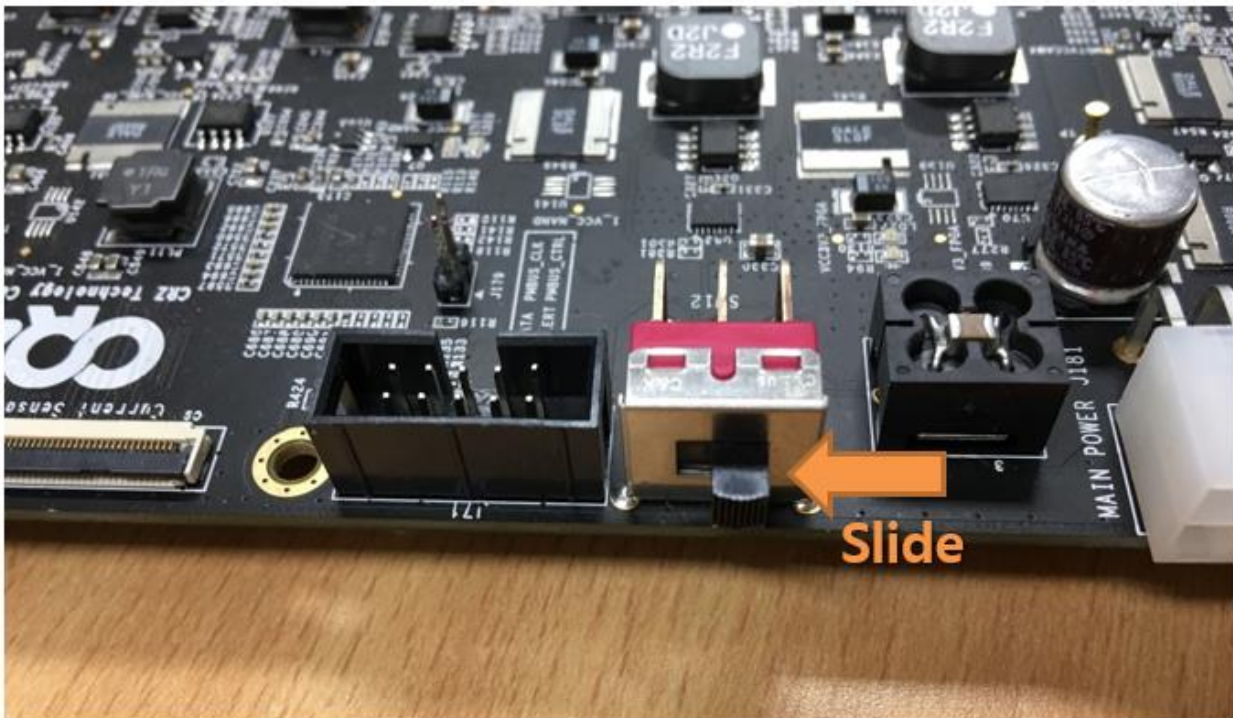
3. SW Setup

3.1. Vivado Installation

Install Vivado 2019.1 through below link.

https://www.xilinx.com/support/download/index.html/content/xilinx/en/downloadNav/vivado-design-tools/2019-1.html

Vivado Design Suite - HLx Editions - 2019.1 Full Product Installation

Important

We strongly recommend to use the web installers as it reduces download time and saves significant disk space.

Please see Installer Information for details.

Note: Download verification is only supported with Google Chrome and Microsoft Internet Explorer web browsers.

⬇ Vivado HLx 2019.1: WebPACK and Editions - Windows Self Extracting Web Installer (EXE - 64.62 MB)

MD5 SUM Value : 74300307 0fb7785 7ad098bd6873bdf0b

⬇ Vivado HLx 2019.1: WebPACK and Editions - Linux Self Extracting Web Installer (BIN - 115.05 MB)

MD5 SUM Value : 533000dc5324be422915eb4e93f9ce59

Download Verification ⓘ

| Digests | Signature | Public Key |

Download Includes

Download Type
Last Updated
Answers

Documentation

Support Forums

Make sure that Vivado is system edition and that "Software Development Kit" and "Zynq-7000" are checked
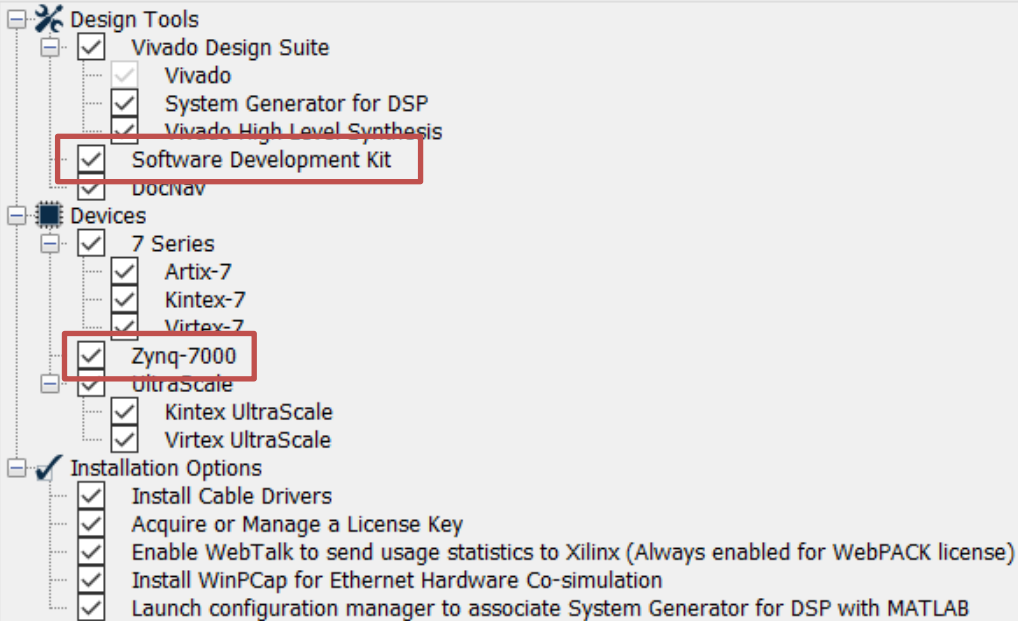
3.2. Launch Vivado

Open Cosmos+ OpenSSD Vivado project.(OpenSSD2-8C8W-16K_19.1)

Recently new OpenSSD project design has been developed for Toshiba NAND Flash Module.

In case of Toshiba NAND Flash Module, download Vivado project from below link.

cosm-plus-pecc-167MT_20210210.7z
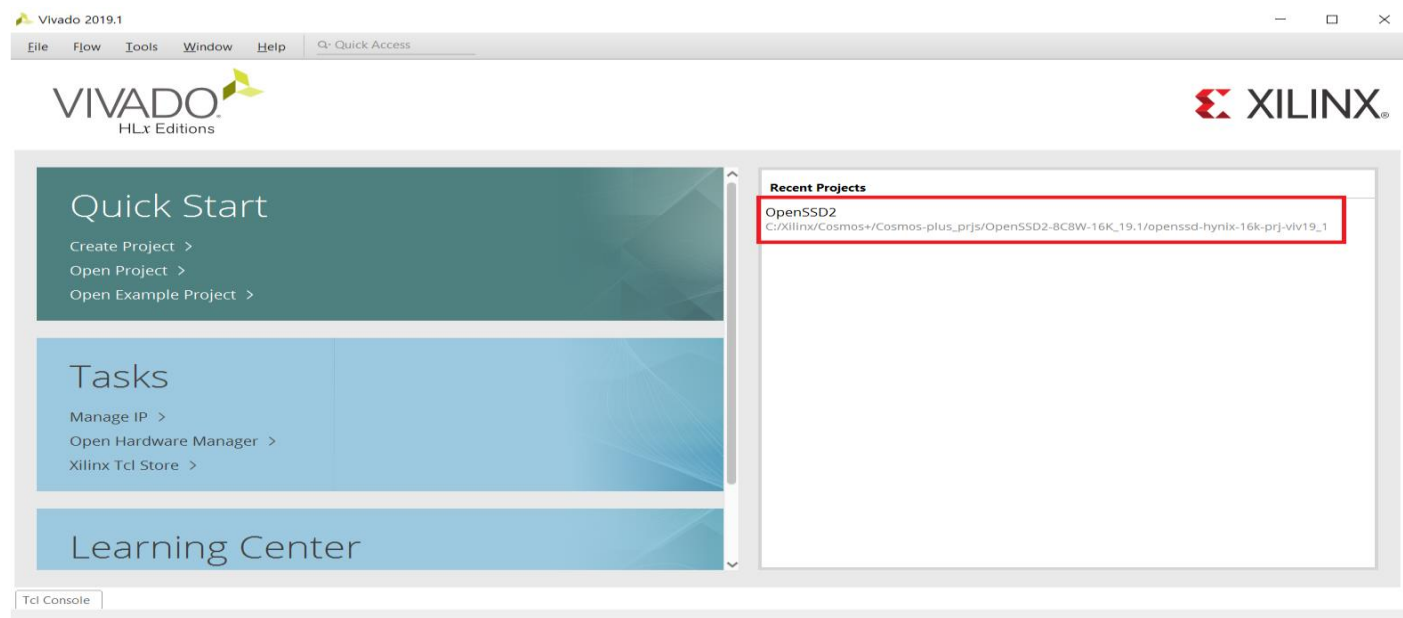
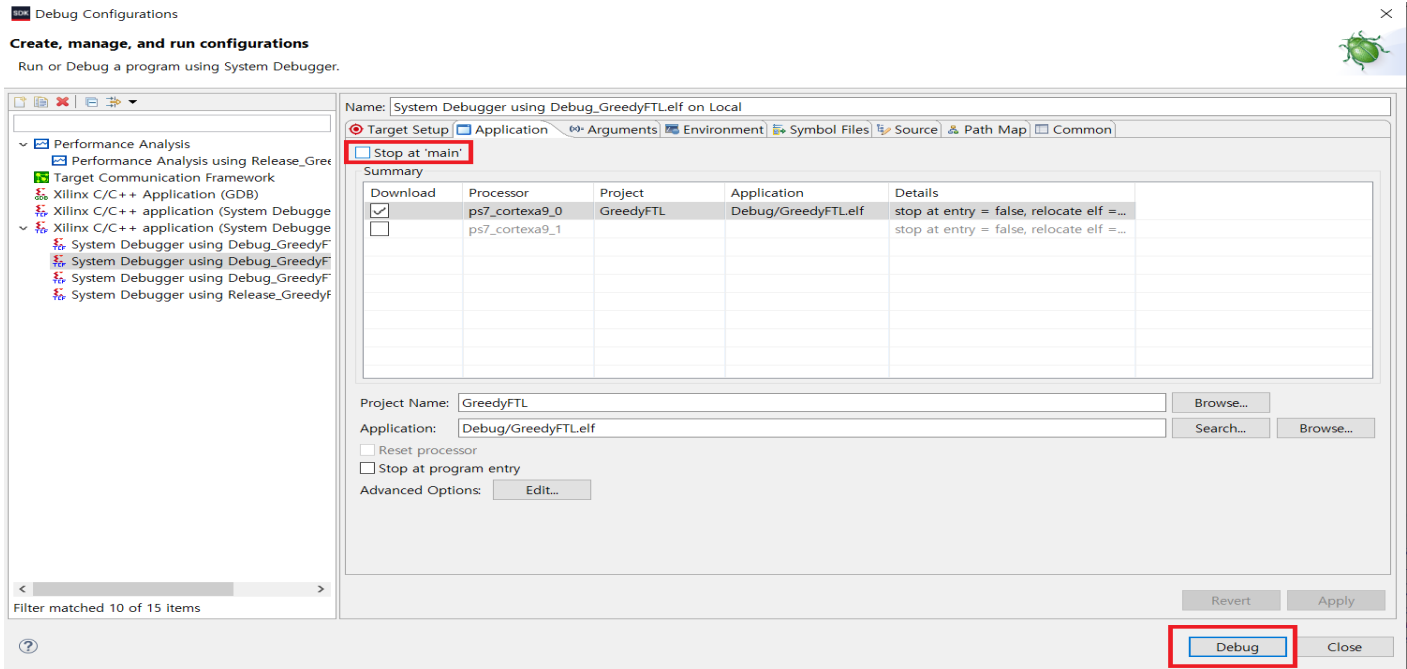Launch SDK.
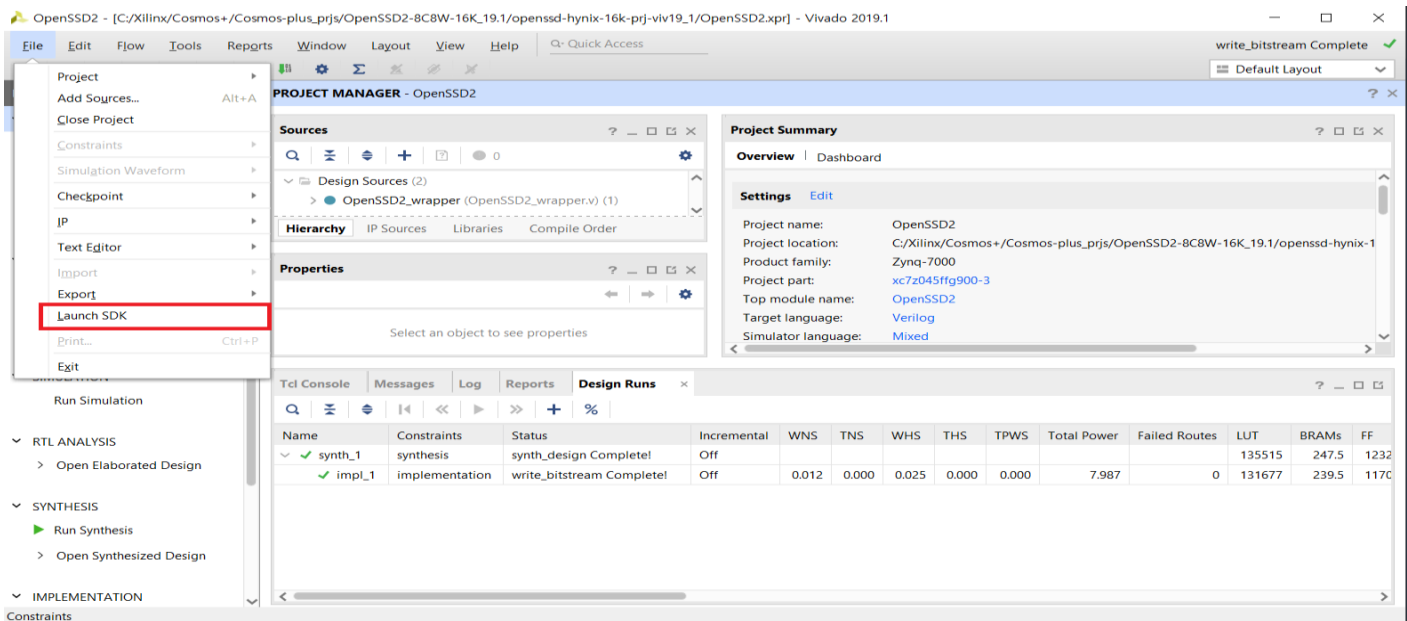
Run Debug Configuration on SDK.
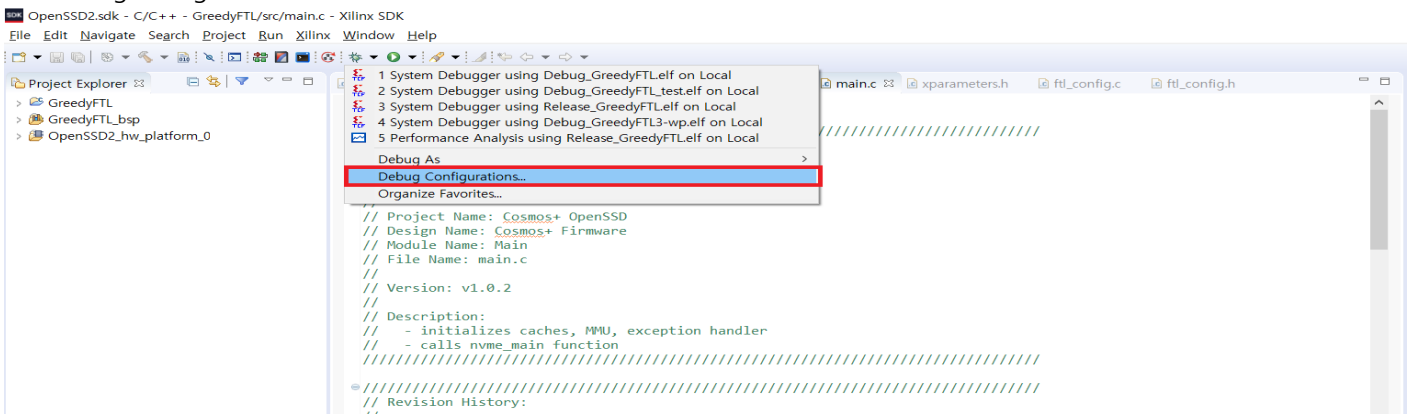
Select "Program FPGA".
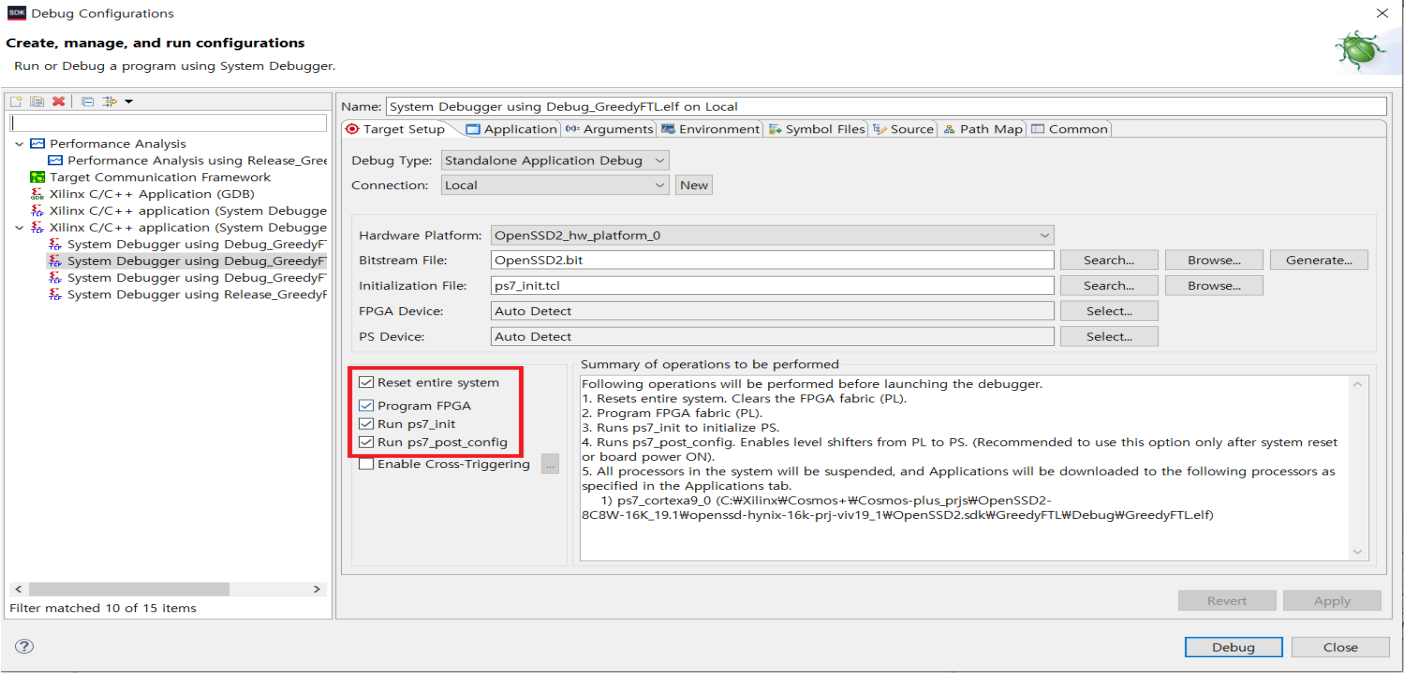
Uncheck "Stop at main" and Press "Debug".
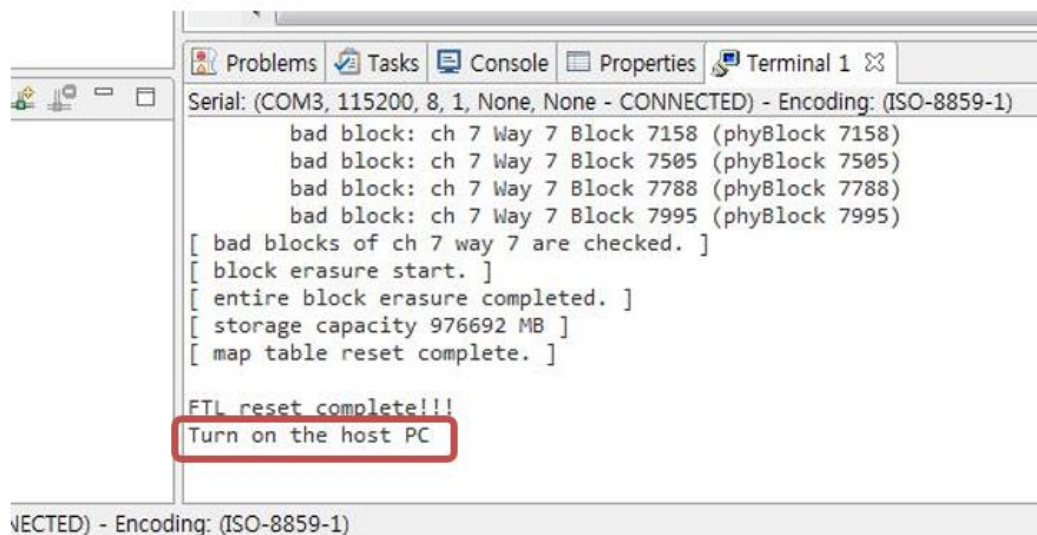
Launch terminal program on the Development PC.
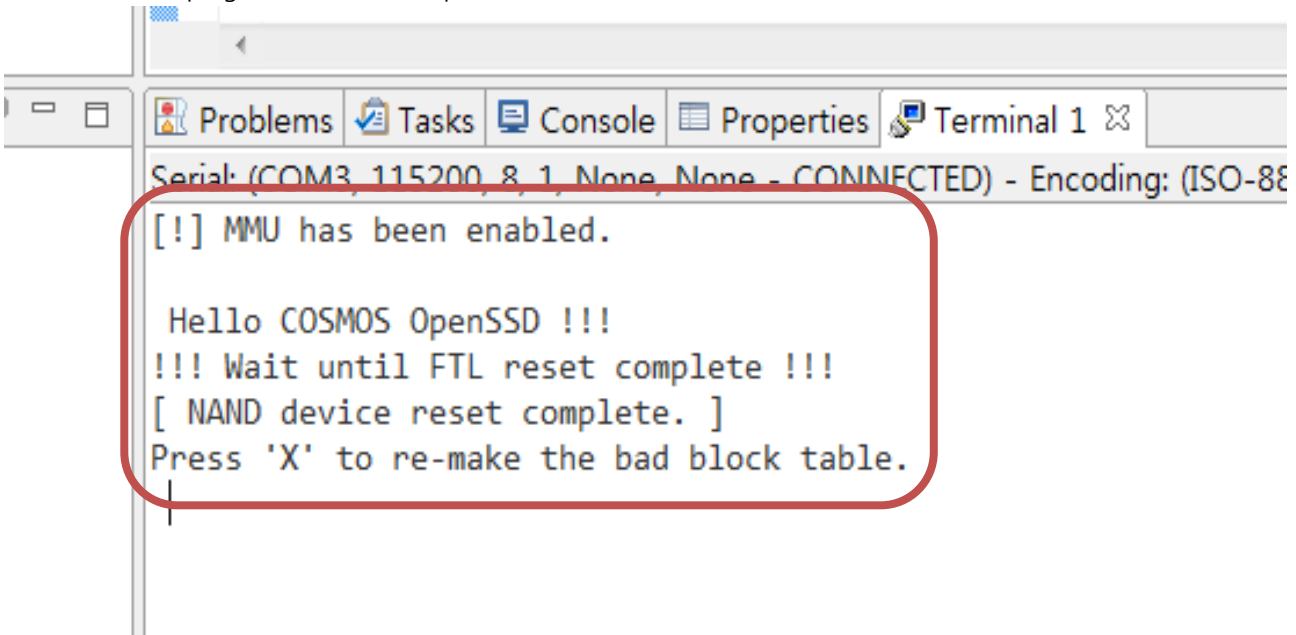
Press 'n' to maintain the bad block table

Turn on the Host PC when the firmware reset is done.
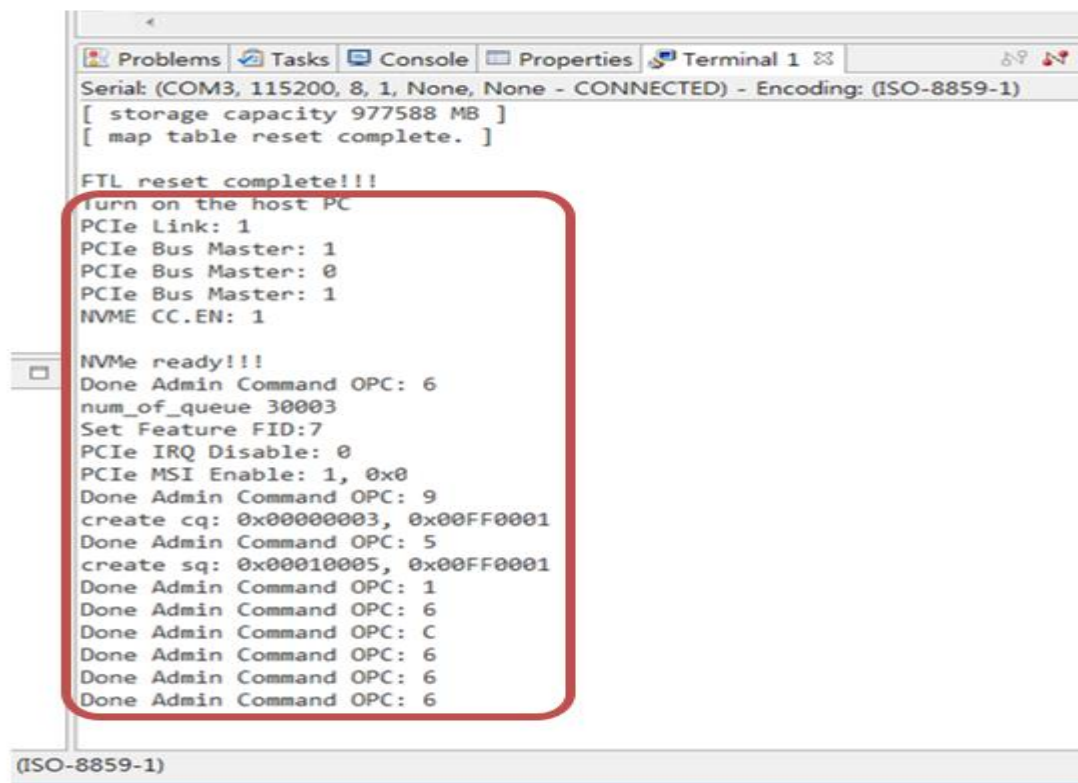
NVMe SSD initialization steps are on going

4. Operating Cosmos+ OpenSSD (Linux)

4.1. Check device recognition

- Click the pointed icon
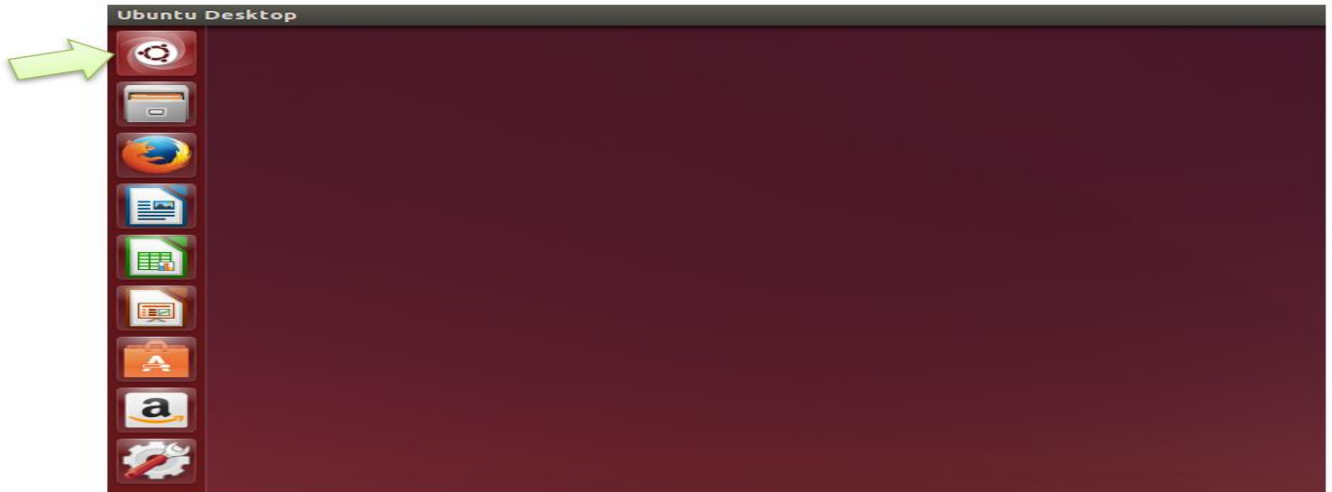
- Click the terminal icon

- Types "lspci" -> press ENTER -> check "Non-Volatile memory controller: Xilinx Corporation Device 7028" on the PCI device list

- Types "ls /dev" -> press ENTER -> check "nvme0nxxxx" on the device list

4.2. Create a partition

- Type "sudo fdisk /dev/nvme0nxxxx", press ENTER -> type your password, press ENTER -> type "n", press ENTER -> type "p", press ENTER -> type "1", press ENTER -> type "4096", press ENTER

4.3. Check the created partition
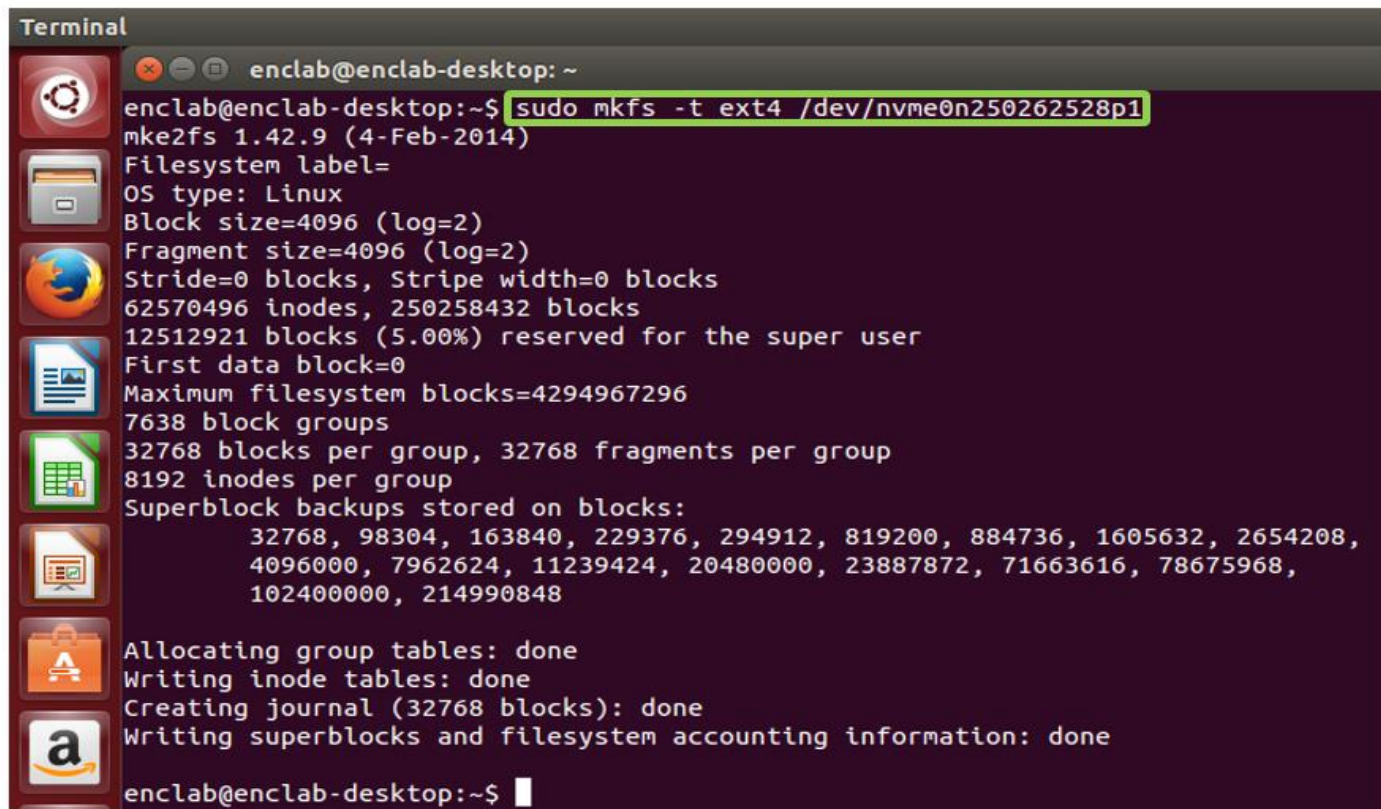
- Types "ls /dev" -> press ENTER -> check "nvme0nxxxxp1" on the device list

4.4. Format the partition

- Type "mkfs -t ext4 / dev/nvme0nxxxxp1", press ENTER
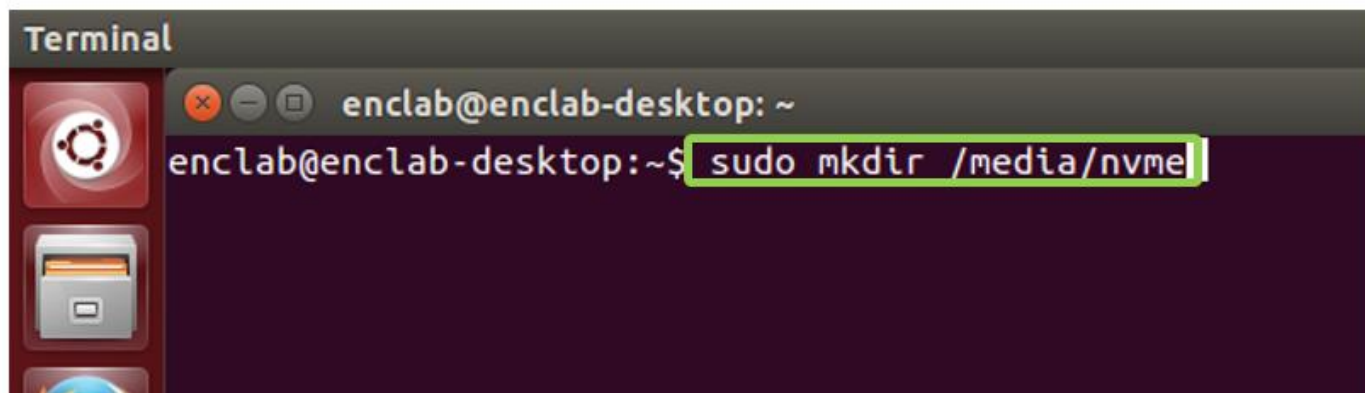
```
Terminal

    ⊗ ⊖ ⊡  enclab@enclab-desktop: ~

enclab@enclab-desktop:~$ sudo mkfs -t ext4 /dev/nvme0n250262528p1
mke2fs 1.42.9 (4-Feb-2014)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
62570496 inodes, 250258432 blocks
12512921 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=4294967296
7638 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424, 20480000, 23887872, 71663616, 78675968,
        102400000, 214990848

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done

enclab@enclab-desktop:~$ █
```

4.5. Create a mount point

- Type "sudo mkdir /media/nvme", press ENTER

```
Terminal

    ⊗ ⊖ ⊡  enclab@enclab-desktop: ~

enclab@enclab-desktop:~$ sudo mkdir /media/nvme
```

4.6. Mount the partition

- Type "sudo mount /dev/nvme0nxxxxp1 /media/nvme", press ENTER

```
Terminal
enclab@enclab-desktop: ~
enclab@enclab-desktop:~$ sudo mount /dev/nvme0n250262528p1 /media/nvme
enclab@enclab-desktop:~$
```
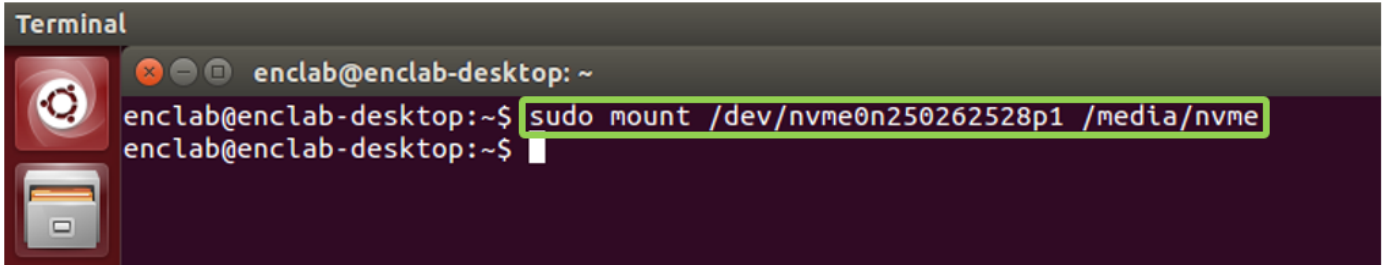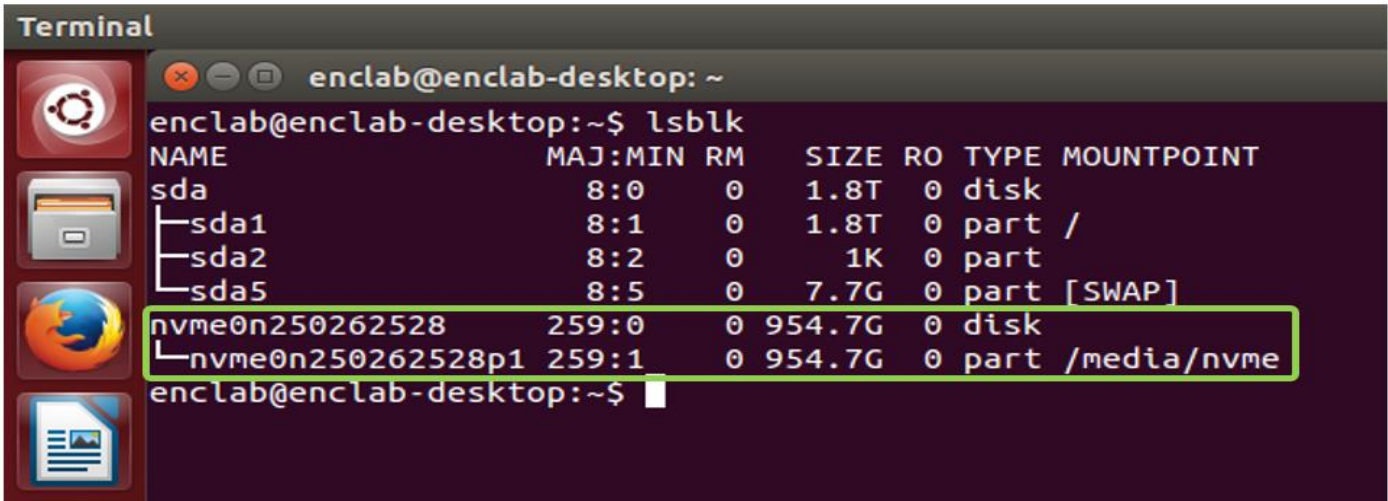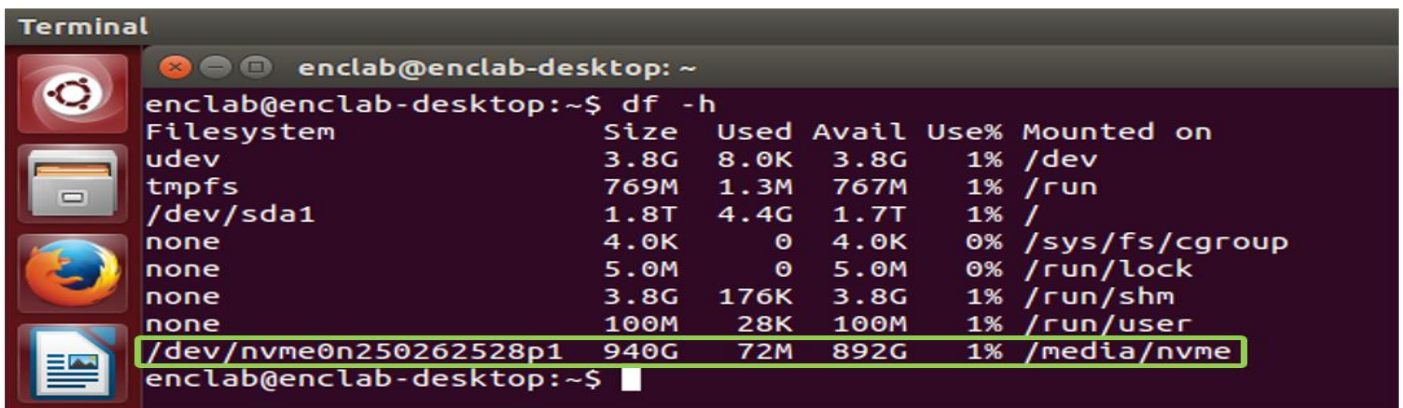
4.7. Check the mounted partition

- Type "lsblk", press ENTER -> check the mounted partition on the block device list

```
Terminal
enclab@enclab-desktop: ~
enclab@enclab-desktop:~$ lsblk
NAME                    MAJ:MIN RM    SIZE RO TYPE MOUNTPOINT
sda                         8:0   0   1.8T  0 disk
├─sda1                      8:1   0   1.8T  0 part /
├─sda2                      8:2   0     1K  0 part
└─sda5                      8:5   0   7.7G  0 part [SWAP]
nvme0n250262528           259:0   0 954.7G  0 disk
└─nvme0n250262528p1       259:1   0 954.7G  0 part /media/nvme
enclab@enclab-desktop:~$
```

- Type "df -h", press ENTER -> check the mounted partition on the storage list

```
Terminal
enclab@enclab-desktop: ~
enclab@enclab-desktop:~$ df -h
Filesystem                  Size  Used Avail Use% Mounted on
udev                        3.8G  8.0K  3.8G   1% /dev
tmpfs                       769M  1.3M  767M   1% /run
/dev/sda1                   1.8T  4.4G  1.7T   1% /
none                        4.0K     0  4.0K   0% /sys/fs/cgroup
none                        5.0M     0  5.0M   0% /run/lock
none                        3.8G  176K  3.8G   1% /run/shm
none                        100M   28K  100M   1% /run/user
/dev/nvme0n250262528p1      940G   72M  892G   1% /media/nvme
enclab@enclab-desktop:~$
```