

# Jetson TX2 기반 YOLO 응용 과정

- Day 1 -

- Day 1 -

2020.00

2020.00



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Yangjae Innovation Hub

모두의연구소

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02

JetPack 셋업



# 01. 우분투 가상환경 셋업

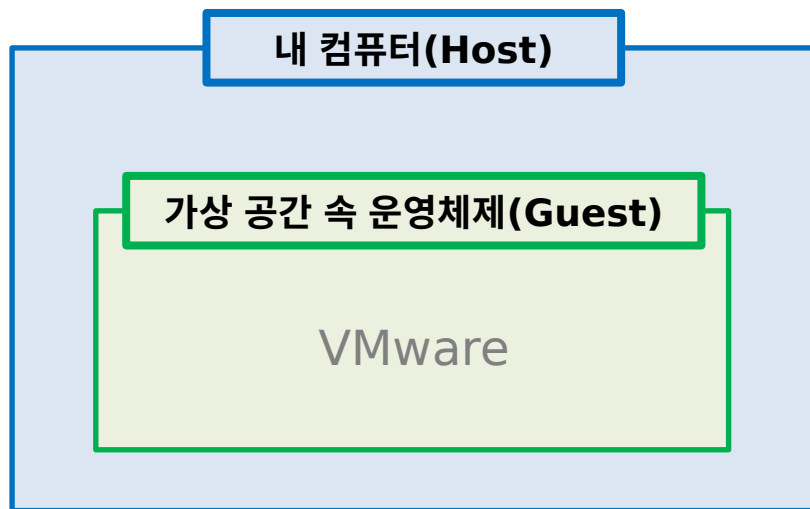
## \* 우분투 가상환경 셋업 절차



# 01. 우분투 가상환경 셋업

## \* VMware

- Virtual Machine (가상머신)
- VMware는 많은 컴퓨터 중에서 우리가 흔히 윈도우를 설치해서 사용하는 컴퓨터와 동일한 환경의 가상의 PC를 만들어준다.  
이 기능은 **실제 컴퓨터안에 컴퓨터를 한대 더 사용하는 것과 같은 효과**를 가질 수 있다.  
즉, 한 컴퓨터로 마치 여러 대의 컴퓨터를 사용하듯이 가상의 공간을 만들어주는 프로그램이다.



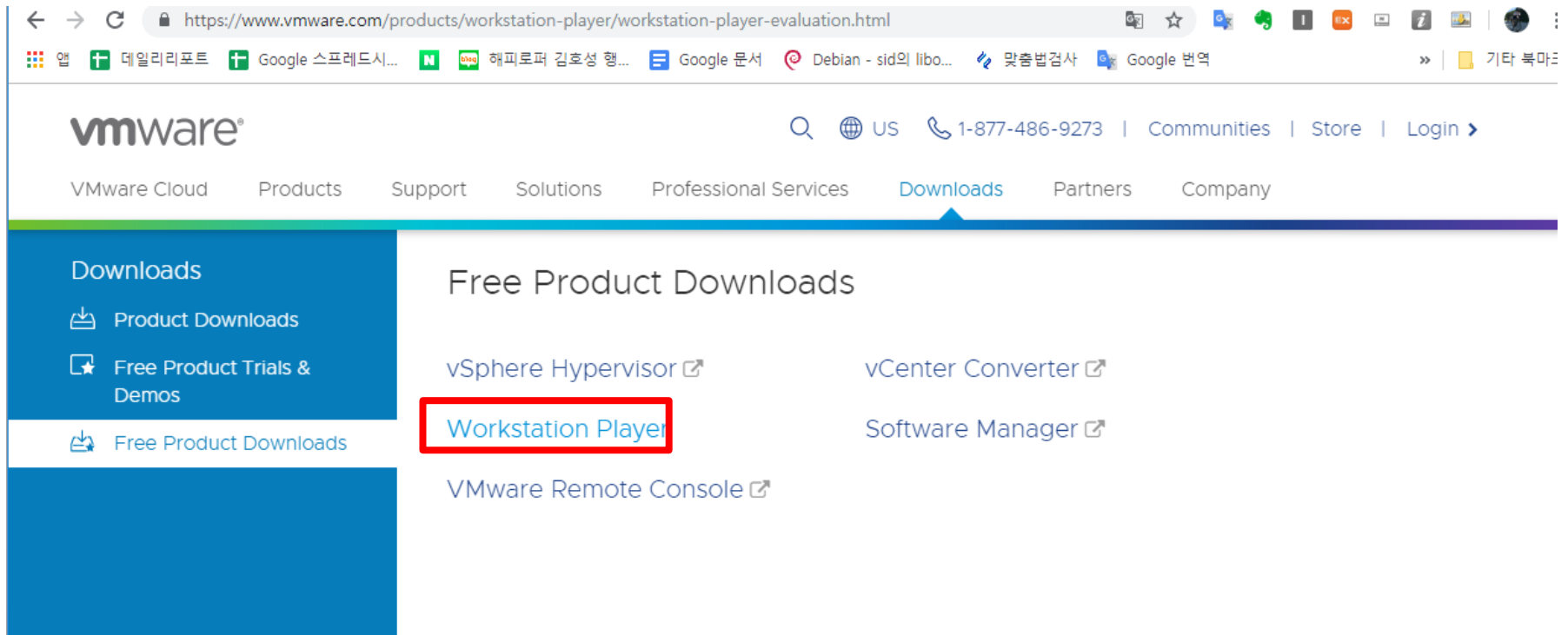
VMware	
장점	<u>Guest와 Host 컴퓨터는 별개.</u> 따라서, Guest 컴퓨터 작업 중 문제가 생겨도 Host 컴퓨터는 영향을 받지 않음. (반대의 상황도 동일함)
단점	Guest 컴퓨터는 Host 컴퓨터의 자원을 빌려 사용하므로, <u>Host 컴퓨터 성능에 영향을 주고 받음.</u> (어쩔 수없이 실제 컴퓨터 보다 느리다)

# 01. 우분투 가상환경 셋업

## [1] VMware 다운로드

① 최신 버전의 "VMware Workstation Player"를 다운받기 위해서 VMware 홈페이지에 접속한다.

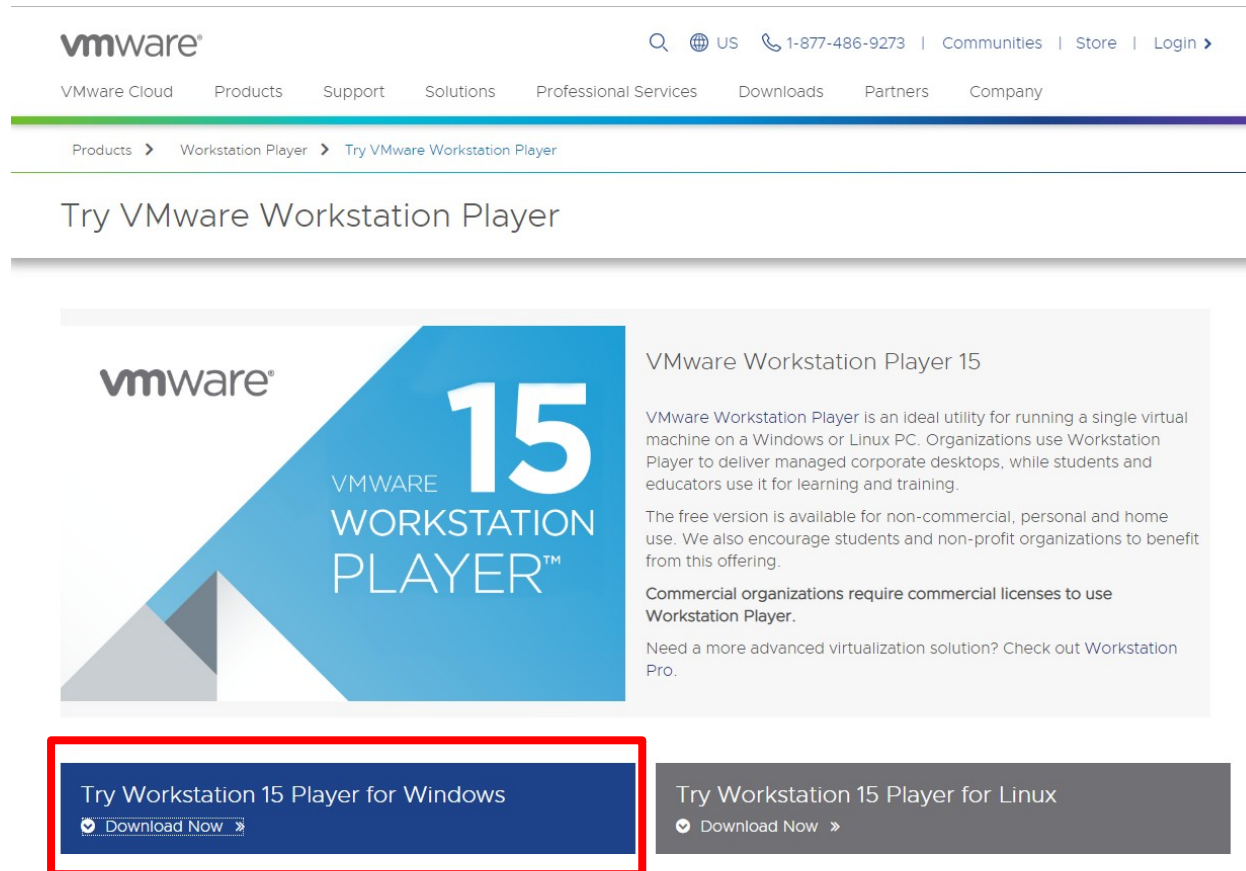
>> [www.vmware.com](http://www.vmware.com) 또는 [www.vmware.com/kr.html](http://www.vmware.com/kr.html)



# 01. 우분투 가상환경 셋업

## [1] VMware 다운로드

② VMware Workstation Player 15.0.0 버전을 다운로드 한다.




vmware®

US 1-877-486-9273 | Communities | Store | Login >

VMware Cloud Products Support Solutions Professional Services Downloads Partners Company

Products > Workstation Player > Try VMware Workstation Player

### Try VMware Workstation Player



VMware Workstation Player 15

VMware Workstation Player is an ideal utility for running a single virtual machine on a Windows or Linux PC. Organizations use Workstation Player to deliver managed corporate desktops, while students and educators use it for learning and training.

The free version is available for non-commercial, personal and home use. We also encourage students and non-profit organizations to benefit from this offering.

Commercial organizations require commercial licenses to use Workstation Player.

Need a more advanced virtualization solution? Check out Workstation Pro.

Try Workstation 15 Player for Windows

Download Now >

Try Workstation 15 Player for Linux

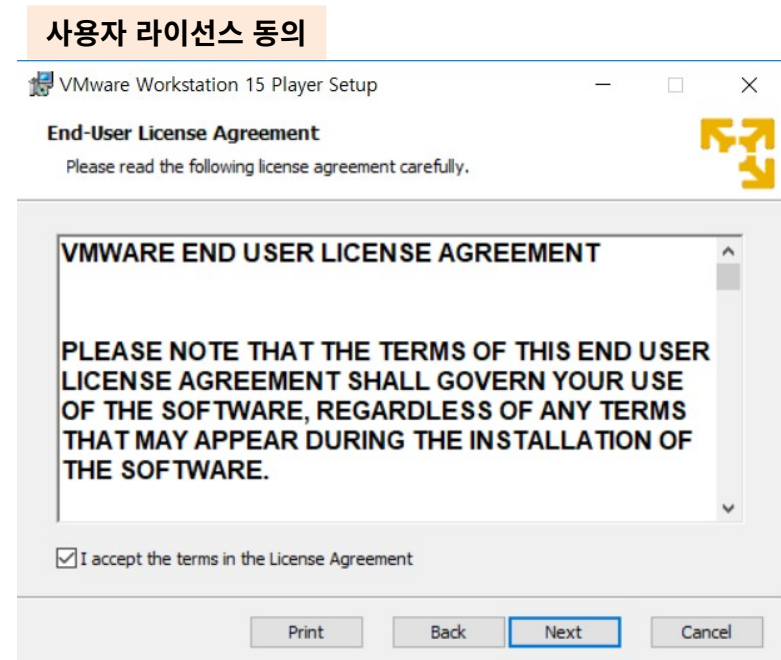
Download Now >



# 01. 우분투 가상환경 셋업

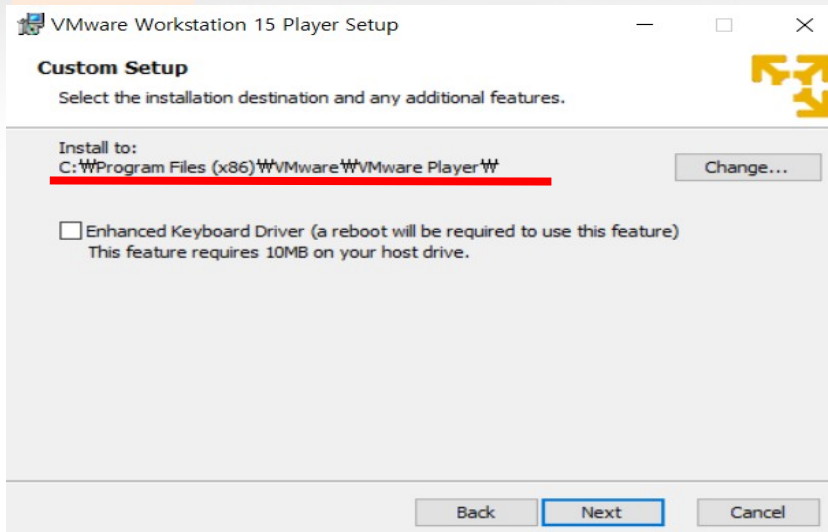
## [1] VMware 다운로드

- ③ 다운로드한 VMware 설치 파일을 실행한다.

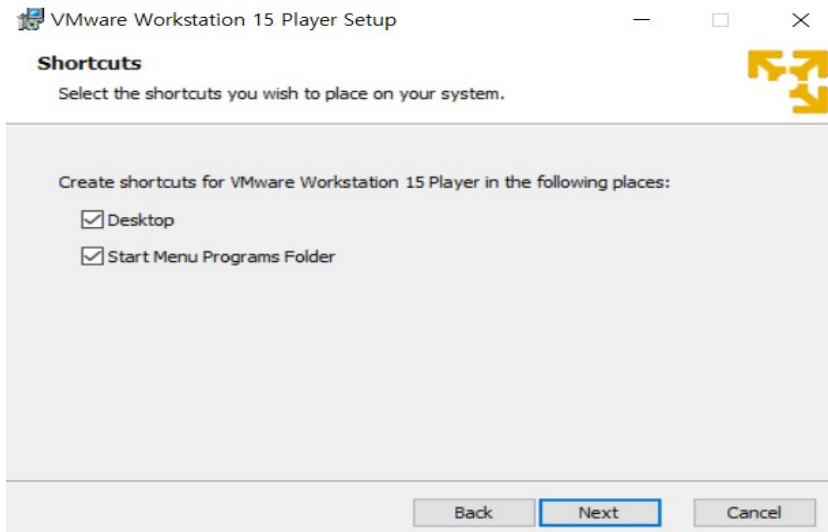
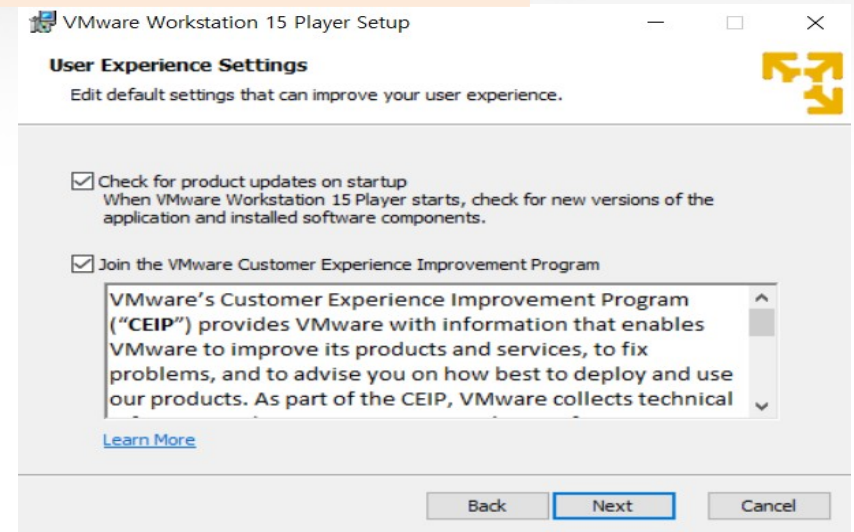


# 01. 우분투 가상환경 셋업

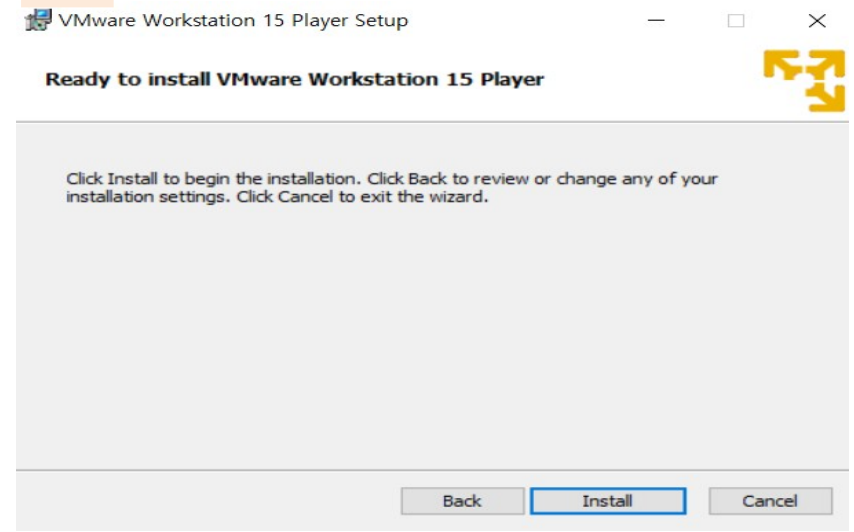
## 커스텀 설정



## 사용자 경험(User Experience) 설정



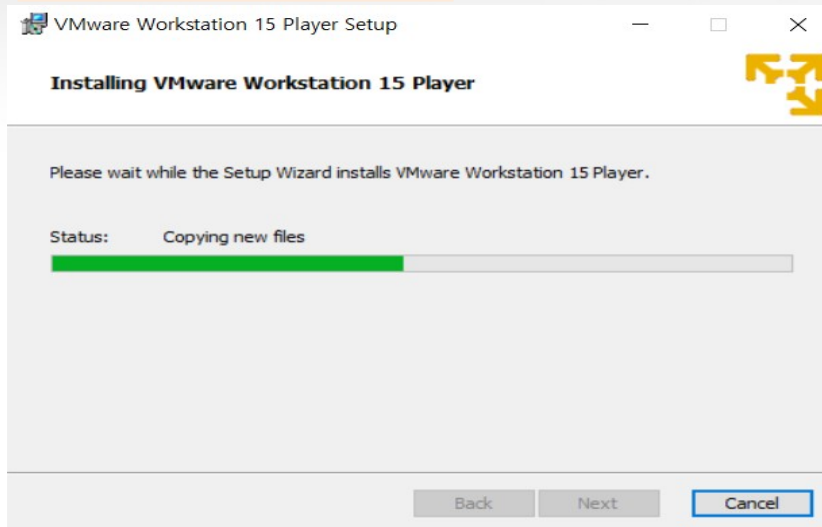
## 설치



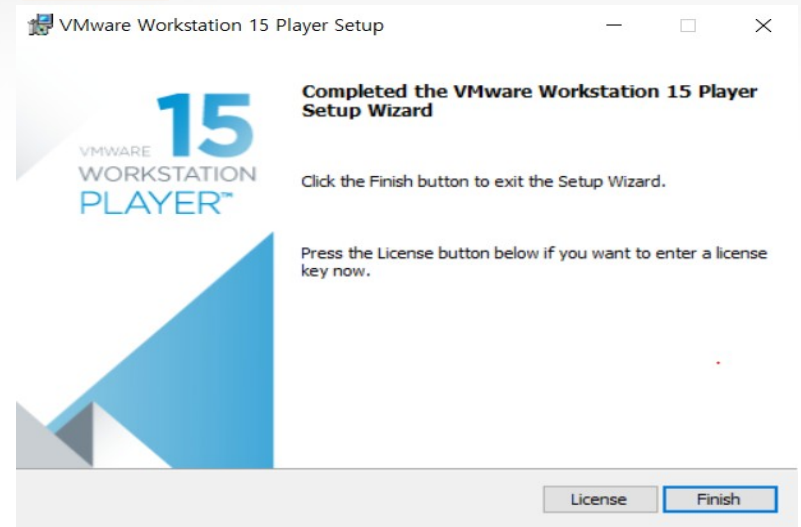


# 01. 우분투 가상환경 셋업

파일 복사 및 설정을 진행합니다.



설치완료



# 01. 우분투 가상환경 셋업

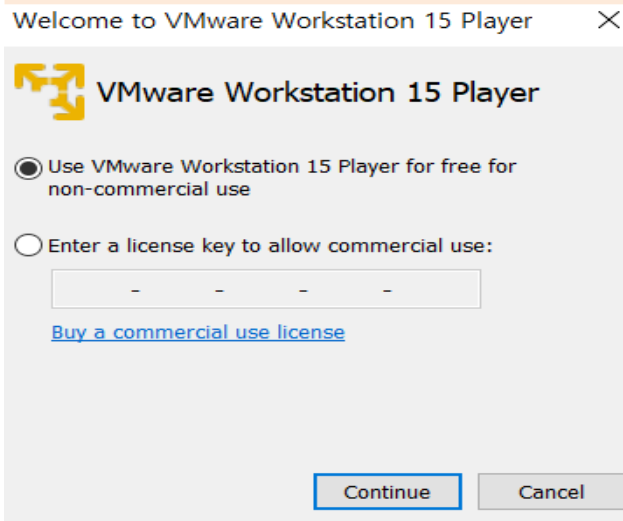
## [2] VMware실행

- ① 바탕 화면 또는 프로그램 그룹에 있는 아이콘을 더블 클릭하여 실행한다.



- ② 라이선스 키 입력

비 상업적 용도로 무료 사용을 선택하고 “Continue”버튼을 선택한다.



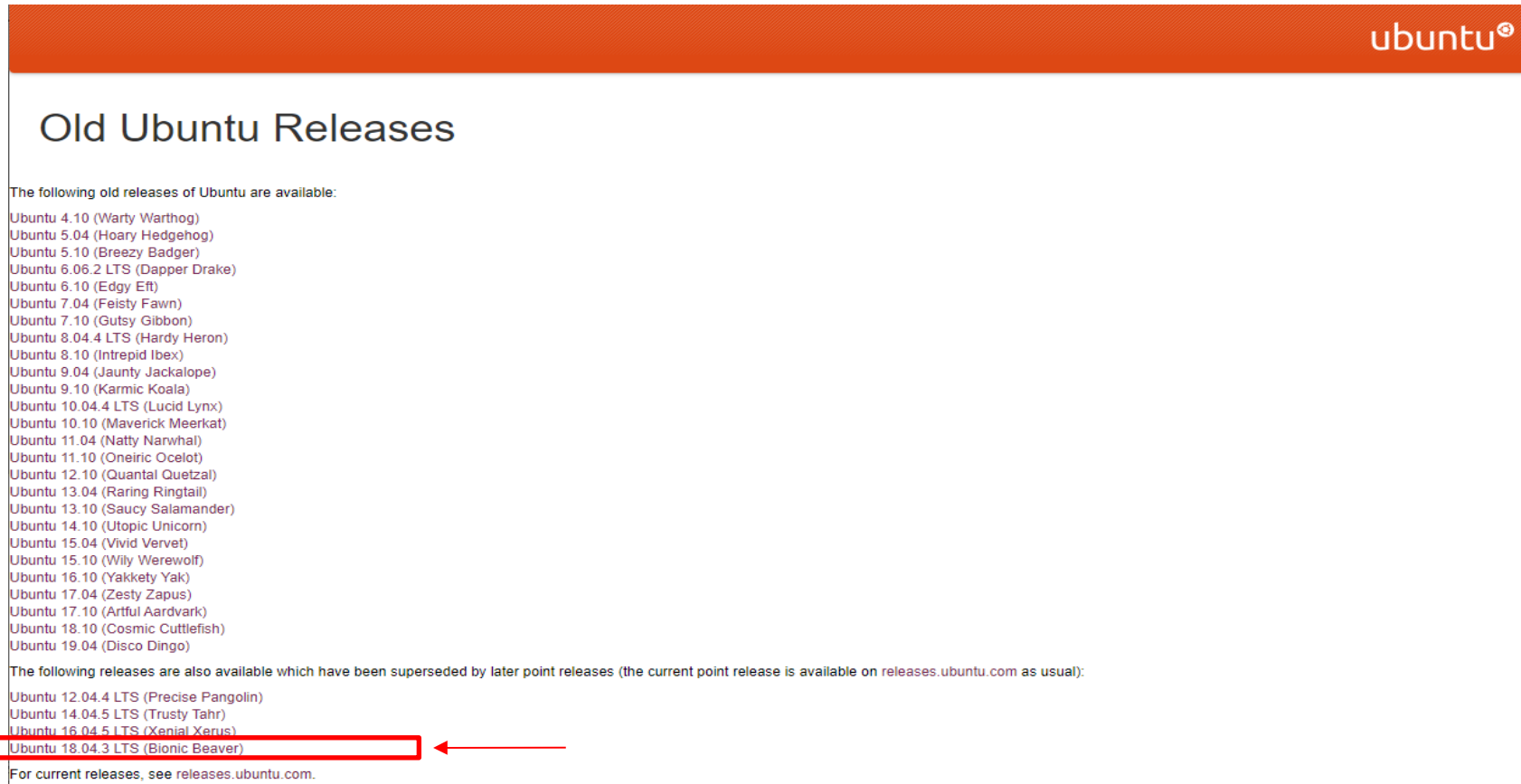
실행 준비가 완료되면 환영 메시지를 표시하는 대화상자가 나타난다.



# 01. 우분투 가상환경 셋업

## [3] 우분투 셋업(우분투 다운로드 및 실행)

- ① <http://old-releases.ubuntu.com/releases/> 링크 접속
- ② Ubuntu 18.04.3 LTS(Bionic Beaver) 클릭 !



# 01. 우분투 가상환경 셋업

## [3] 우분투 셋업(우분투 다운로드 및 실행)

### ③ 64-bit PC (AMD64) desktop image 다운로드

## Ubuntu 18.04 LTS (Bionic Beaver)

### Select an image

Ubuntu is distributed on two types of images described below.

#### Desktop image

The desktop image allows you to try Ubuntu without changing your computer at all, and at your option to install it permanently later. This type of image is what most people will want to use. You will need at least 1024MiB of RAM to install from this image.

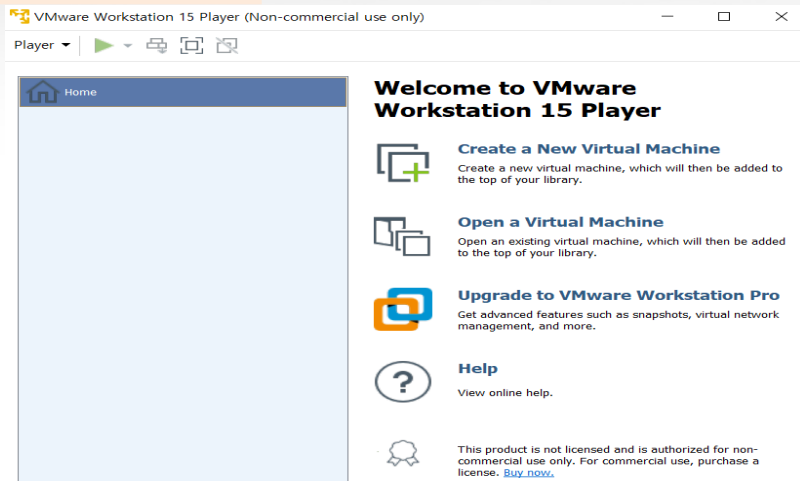
There is one image available:

64-bit PC (AMD64) desktop image

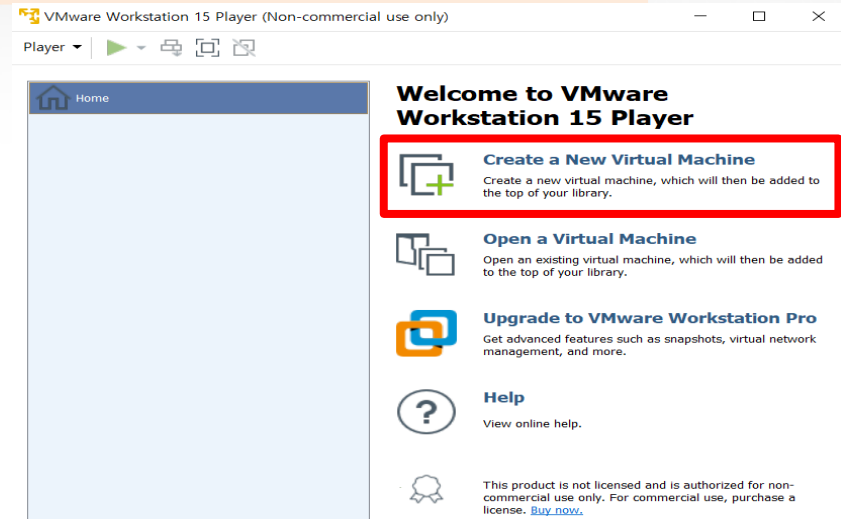
Choose this if you have a computer based on the AMD64 or EM64T architecture (e.g., Athlon64, Opteron, EM64T Xeon, Core 2). Choose this if you are at all unsure.

# 01. 우분투 가상환경 셋업

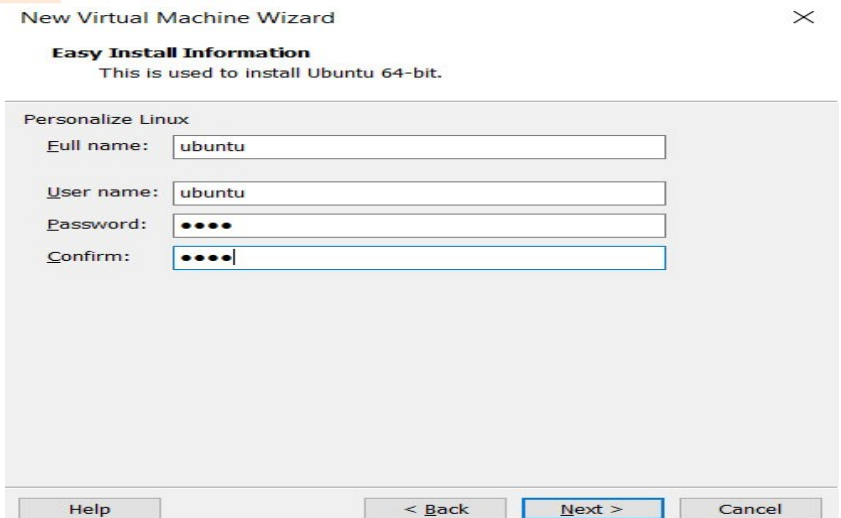
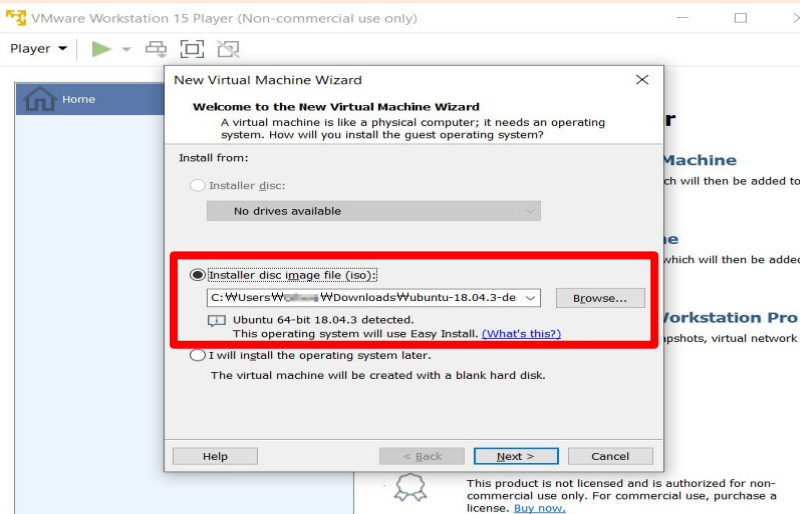
## ④ VMware 실행



## ⑤ Create a New Virtual Machine 선택한다.

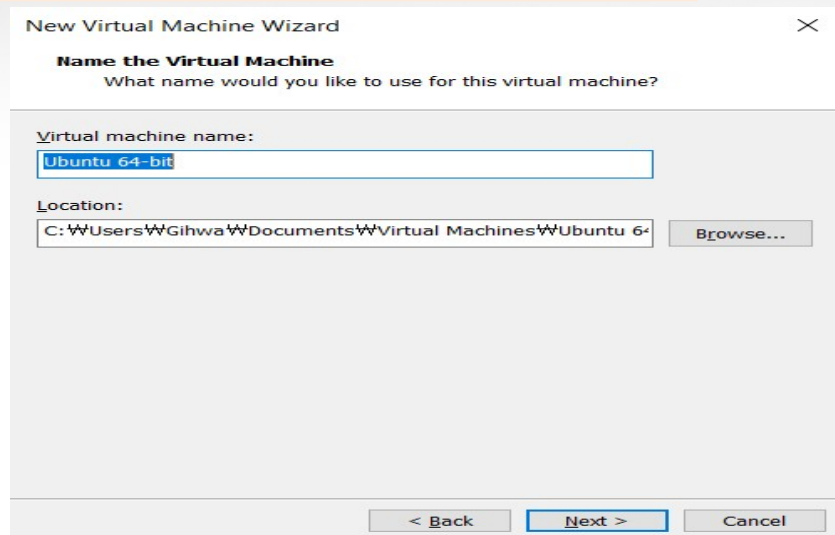


## ⑥ 설치할 Ubuntu ISO 파일을 불러와 사용자 이름과 비밀번호를 설정한다.

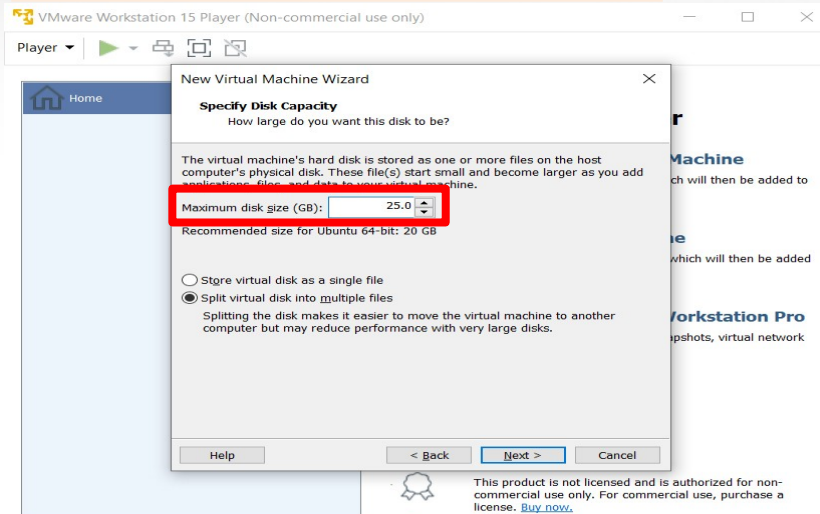


# 01. 우분투 가상환경 셋업

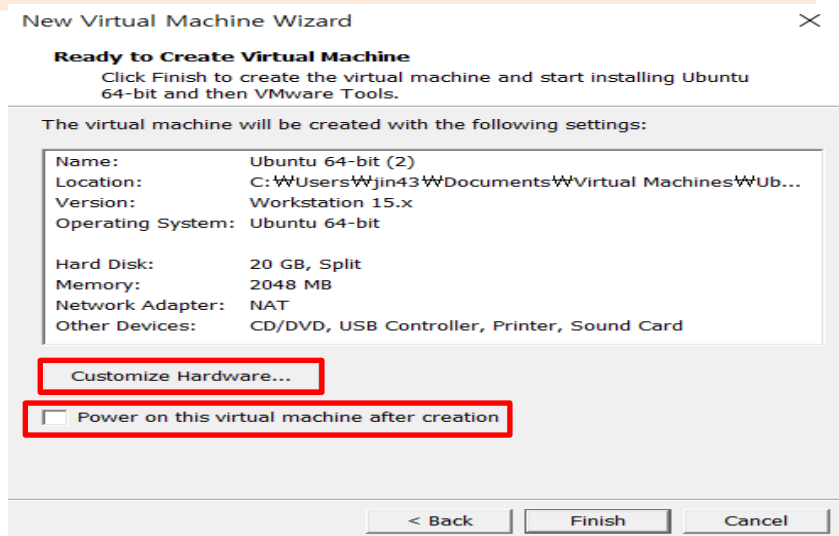
## ⑦ Virtual machine 이름과 설치 위치를 설정한다.



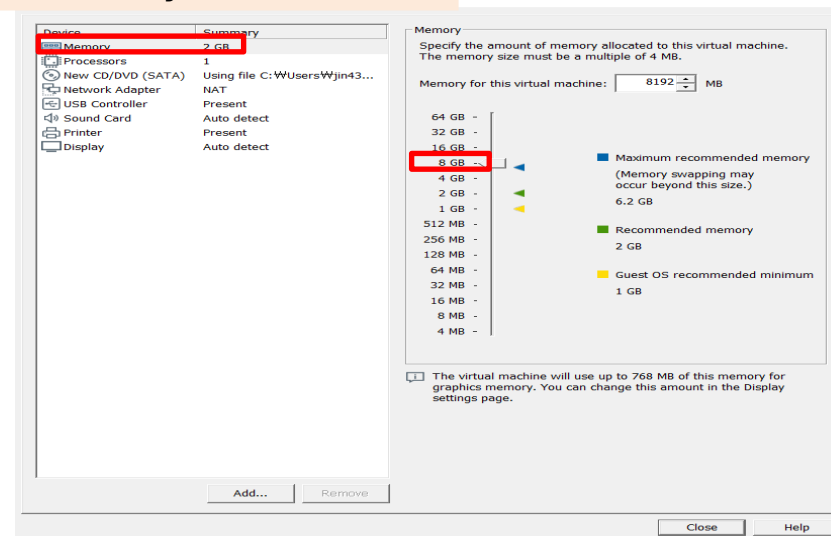
## ⑧ 하드디스크 용량을 60GB 할당하고 선택한다.



## ⑨ 체크박스 체크 해제 후 Customize Hardware를 누른다.



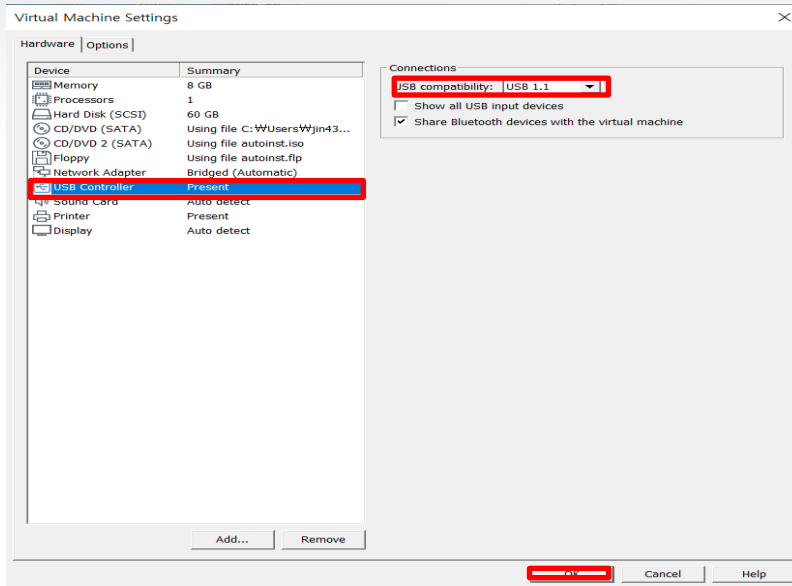
## ⑩ Memory 용량을 8GB로 설정



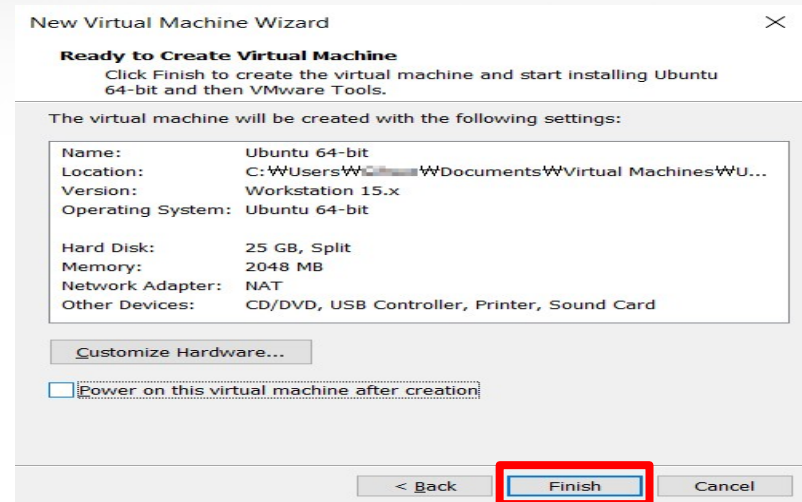


# 01. 우분투 가상환경 셋업

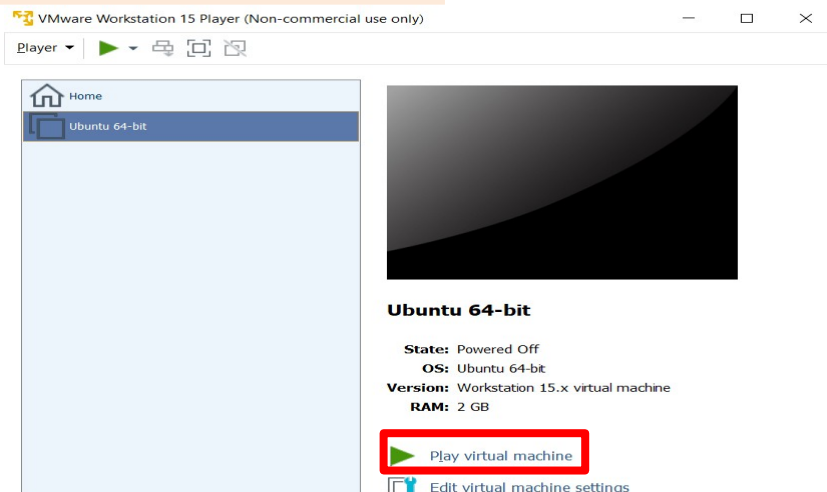
## ⑪ USB Controller 선택 후 USB 1.1 호환을 선택 후 창을 닫는다.



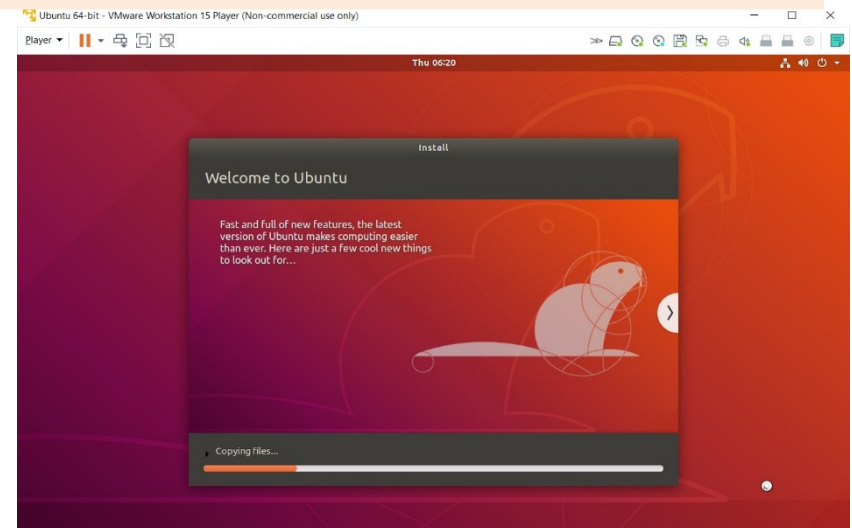
## ⑫ Finish를 누른다.



## ⑬ play virtual machine 클릭



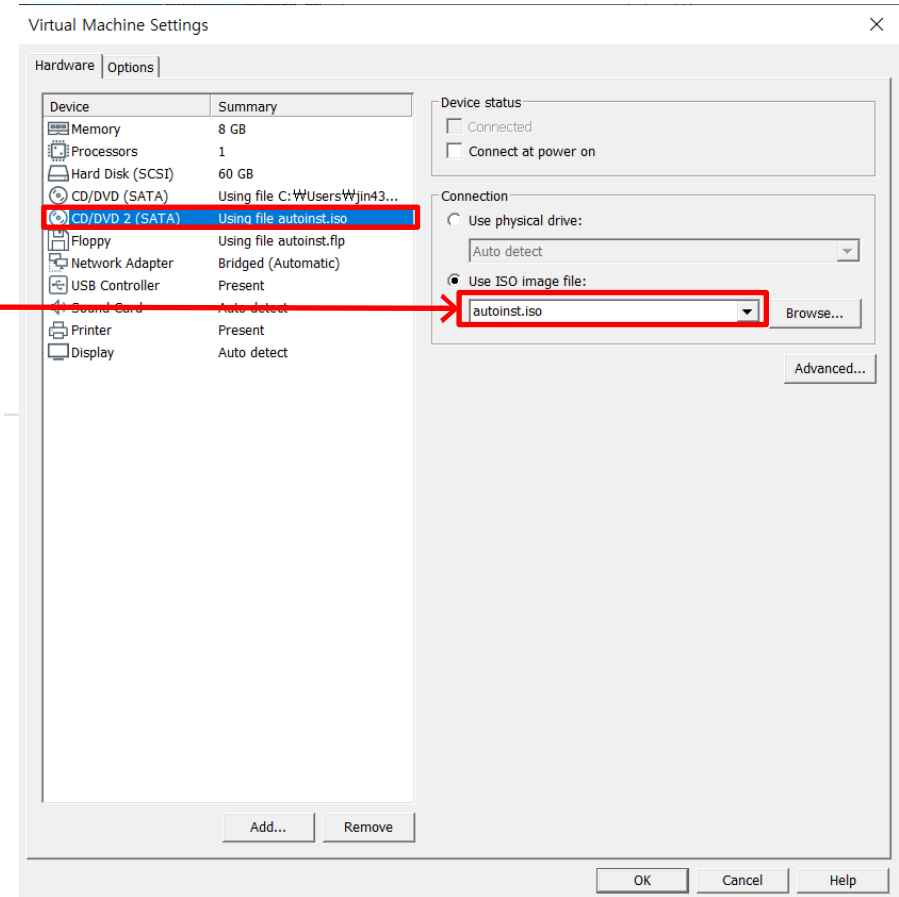
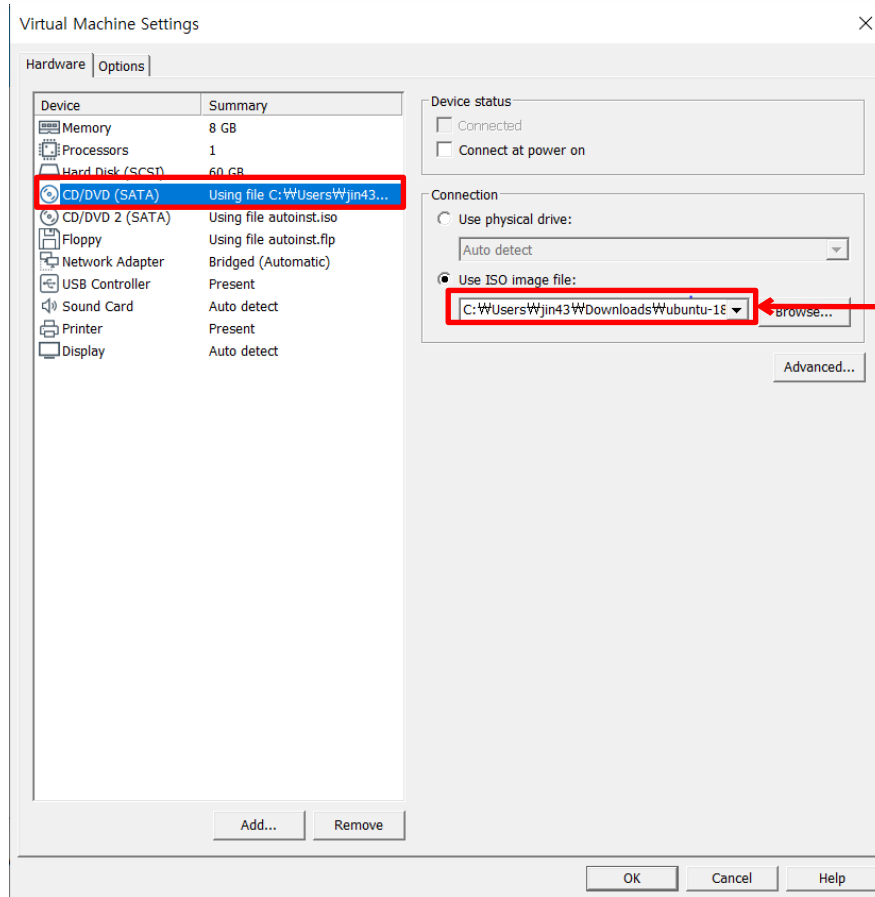
## ⑭ Ubuntu 18.04.3 LTS와 VMware Tool을 함께 설치한다.



# 01. 우분투 가상환경 셋업

★ 설치화면에서 Black Screen 뜨고 진행 안 될 시

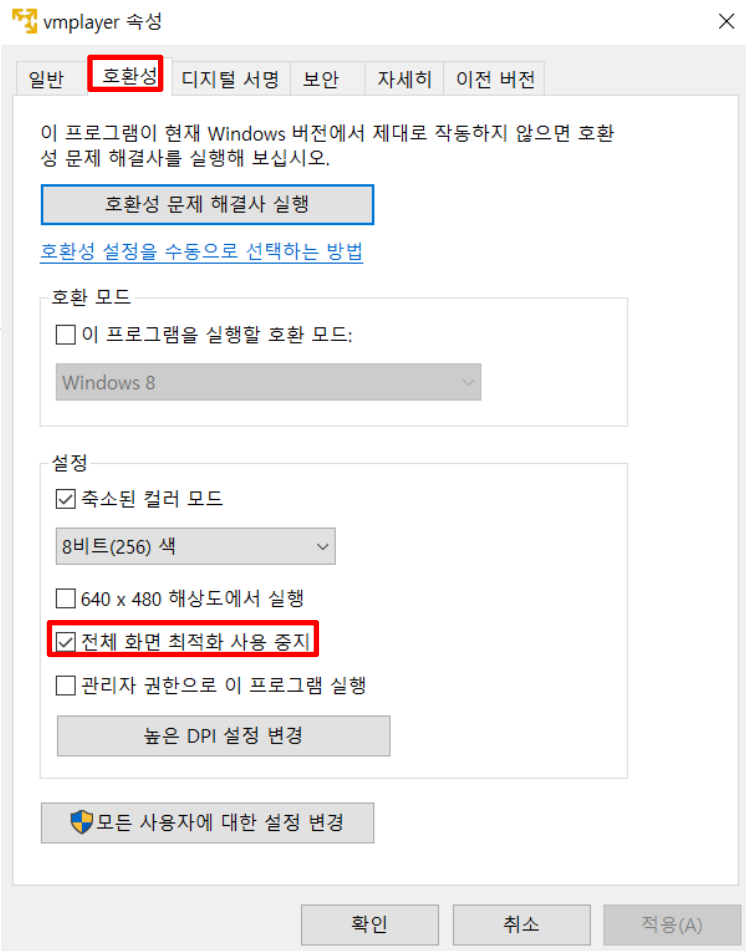
Edit virtual machine settings - 두 CD/DVD 드라이버의 입력을 서로 바꿔 본다.



# 01. 우분투 가상환경 셋업

## ★ 설치화면에서 마우스 싱크가 안 맞을 시

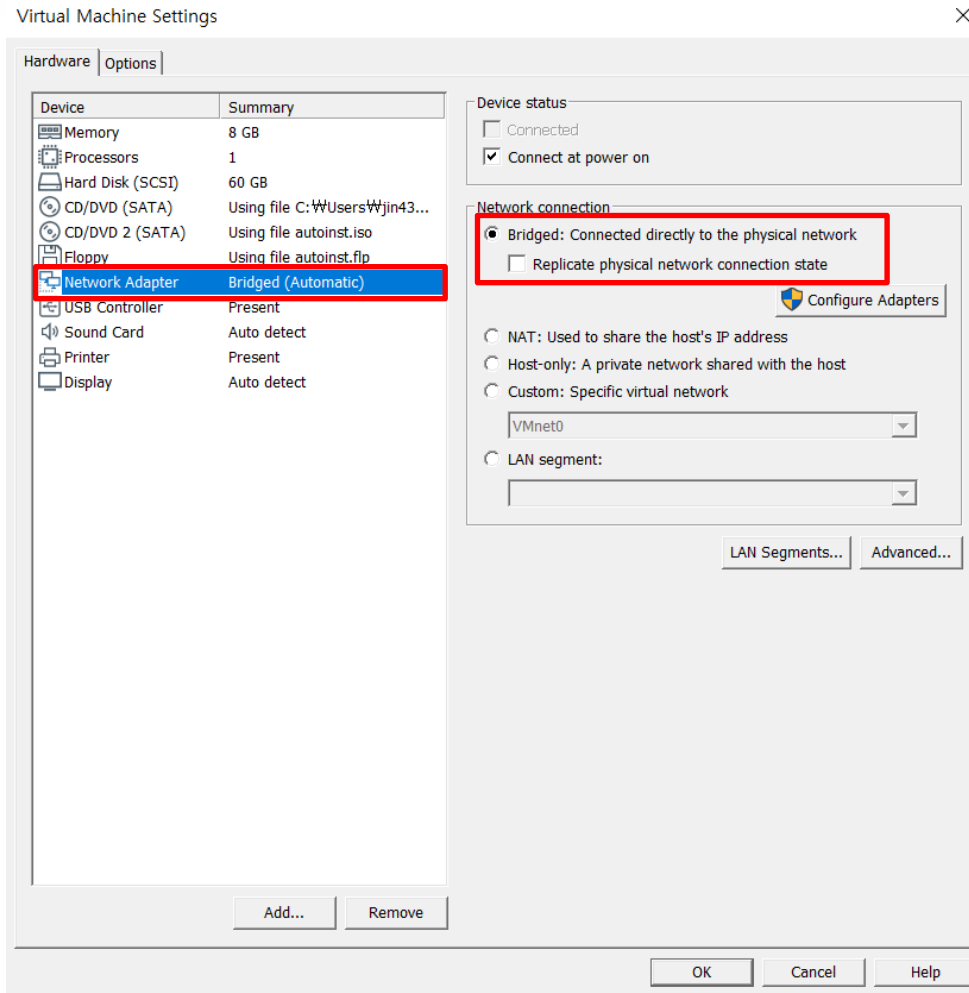
1. VMWare 설치 경로(C:\Program Files (x86)\VMware\VMware Player) 이동
2. VMWare.exe 우 클릭 후, 속성 선택
3. 호환성 탭으로 이동
4. 설정 중 "높은 DPI 설정에서 디스플레이 배율을 사용하지 않음" 혹은 "전체화면 최적화에 체크"



# 01. 우분투 가상환경 셋업

## ★ 네트워크가 너무 느릴 때

bridged 방식으로 변경 + Replicate physical network connection state 체크 해제



## 02. Jetpack 셋업

### \* Jetpack

- Jetpack 또는 Jetpack SDK



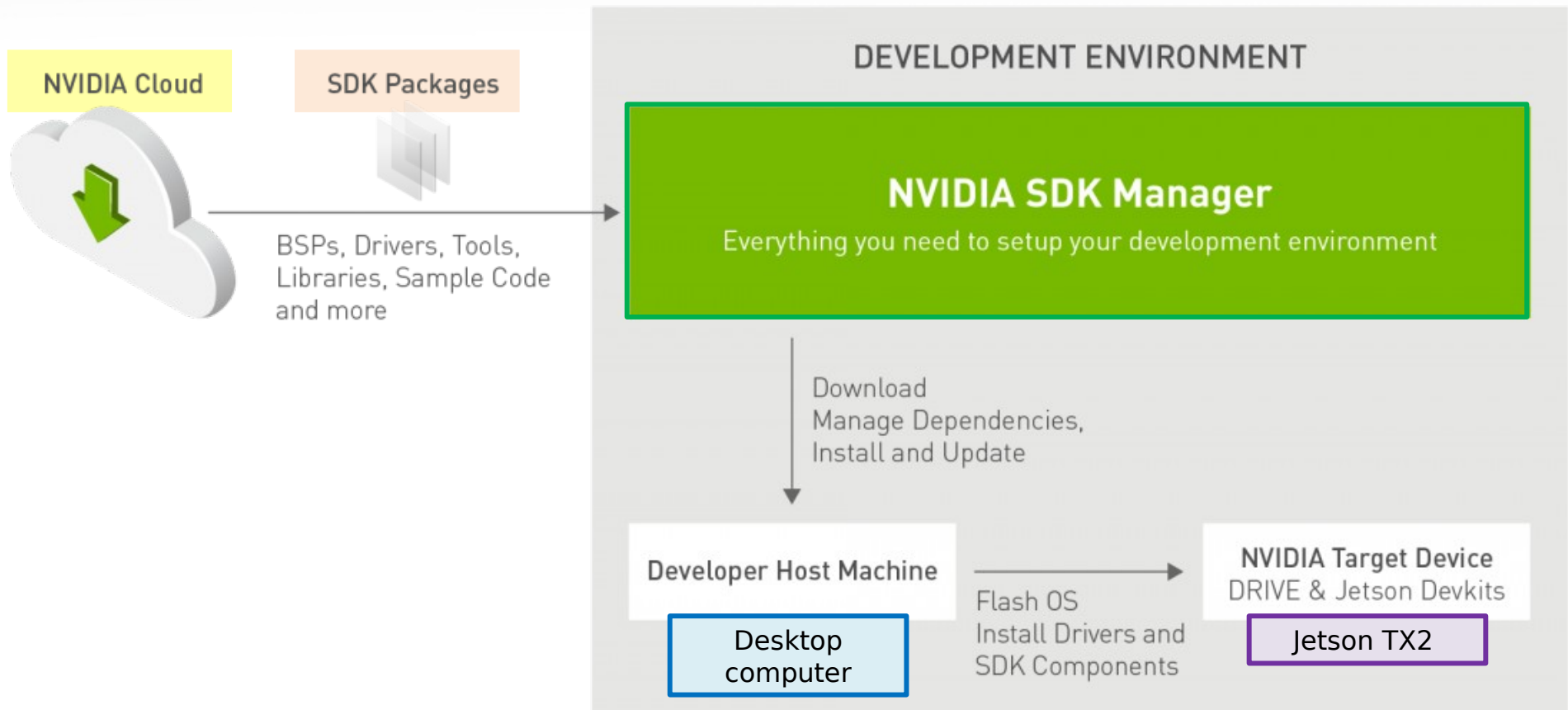
SDK 란, 개발을 하는데 필요한 도구들의 모음.

- AI 어플리케이션 구축을 위한 포괄적인 솔루션(일종의 소프트웨어 뭉치)
  - OS Image, Libraries and APIs, developer tools, sample, documentation ....
- 

### \* Jetpack SDK Manager

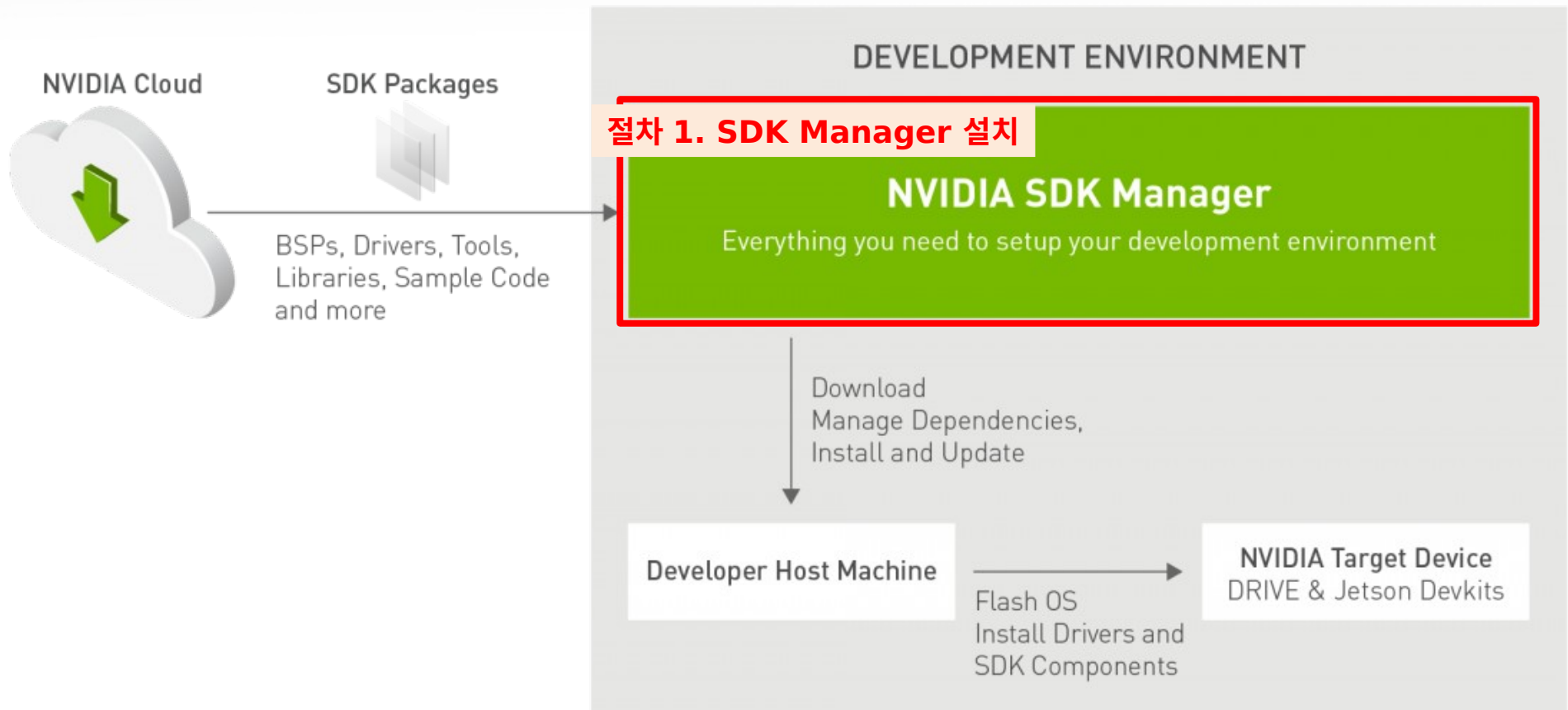
- NVIDIA DRIVE, Jetson SDK에 End-to-End 개발환경 세팅 법 제공.
- Jetpack SDK Manager를 이용하여, Jetpack SDK를 NVIDIA cloud에서 Jetson Tx2 보드로 다운로드.

## 02. Jetpack 셋업





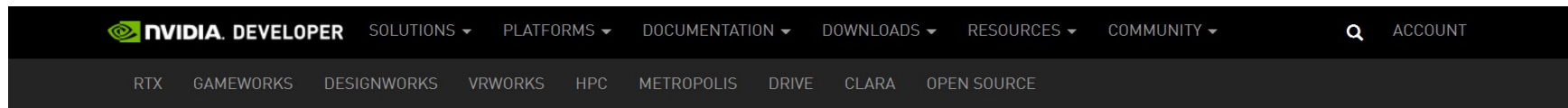
## 02. Jetpack 셋업



# 02. Jetpack 셋업

## [1] NVIDIA SDK Manager 설치

- ① NVIDIA SDK Manager를 NVIDIA 사이트에서 다운로드 받는다.
  - >> <https://developer.nvidia.com/nvidia-sdk-manager> (다운로드를 위하여 회원가입 진행)
  - Ubuntu 18.04.3 LTS를 설치한 VMware에서 진행 (Ubuntu 18.04.3 LTS가 설치된 PC, 노트북도 무관)



Home > DEVELOPER > NVIDIA SDK Manager

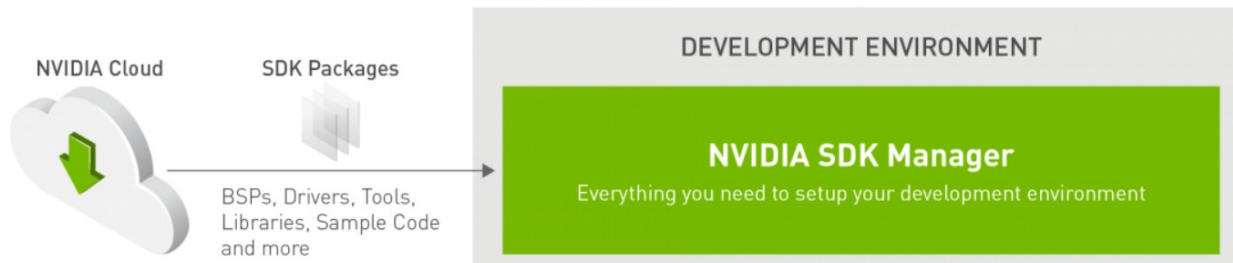
## NVIDIA SDK Manager

### Everything You Need to Set Up Your Development Environment

NVIDIA SDK Manager provides an end-to-end development environment setup solution for NVIDIA's DRIVE and Jetson SDKs for both host machine and target devices.



[SDK Manager User Guide](#)



## 02. Jetpack 셋업

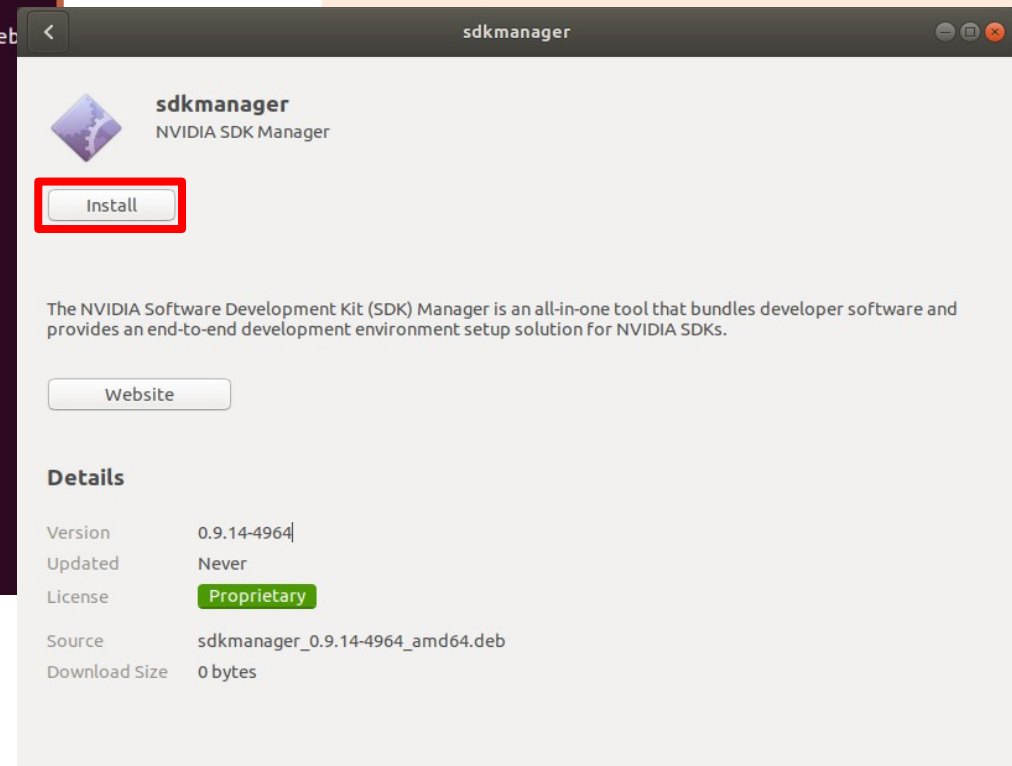
### [1] NVIDIA SDK Manager 설치

② .deb 확장자 파일을 클릭하여 설치한다.

```
ubuntu@ubuntu: ~/Downloads
File Edit View Search Terminal Help
ubuntu@ubuntu:~$ cd Downloads
ubuntu@ubuntu:~/Downloads$ sudo apt install ./sdkmanager_0.9.14-4964_amd64.deb
```

방법 1. 터미널에서 APT INSTALL 명령어로 설치

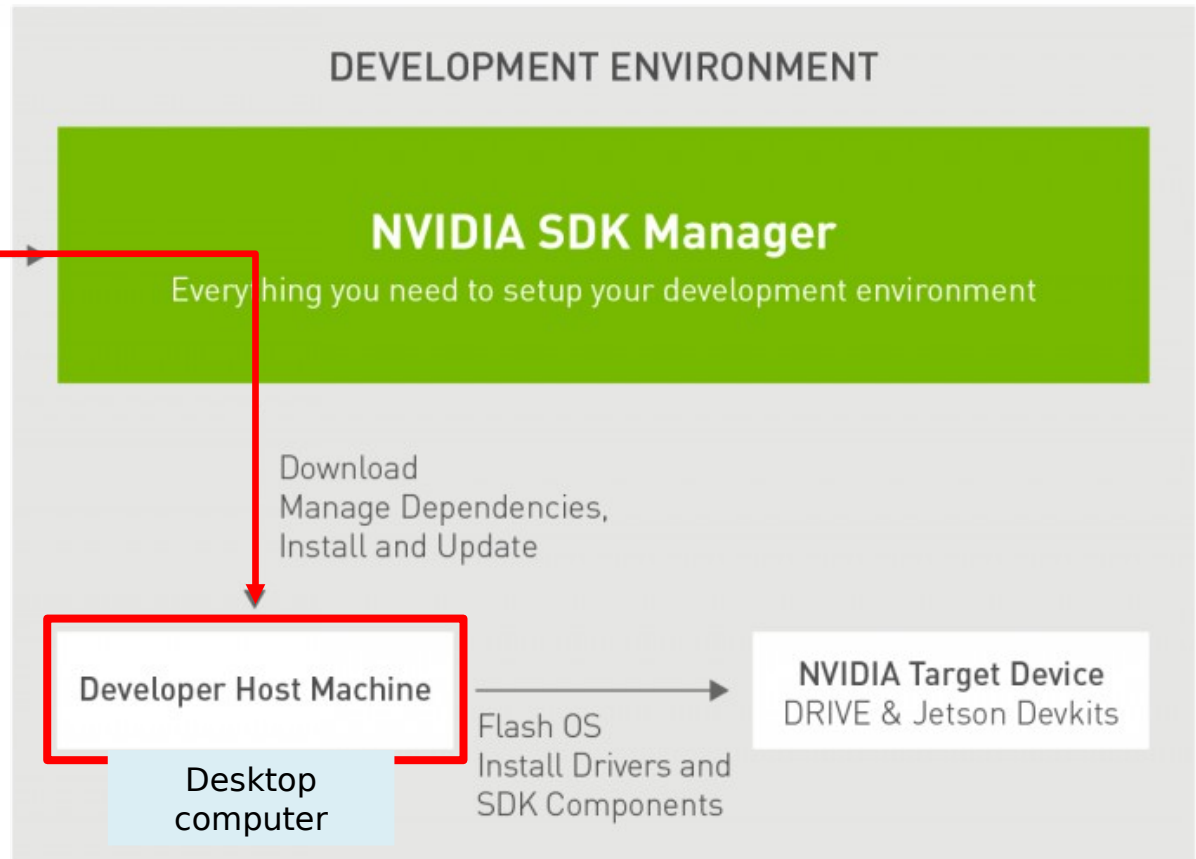
방법 2. 동일한 방법을 시각적 GUI로 설치



## 02. Jetpack 셋업



### 절차 2. JetPack 다운로드

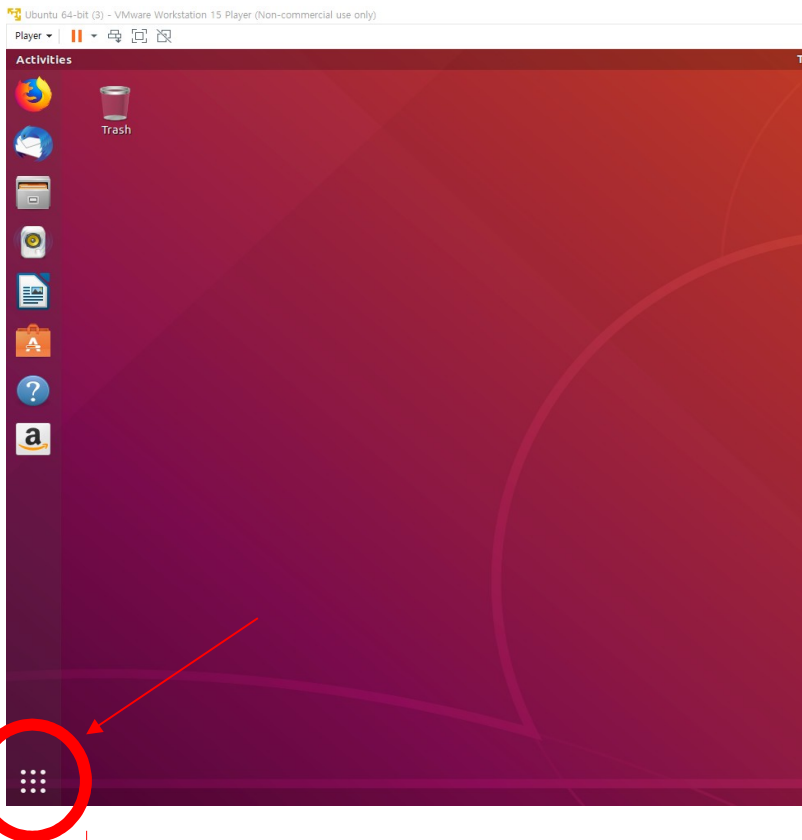


# 02. Jetpack 셋업

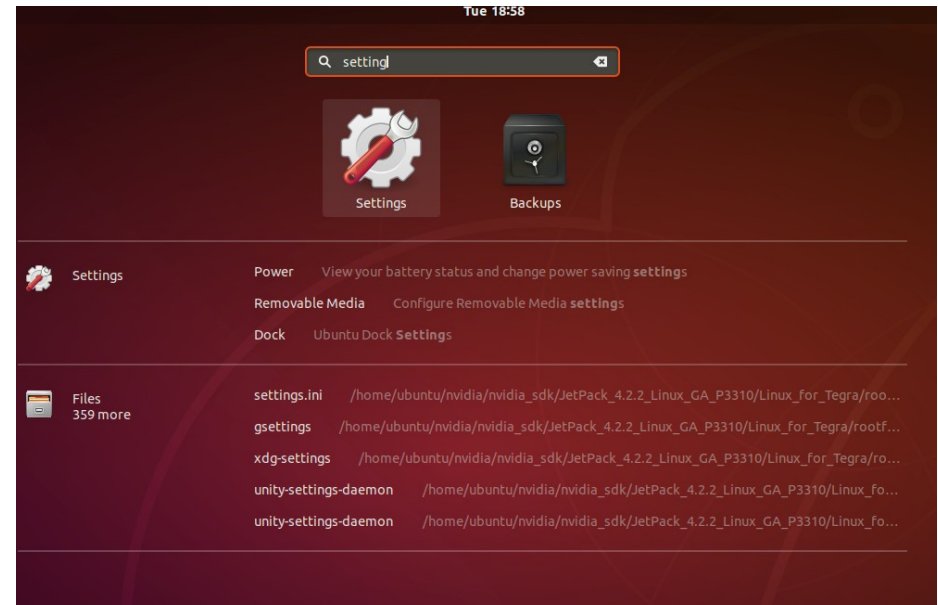
## [2] JetPack 다운로드

⇒ Jetpack 다운로드를 진행하기 전,  
NVIDIA SDK Manager 실행 창이 일부 잘리는 현상이 있을 수 있어 화면 배율을 조정.

### 1) 아래의 메뉴를 클릭



### 2) 검색창에 'setting' 검색

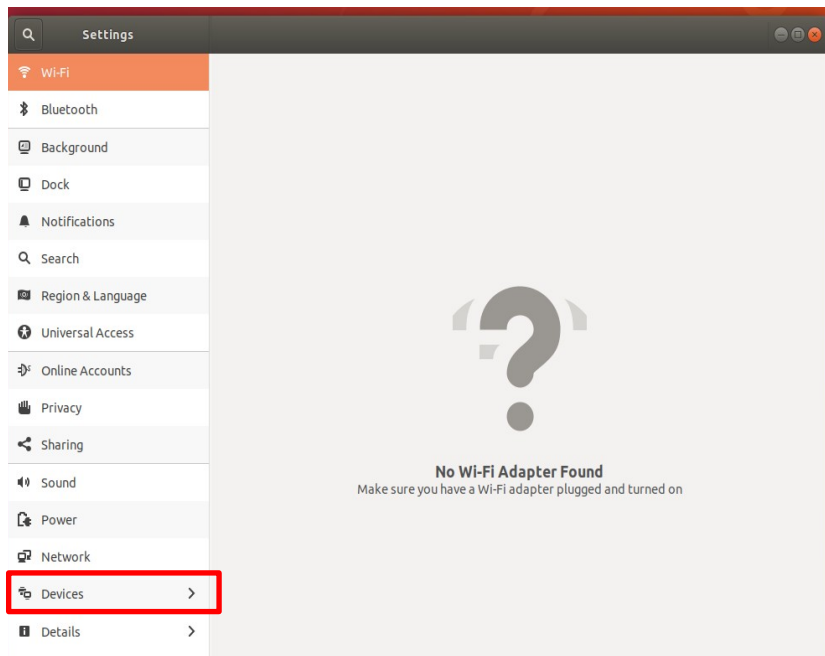


# 02. Jetpack 셋업

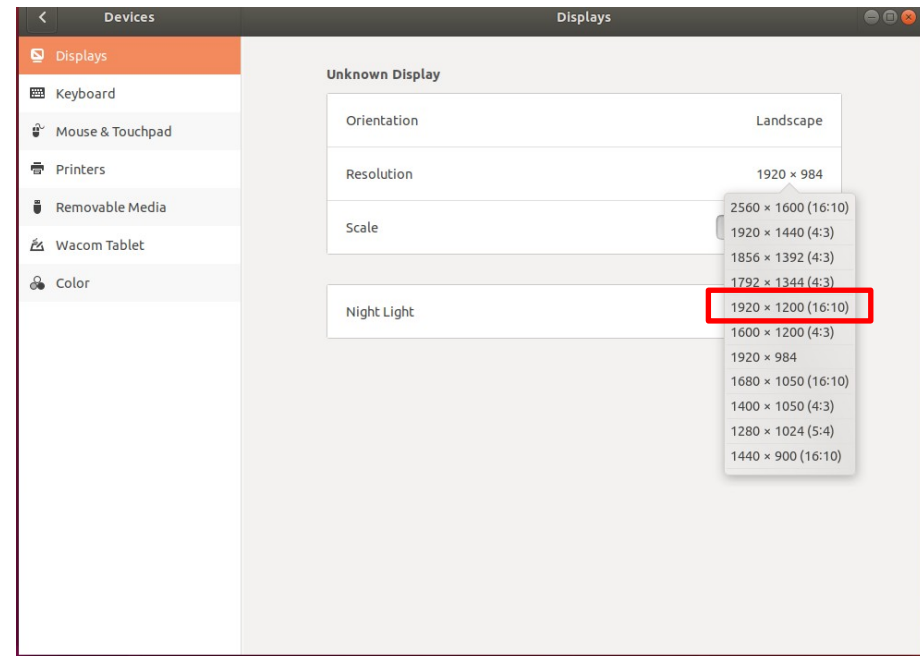
## [2] JetPack 다운로드

⇒ Jetpack 다운로드를 진행하기 전,  
NVIDIA SDK Manager 실행 창이 일부 잘리는 현상이 있을 수 있어 화면 배율을 조정.

### 3) Devices 선택



### 4) Display 에서, Resolution을 1920 X 1200(16:10)으로 설정



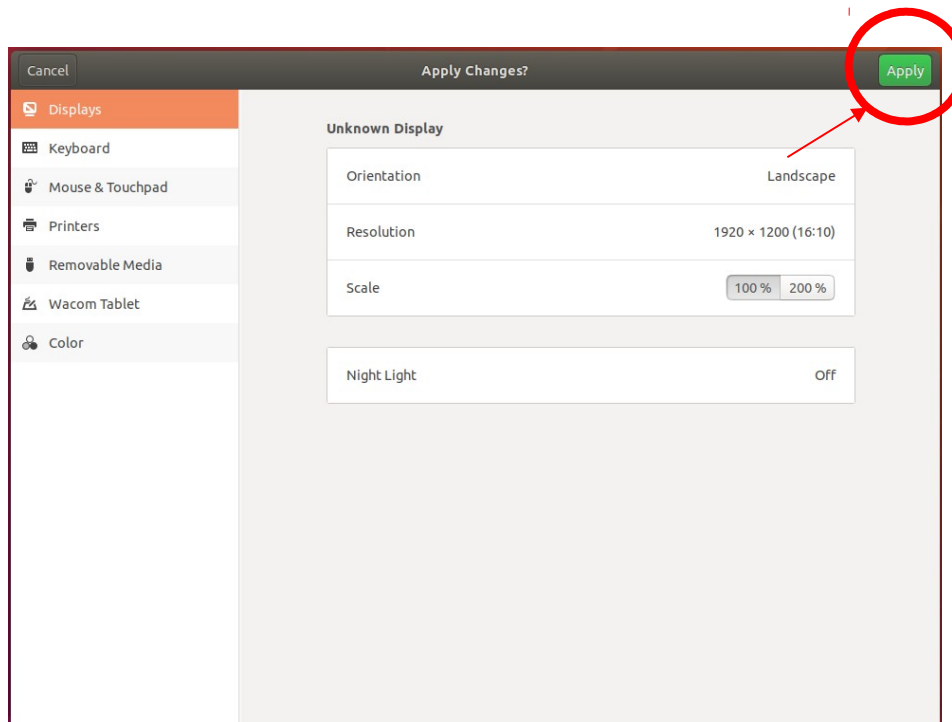


# 02. Jetpack 셋업

## [2] JetPack 다운로드

⇒ Jetpack 다운로드를 진행하기 전,  
NVIDIA SDK Manager 실행 창이 일부 잘리는 현상이 있을 수 있어 화면 배율을 조정.

### 5) Apply 클릭 후, 창이 뜨면 Keep Changing 클릭

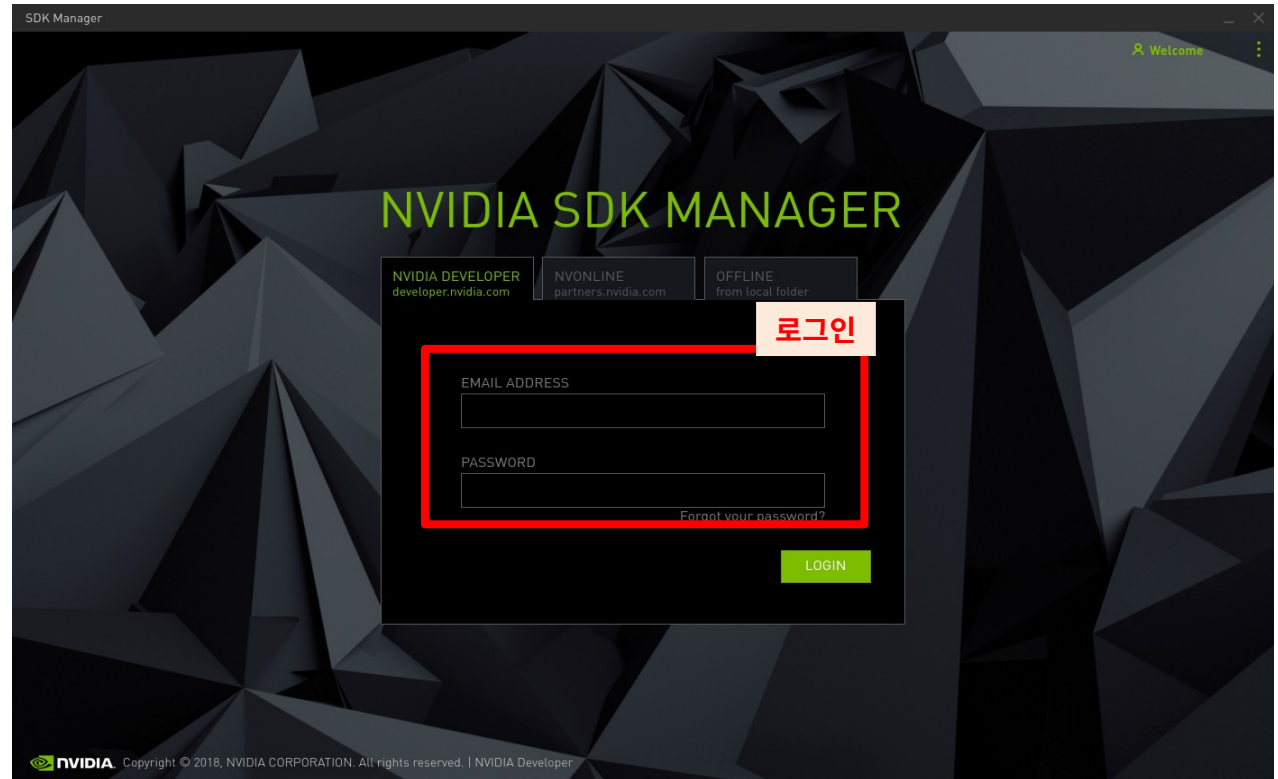
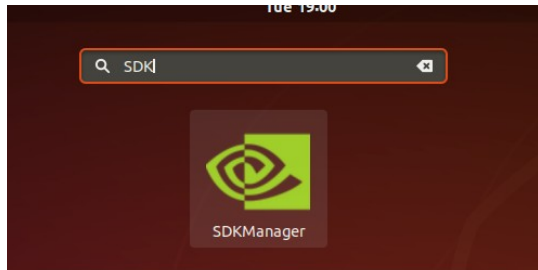


# 02. Jetpack 셋업

## [2] JetPack 다운로드

① NVIDIA 계정으로 로그인 후 진행.

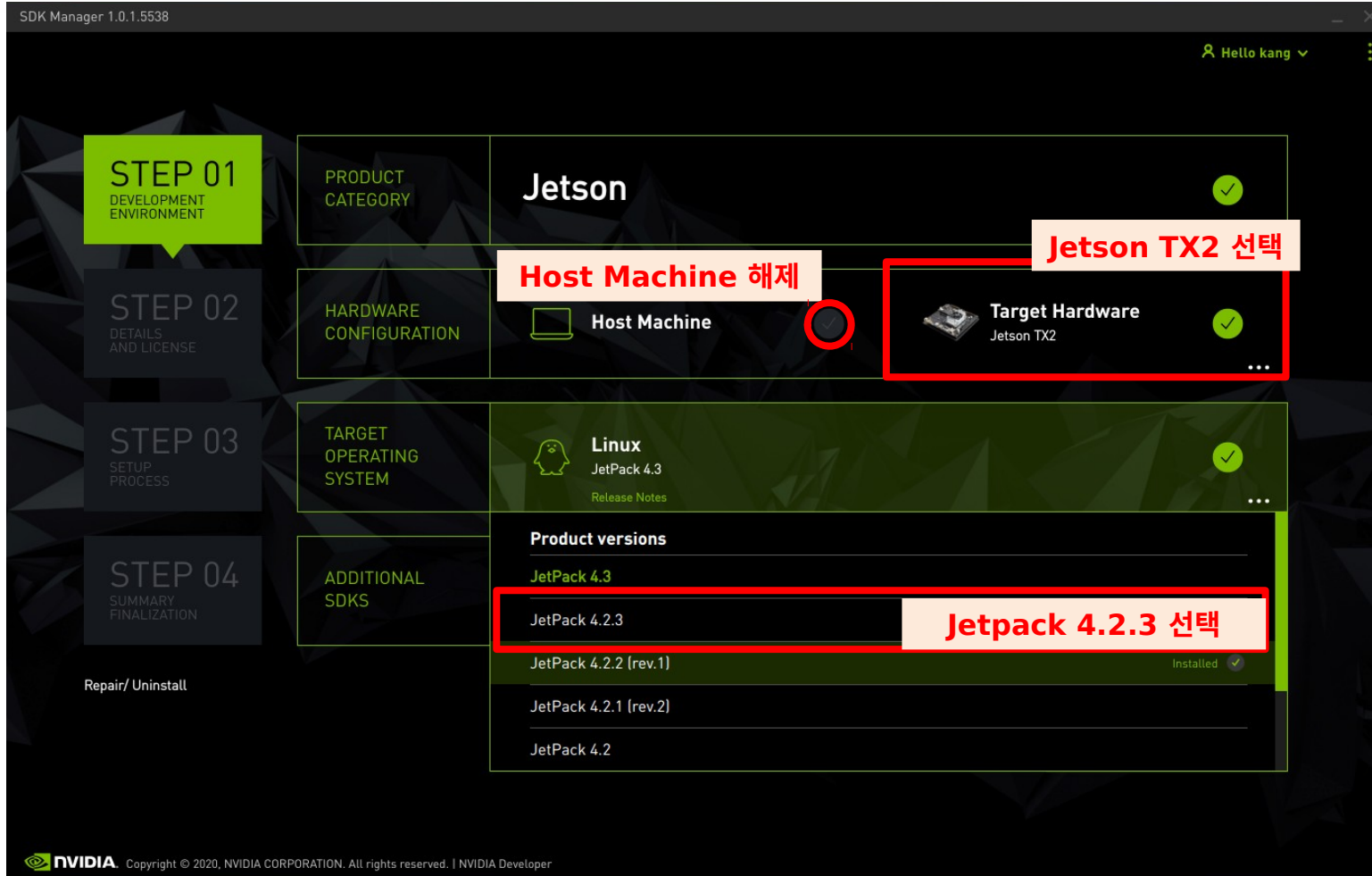
- 메뉴에서 'SDK' 를 검색하여 NVIDIA SDK MANAGER 실행.
- Facebook 계정으로 NVIDIA 로그인을 하였을 경우, 동일하게 Facebook 계정 입력하면 됨.



# 02. Jetpack 셋업

## [2] JetPack 다운로드

② STEP 01 세팅 (세팅 후 Continue 클릭)



# 02. Jetpack 셋업

## [2] JetPack 다운로드

③ STEP 02 세팅 (세팅 후 Continue 클릭)

SDK Manager 0.9.14.4964

Hello Gihwan

**STEP 01**  
DEVELOPMENT ENVIRONMENT

**STEP 02**  
DETAILS AND LICENSE

**STEP 03**  
SETUP PROCESS

**STEP 04**  
SUMMARY FINALIZATION

**Additional SDKs 선택 해제**

JETPACK 4.2.2 (REV.1) LINUX FOR JETSON TX2 [Expand all](#)

TARGET COMPONENTS	DOWNLOAD SIZE	STATUS
<input checked="" type="checkbox"/> Jetson OS		
> Jetson OS image	1,336 MB	
> Flash Jetson OS		
<input checked="" type="checkbox"/> Jetson SDK Components		
> CUDA	954.0 MB	
> AI	811.3 MB	
> Computer Vision	100.9 MB	
> NVIDIA Container Runtime	1.0 MB	
> Multimedia	67.0 MB	
<input checked="" type="checkbox"/> Additional SDKs		
> <input type="checkbox"/> DeepStream	100.0 MB	
> <input checked="" type="checkbox"/> TensorRT	100.0 MB	Downloaded

**DOWNLOAD & INSTALL OPTIONS**

System requires up to 10GB of available disk space during setup.

☒ I accept the terms and conditions of the [license agreements](#).

**CONTINUE** >  
TO STEP 03

< BACK TO STEP 01

**라이선스 동의 확인**

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# 02. Jetpack 셋업

## [2] JetPack 다운로드

### ③ STEP 03

SDK Manager 0.9.14.4964

Hello Gihwan

**STEP 01**  
DEVELOPMENT ENVIRONMENT

**STEP 02**  
DETAILS AND LICENSE

**STEP 03**  
SETUP PROCESS

**STEP 04**  
SUMMARY FINALIZATION

**DETAILS** | **TERMINAL**

JETPACK 4.2.2 (REV.1) LINUX FOR JETSON TX2 [Expand all](#)

TARGET COMPONENTS	DOWNLOAD SIZE	STATUS
✓ Jetson OS		
> Jetson OS image	1,336 MB	○ Downloading - 9.2%
> Flash Jetson OS		ⓘ Skipped
✓ Jetson SDK Components		
> CUDA	954.0 MB	○ Downloading - 34.9%
> AI	811.3 MB	○ Downloading - 40.4%
> Computer Vision	100.9 MB	● Pending download
> NVIDIA Container Runtime	1.0 MB	● Pending download
> Multimedia	67.0 MB	● Pending download

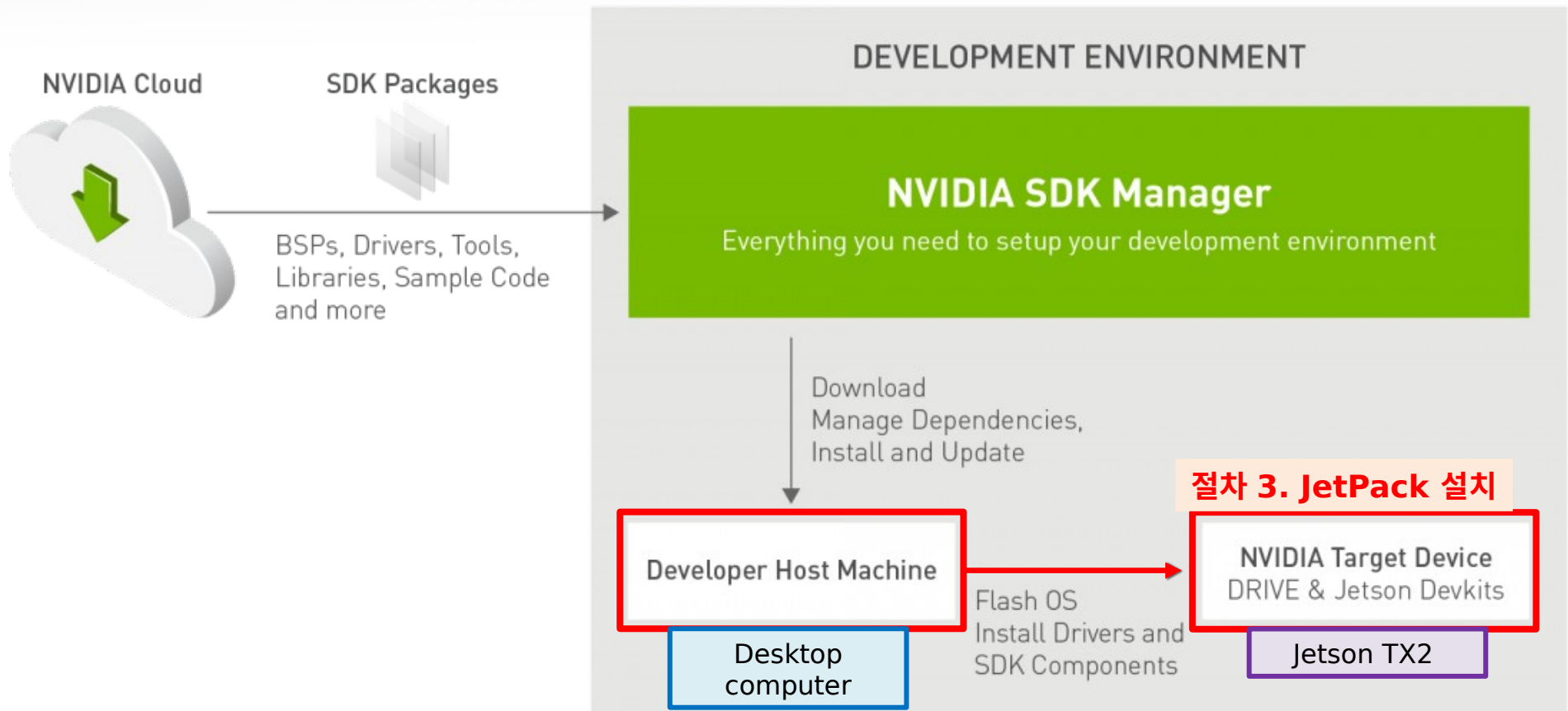
○ Downloading: 23.95% [10.83MB/s]

Download folder: /home/ubuntu/Downloads/nvidia/sdkm\_downloads

**PAUSE FOR A BIT** ||

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## 02. Jetpack 셋업

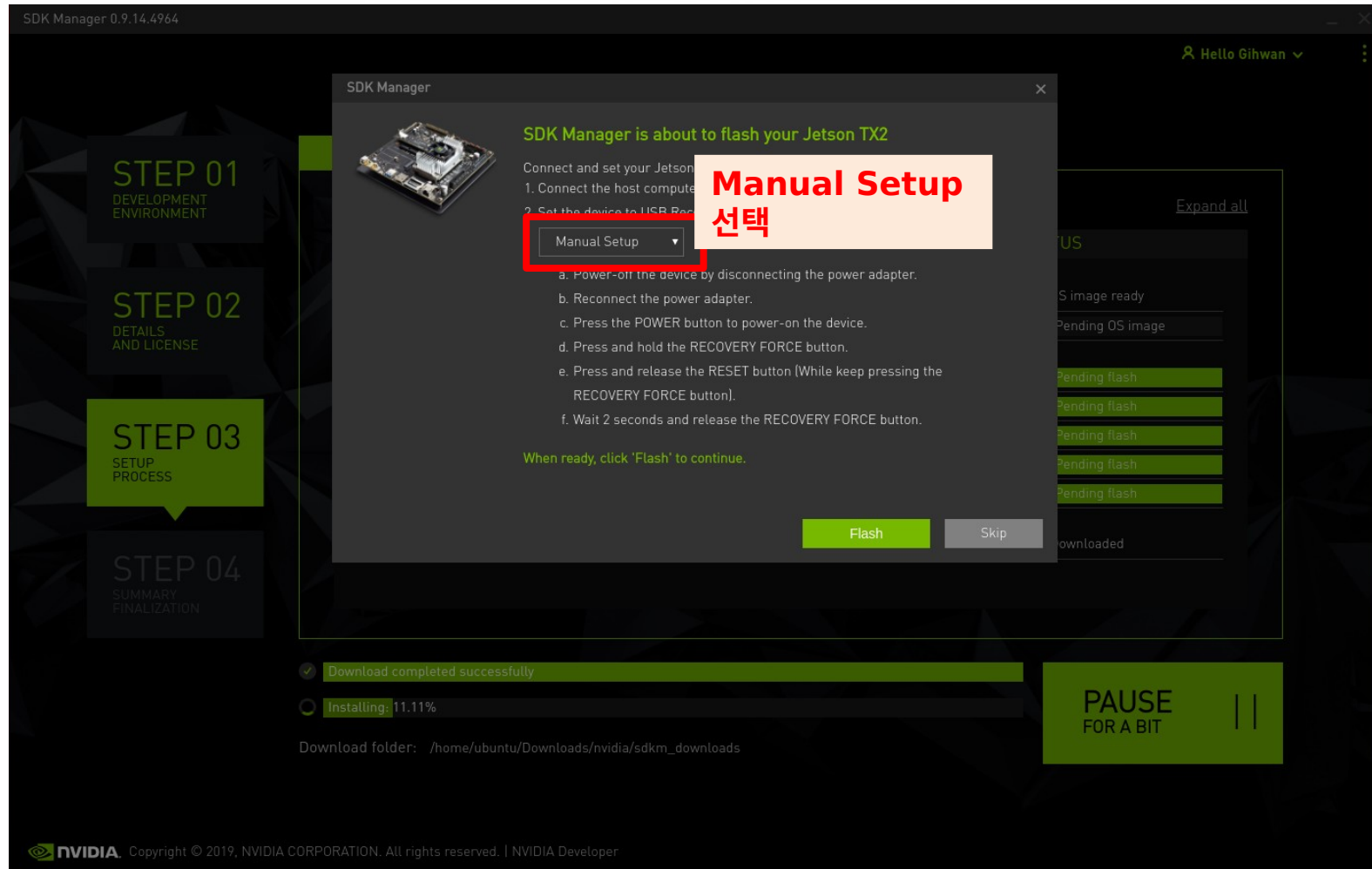




# 02. Jetpack 셋업

## [3] JetPack 설치

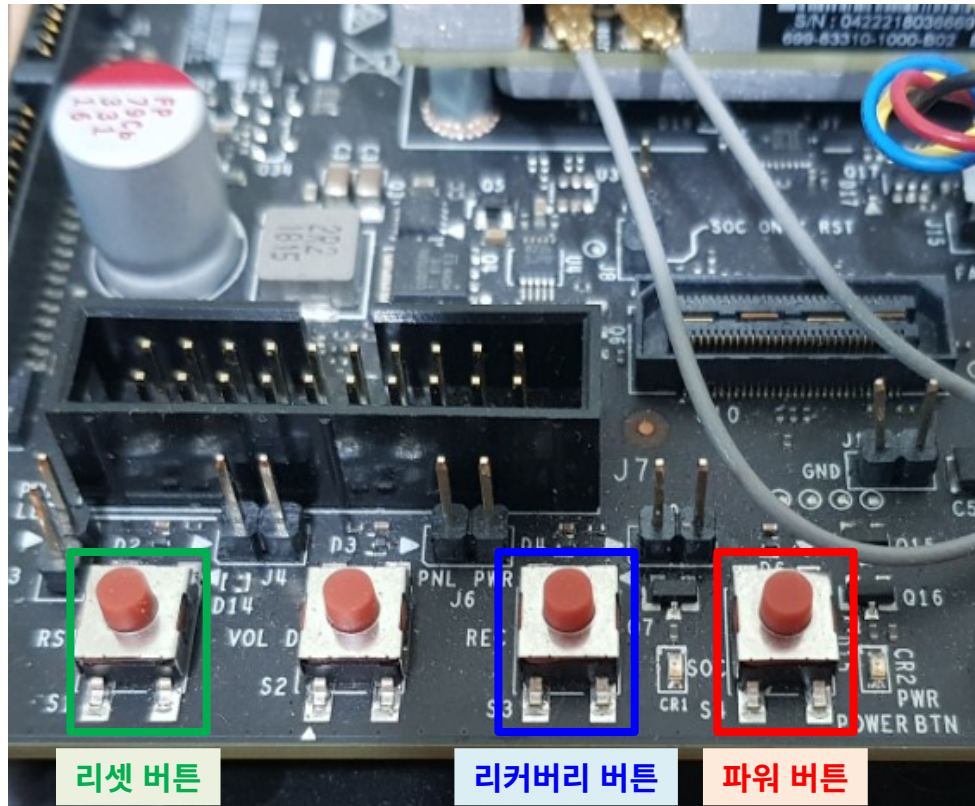
① Download가 완료되고, Flash 준비가 끝나면 화면이 나타난다.



## 02. Jetpack 셋업

### [3] JetPack 설치

② Jetson TX2를 리커버리 모드로 만든다.

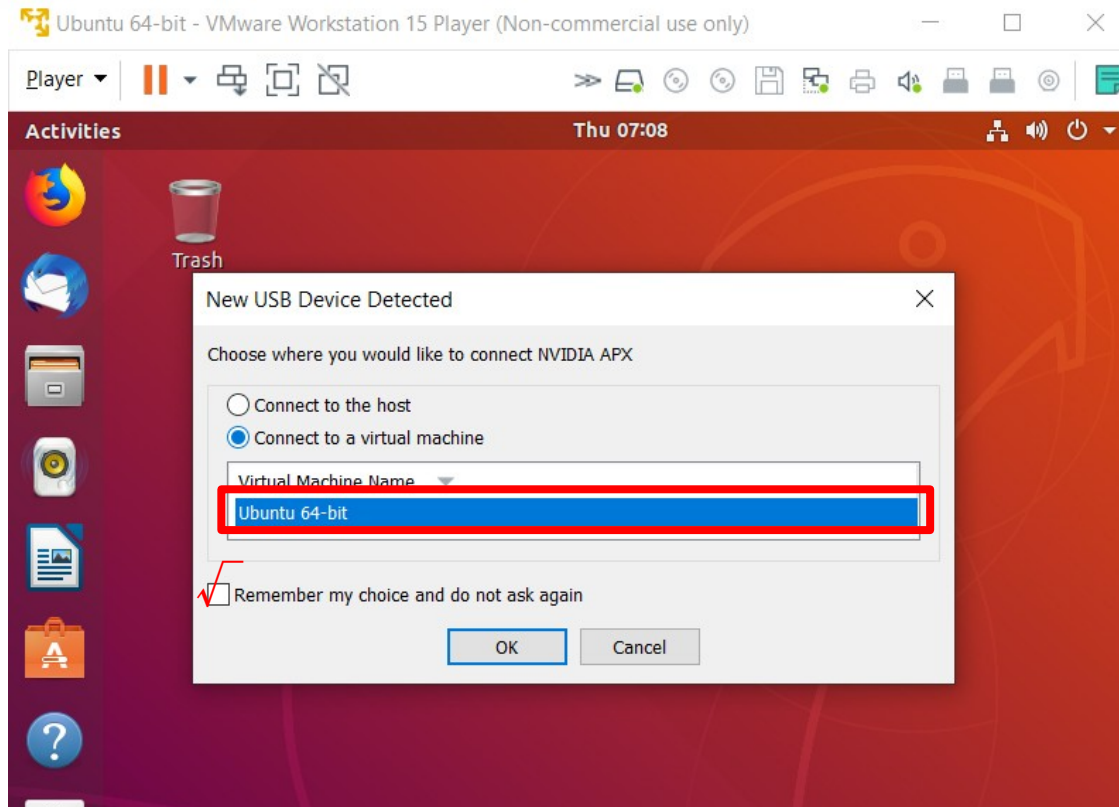


- 1) (전원 꺼져 있을 시) **파워 버튼** 클릭
- 2) **리커버리 버튼** 누르고 있기
- 3) 리커버리 누른 상태에서 **리셋 버튼** 클릭
- 4) 2초 후에 **리커버리 버튼** 그만 누르기

# 02. Jetpack 셋업

## [3] JetPack 설치

### ③ PC 와 Jetson TX2 USB 연결



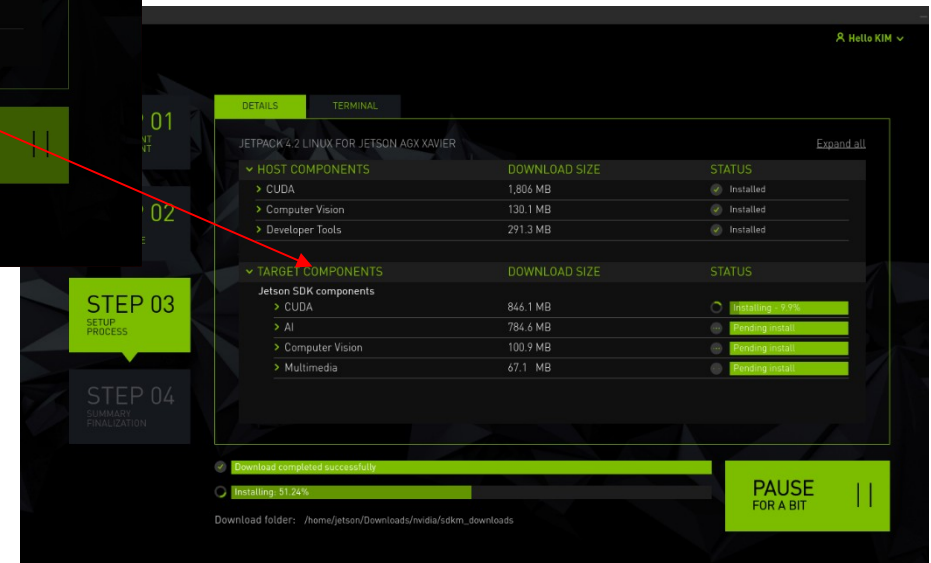
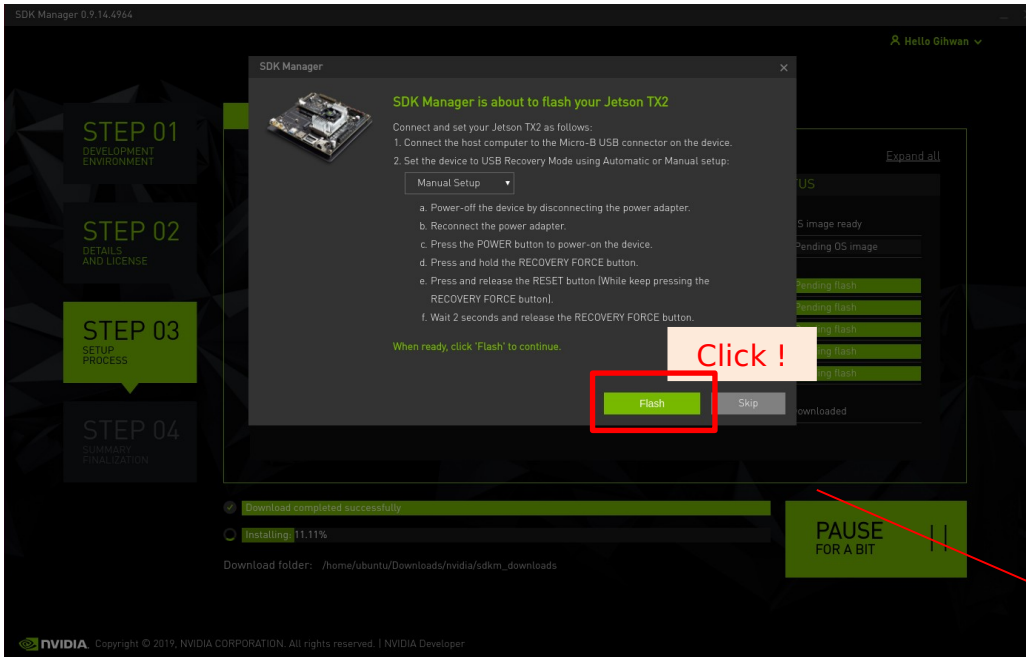
만일 USB를 연결하여도 위의 창이 나타나지 않으면 윈도우 제어판 → 프로그램 제거 → VMware Workstation 15 Player 클릭.

- 프로그램 삭제가 아닌 Repair 버튼을 클릭.
- 기존의 가상환경은 그대로 유지된다.

# 02. Jetpack 셋업

## [3] JetPack 설치

### ④ Flashing



# 02. Jetpack 셋업

## [3] JetPack 설치

### ④ Flashing

**USB 연결을 해제하지 마세요.**

**우선 Jetson TX2 우분투 셋업 먼저!**

**OS Flash를 마쳤으면 나타나는 화면.**

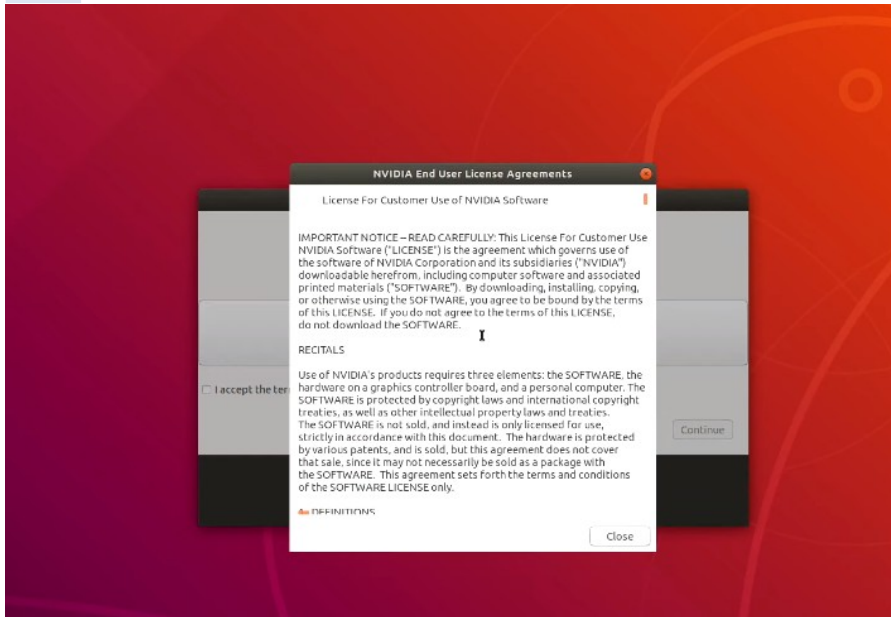
Component	Size	Status
CUDA	846.1 MB	Pending install
AI	784.6 MB	Pending install
Computer Vision	100.9 MB	Pending install

Download folder: /home/jetson/Downloads/nvidia/sdkm\_downloads

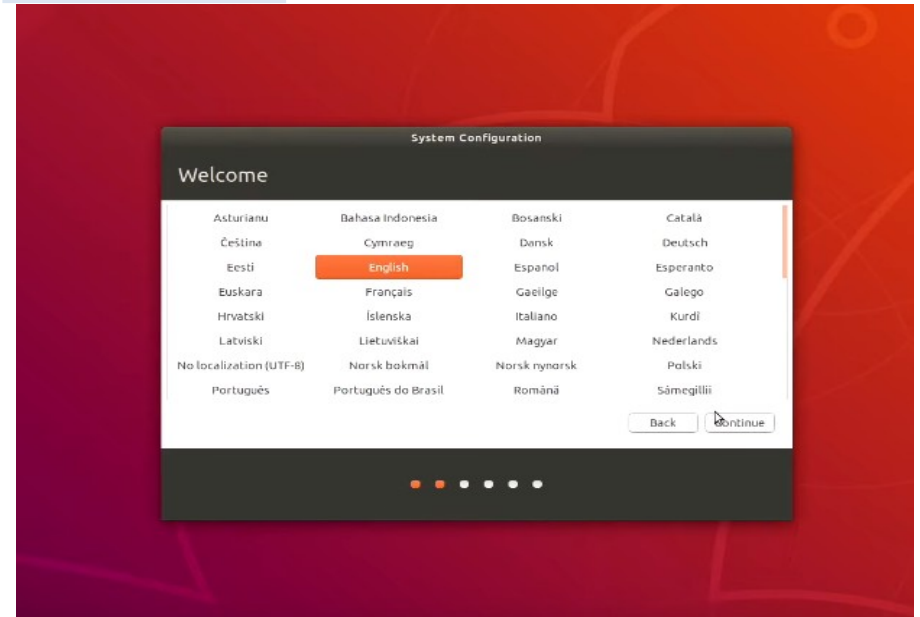
# 02. Jetpack 셋업

## [4] JetPack 설치 \_ Jetson TX2 Ubuntu set up

①



② English 선택

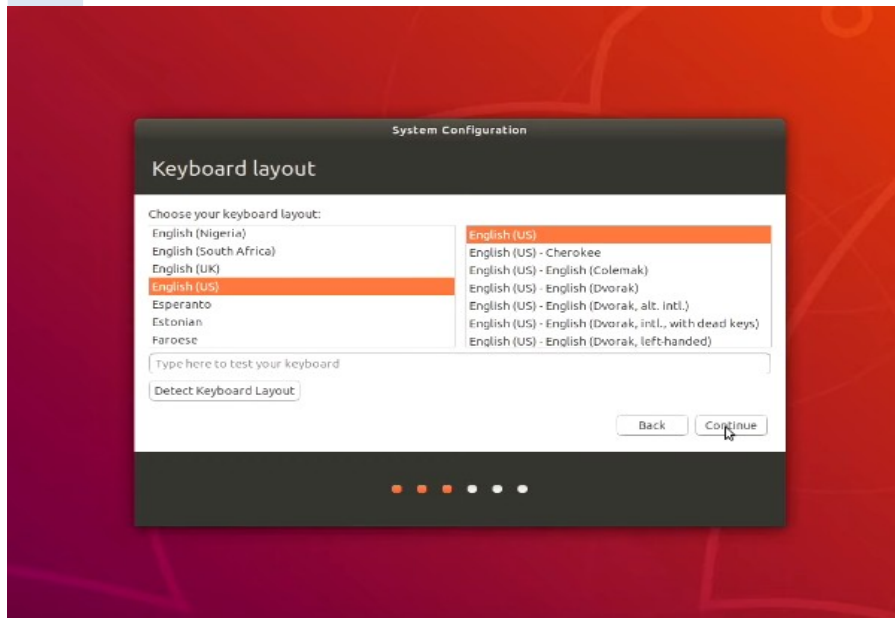




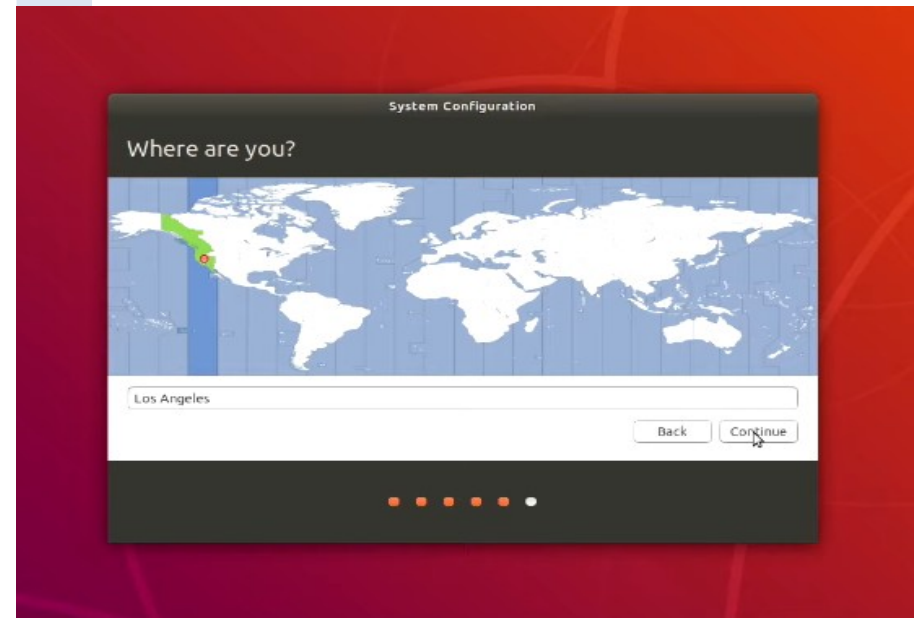
## 02. Jetpack 셋업

### [4] JetPack 설치 \_ Jetson TX2 Ubuntu set up

③



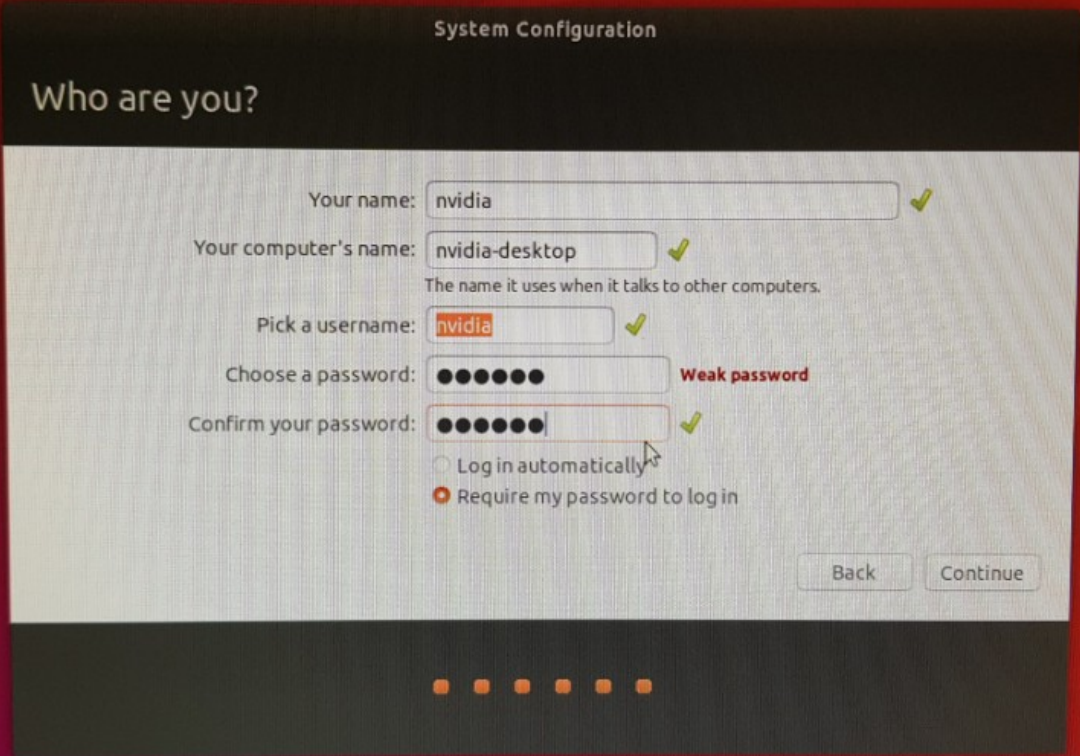
④



## 02. Jetpack 셋업

### [4] JetPack 설치 \_ Jetson TX2 Ubuntu set up

⑤ username & password : **nvidia** 로 설정한다



The screenshot shows the 'System Configuration' window titled 'Who are you?'. It contains the following fields and options:

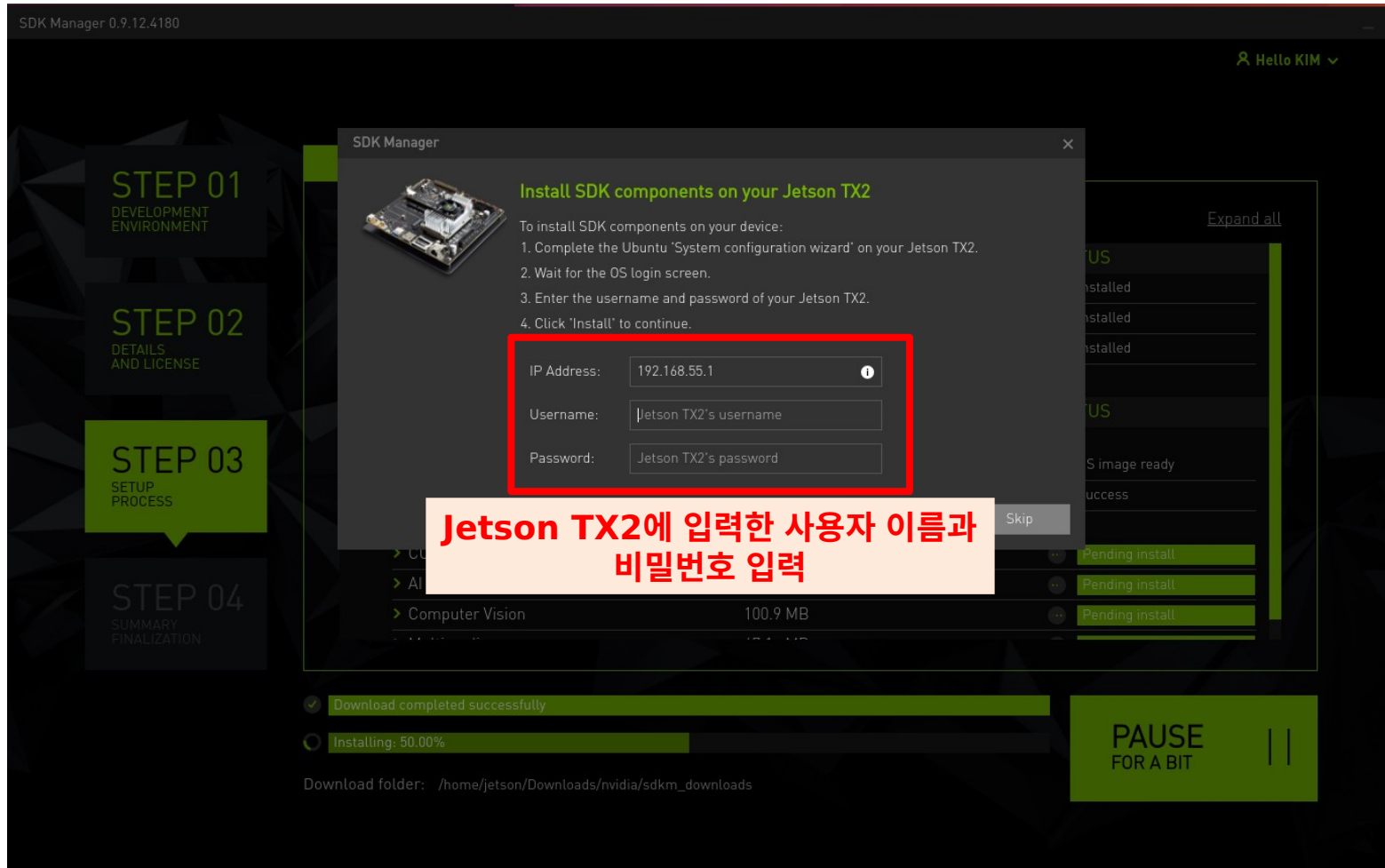
- Your name:** nvidia (with a green checkmark)
- Your computer's name:** nvidia-desktop (with a green checkmark). Below this is the text: 'The name it uses when it talks to other computers.'
- Pick a username:** nvidia (with a green checkmark)
- Choose a password:** [masked] (with a red 'Weak password' warning)
- Confirm your password:** [masked] (with a green checkmark)
- Login options:**
  - ☐ Log in automatically
  - ☒ Require my password to log in
- Buttons:** Back and Continue
- Progress indicator:** A row of six dots at the bottom, with the first four being orange and the last two being grey.



## 02. Jetpack 셋업

### [4] JetPack 설치 \_ Jetson TX2 Ubuntu set up

⑥ NVIDIA SDK Manager에 ⑤에서 입력한 user name, password(nvidia)를 입력한다.



# 02. Jetpack 셋업

## [4] JetPack 설치 \_ Jetson TX2 Ubuntu set up

⑦ Jetson TX2 셋업 완료 !

The screenshot displays the NVIDIA JetPack SDK Manager interface. On the left, a vertical sidebar lists four steps: STEP 01 (DEVELOPMENT ENVIRONMENT), STEP 02 (DETAILS AND LICENSE), STEP 03 (SETUP PROCESS), and STEP 04 (SUMMARY FINALIZATION). The main panel is titled 'JETPACK 4.2 LINUX FOR JETSON TX2' and shows a table of installed components. A large green checkmark and the text 'INSTALLATION COMPLETED SUCCESSFULLY.' are prominently displayed at the bottom. A 'FINISH AND EXIT' button is also visible.

SDK Manager 0.9.12.4180

Hello KIM

**STEP 01**  
DEVELOPMENT ENVIRONMENT

**STEP 02**  
DETAILS AND LICENSE

**STEP 03**  
SETUP PROCESS

**STEP 04**  
SUMMARY FINALIZATION

DETAILS TERMINAL

JETPACK 4.2 LINUX FOR JETSON TX2 [Expand all](#)

HOST COMPONENTS	DOWNLOAD SIZE	STATUS
> CUDA	1,806 MB	✓ Installed
> Computer Vision	130.1 MB	✓ Installed
> Developer Tools	291.3 MB	✓ Installed

TARGET COMPONENTS	DOWNLOAD SIZE	STATUS
Jetson OS		
> Jetson OS image	1,284 MB	✓ OS image ready
> Flash Jetson OS		✓ Success
Jetson SDK components		
> CUDA	846.1 MB	✓ Installed
> AI	784.6 MB	✓ Installed
> Computer Vision	100.9 MB	✓ Installed

✓ INSTALLATION COMPLETED SUCCESSFULLY. [EXPORT LOGS](#)

FINISH AND EXIT

< BACK TO STEP 01

## 02. Jetpack 셋업

### [5] Tensorflow 수동 설치

- 몇몇 기기에서 Tensorflow를 JetPack과 같이 설치 시 설치가 중단되는 문제를 확인.

#### ① 의존 시스템 패키지 설치

```
$ sudo apt update
$ sudo apt install libhdf5-serial-dev hdf5-tools libhdf5-dev zlib1g-dev zip libjpeg8-dev
$ sudo apt install python3-pip
```

#### ② 의존 파이썬 패키지 설치

```
$ sudo pip3 install -U pip testresources setuptools
$ sudo pip3 install -U numpy==1.16.1 future==0.17.1 mock==3.0.5 h5py==2.9.0
keras_preprocessing==1.0.5 keras_applications==1.0.8 gast==0.2.2 enum34 futures
```

#### ③ protobuf 설치

\*참조 <https://jkjung-avt.github.io/tf-trt-revisited/>

```
$ wget https://raw.githubusercontent.com/jkjung-avt/jetson_nano/master/install_protobuf-3.6.1.sh
$ chmod u+x ~/install_protobuf-3.6.1.sh
$ ./install_protobuf-3.6.1.sh
```

## 02. Jetpack 셋업

### [5] Tensorflow 수동 설치

#### ④ 파이썬3을 Default로 설정

```
$ gedit ~/.bashrc
```

맨 밑 라인에

```
alias python=python3
```

```
alias pip='pip3'
```

추가 후 터미널 종료

#### ⑤ 텐서플로우 설치

```
$ sudo pip3 install --pre --extra-index-url  
https://developer.download.nvidia.com/compute/redist/jp/v42 tensorflow-gpu==1.14.0+nv19.10
```

## 02. Jetpack 셋업

### [6] Tensorflow 테스트

#### ① TensorFlow/TensorRT Models on Jetson TX2 다운로드

```
$ cd ~/project
$ git clone https://github.com/jkjung-avt/tf_trt_models
$ cd tf_trt_models
$ chmod u+x ~/install.sh
$ ./install.sh
```

#### ② matplotlib 설치

```
$ sudo pip install matplotlib
```

#### ③ code 수정

```
$ cd ~/tf_trt_models
$ gedit camera_tf_trt.py
```

Line 171에서 `tf_config = tf.ConfigProto()` 구문을 수정

=> `tf_config = tf.ConfigProto(allow_soft_placement=True, log_device_placement=True)`

\*참조 <https://jkjung-avt.github.io/tf-trt-models/>

## 02. Jetpack 셋업

### [6] Tensorflow 테스트

④ image test

```
$ python3 camera_tf_trt.py --image --filename examples/detection/data/huskies.jpg --  
model ssd_mobilenet_v1_coco
```

⑤ on board camera test

```
$ python3 camera_tf_trt.py --model ssd_inception_v2_coco \  
--build
```

\*참조 <https://jkjung-avt.github.io/tf-trt-models/>