
KRISO PROJECT

PROJECT DOCUMENT GUIDE

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1. INTRODUCTION

The truck detection and statistics in ports are of considerable significance to intelligent management and control of the port. With the popular installations of the surveillance cameras, a vast database of video footage can be obtained for analysis. The truck's coming and going out of the port can be managed intelligently by detecting and recognizing the necessary information. The port terminals used to manually check and record the information such as License plate number (LP), container code (CC), and truck number (TN), one by one. However, the costs of labor are high, and there are mistakes from the checker due to repetitive work. Therefore, the automatic and intelligent detection and recognition system is needed.

In this project, we have focused on proposing a comprehensive solution for the AI-based detection and recognition of LP, CC, TN, and DC. There are many forms of trucks and containers. Intermodal containers shift among trucks, trains, and ocean transportation at terminals. The vehicle localization and tracking can detect the trucks, whereas trajectory recognition and estimation provide better guidance for trucks. In this document, we have presented the guidelines related to hardware and software used and their installation process step by step in the project in detail.

2. OBJECTIVES

The project is about the AI-based CCTV surveillance system of trucks near the port. As the Ubay Solution strives to expand and grow into a leading company to be recognized as the No. 1 video sensing solution company at home and abroad. This project is also the continuity of the company to develop technologies based on Artificial Intelligence for detecting and recognizing the required information. The following are the main objectives of the KRISO project:

- To detect and recognize License plate number
- To detect and recognize Container code
- To detect and recognize truck number

3. SYSTEM SPECIFICATIONS

3.1. Hardware

3.1.1. NVIDIA Jetson Nano Developer Kit

- GPU: 128-core Maxwell
- CPU: Quad-code ARM A57 @ 1.43 GHz
- Memory: 4 GB 64-bit LPDDR4 25.6 GB/s
- Mechanical: 69 mm x 45 mm, 260-pin edge connector

Note: Memory card: SanDisk Extreme Pro 32GB

Micro-USB Power Supply: CWT KPC-020B

3.1.2. CCTV Camera: IDIS DC-E1342WRX

- Image sensor: 1/2.8" CMOS
- Maximum resolution: 1920x1280
- Focal length: $f = 2.8\text{mm}/4.0\text{mm}/6.0\text{mm}$
- Aperture: F 2.0 (2.8mm)/2.15(4.0mm)/1.6(6.0mm)
- Shutter speed: Auto/Manual (1/30 - 1/10,000), anti-flicker, slow shutter (1-1/5, 1/7.5, 1/15)
- Video compression: H.265, H.264 (MP) M-JPEG
- Frame rate: 30fps (1920 x 1080)

3.2. Software

3.2.1. NVIDIA JetPack SDK 4.4

NVIDIA JetPack SDK 4.4 is a comprehensive environment for building AI applications on Jetson Nano which includes developer toolkits, libraries and APIs as below:

- OS: Ubuntu 18.04
- GPU Driver: 440+
- CUDA: 10.2
- TensorRT: 7.1.0
- cuDNN: 8.0.0
- VPI: 0.0
- Python: 3.6.9
- OpenCV: 4.1.1
- NVIDIA Container Runtime

-
- Jetson Linux API

3.2.2. NVIDIA DeepStream SDK 5.0

DeepStream is a streaming analytic toolkit to build AI-powered applications. It takes the streaming data as input - from USB/CSI camera, video from file or streams over RTSP, and uses AI and computer vision to generate insights from pixels for better understanding of the environment. DeepStream supports application development in C/C++ and in Python through the Python bindings. DeepStream provides building blocks in the form of GStreamer plugins that can be used to construct an efficient video analytic pipeline. These are the requirements before installing the DeepStream SDK.

- Gst Dependencies
- librdkafka
- NVIDIA V4L2 GStreamer
- Gst Python 1.14.5

After installing the above listed requirements, then DeepStream 5.0 is already installed on Jetson Nano.

3.2.3. IDIS CCTV Camera

IDIS is a global security company that designs, develops, and manufactures surveillance solutions for a wide range of commercial and public sector markets. IDIS is a world leading digital surveillance solutions provider with more than two million recorders installed worldwide and over 16.5 million cameras utilizing IDIS technology. There are two software available for users to set up their cameras which are available on the website of IDIS, which are:

1. IDIS Center
2. IDIS Discovery

In this document we will briefly introduce both and will provide a software installation method in the installation guideline section.

IDIS Center: is software for monitoring live videos and playing recorded videos acquired from compatible devices. It provides the following features.

- Remote surveillance of live videos and remote playback of video recordings
- Real-time notification of detected events and remote monitoring of event videos
- Panic recording of live videos and playback of panic recordings
- Registration of up to 1,024 devices
- Remote software upgrade and remote system configuration
- Displays device's system logs

-
- Monitoring live video map
 - H.264, MPEG-4, M-JPEG restoration algorithm support
 - SSL support for security
 - Authority settings by user groups for security
 - Intuitive and user-oriented GUI
 - Operation in a low bandwidth environment

IDIS Discovery: is a software which is used for remote operations on the products. IDIS Discovery is used to connect to the product remotely using a network connection to modify and manage the device's settings. It provides the following key features:

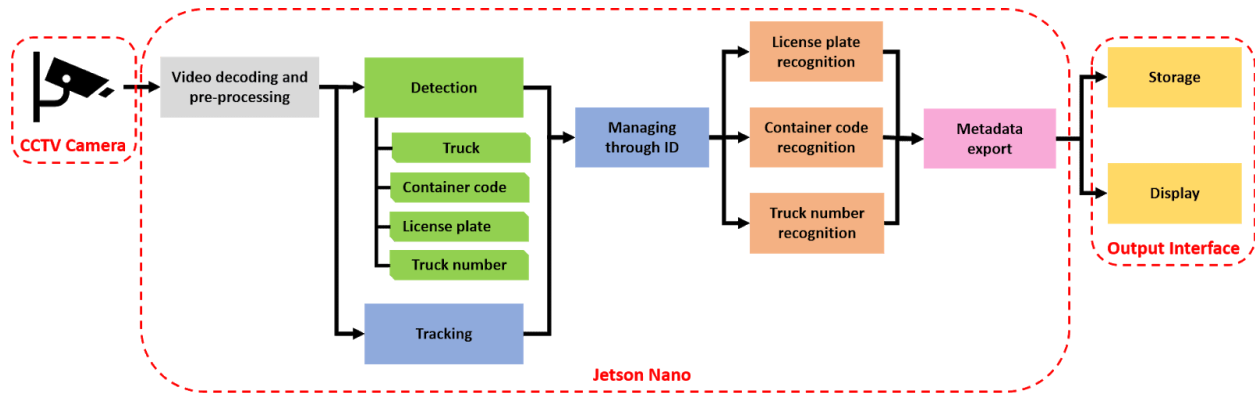
- Reliability
- Performance
- Usability
- Scalability

4. PROTOCOLS

- Network
 - Dynamic Host Configuration Protocol (DHCP) IPv4
 - RTP multicast for video and Audio
- Streaming
 - RTSP
 - H.264
 - HTTP

5. ARCHITECTURE

The overview of the architecture is shown in the fig.1 below, the system starting from input video to outputting insights. The architecture consists of multiple blocks corresponding to different operations. Each block is operated by one of three main hardware components (CCTV Camera, Jetson Nano, and Interface).



The system pipeline is presented as below:

- Streaming data comes directly from the CCTV camera. The streams are then decoded and pre-processed by the Jetson Nano.
- Once input data is processed, the truck detection model is run to determine if there is a truck appearing in the region of interest. If a truck is confirmed, then the detection model will localize the position of the license plate, container code, and truck number for further processing.
- The detected objects (license plate, container code, and truck number) are tracked with unique IDs.
- The recognition plugin is used to read the characters on the detected license plate, container code, and truck number. All the recognition results are exported as metadata to the output interface.
- The results are presented by output interface in various options: rendering on the screen, saving to the local storage, streaming out over RTSP, or sending to the cloud.

5.1. Use Case Diagram

5.2. Technical Details

6. INSTALLATION

6.1. Install IDIS Center

6.1.1. System requirements

The system requirements for installation of IDIS center are given below;

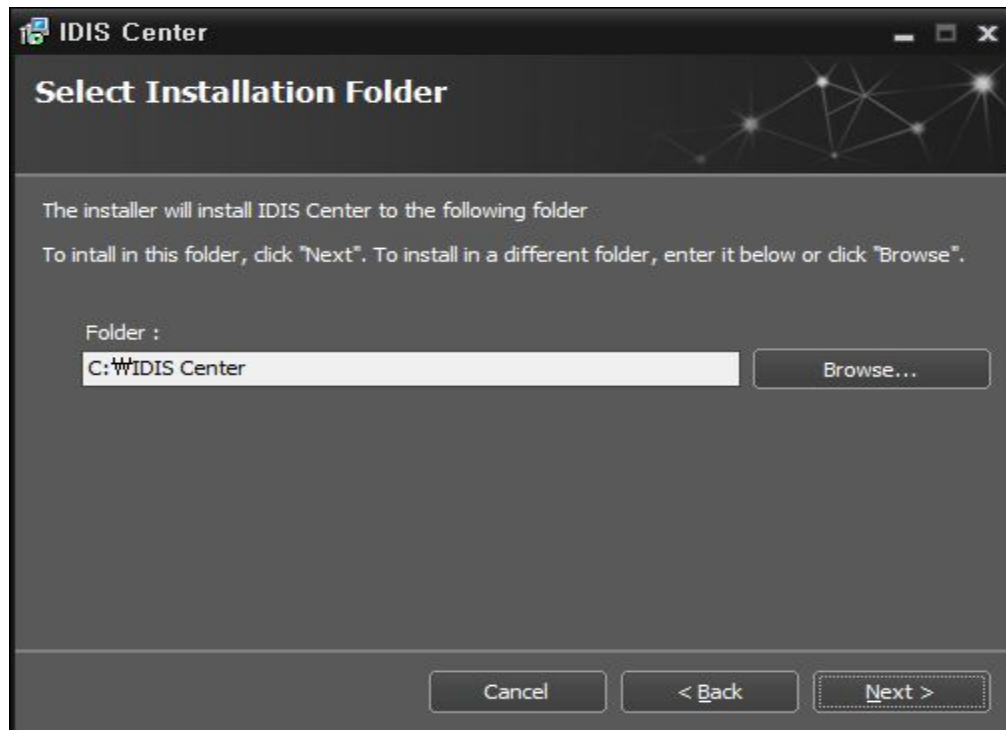
	Recommended	Minimum
OS	Microsoft® Windows® 7 x86 (64bit) (Home, Pro) * Server OS is not recommended.	Microsoft® Windows® 7 x86 (64 Bit) (Home Premium, Professional, Ultimate) * Windows XP, Windows Vista, Windows 8 are not supported.
CPU	Intel Core™ i5-3570 3.30GHz or better	Intel Core™ 2 Duo E7200 2.53GHz
RAM	4GB or more	1.5GB
VGA	AMD Radeon™ HD 7700 or NVIDIA GTX650 or better (1280x1024, 32bpp), multiple monitors	AMD Radeon™ HD 2400 or NVIDIA GeForce FX5500 (1024x768, 24bpp) or Intel® HD Graphic 530 or higher
HDD	6GB or more of available space	1GB
LAN	Gigabit Ethernet or better	10/100 Mbps Ethernet

6.1.2. Installation steps

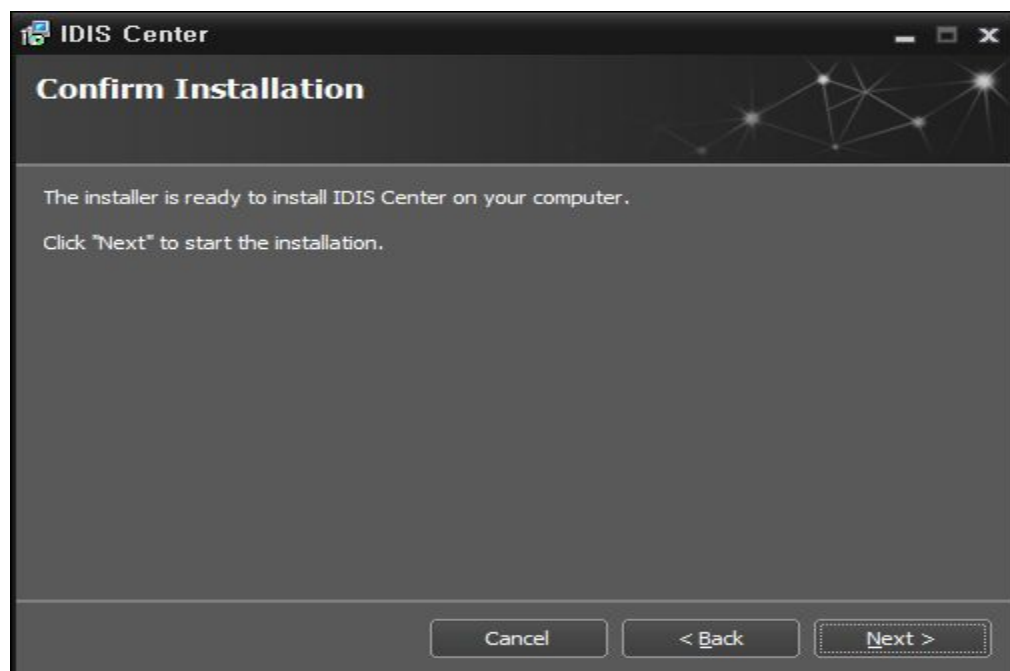
1. You can download the software for installation from the [link](#) or can install from the installation CD.
2. Browse to the **Setup** folder and run **setup.exe**
3. Select a desired language.



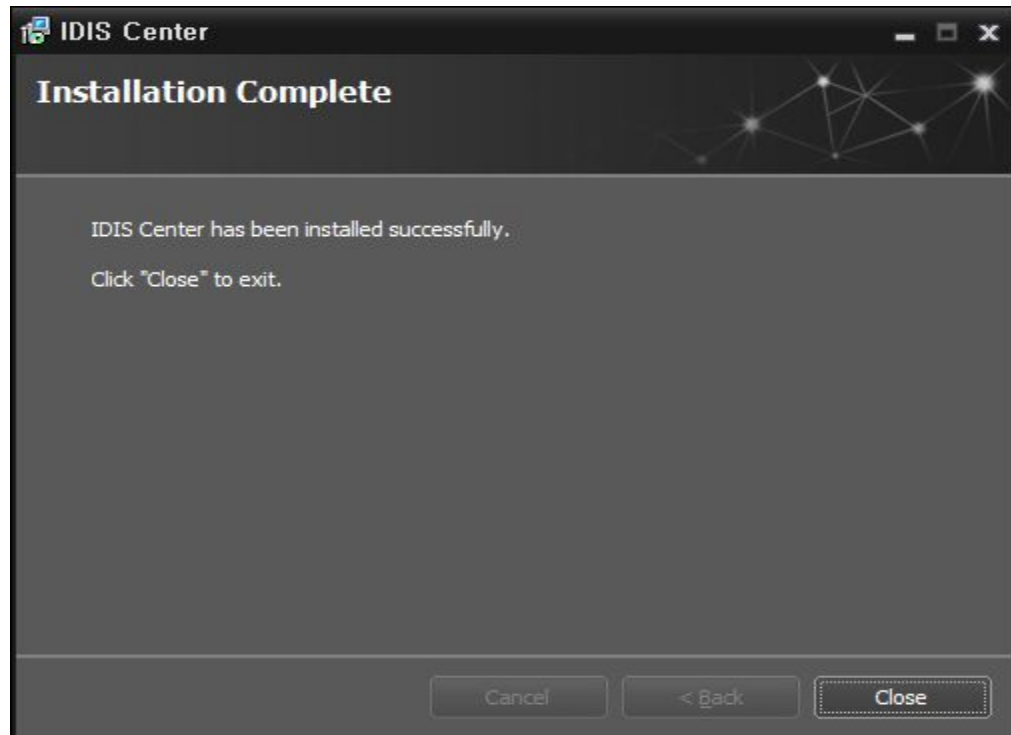
4. When the installation window appears, click **Next**.
5. Select an installation path for the program, and click **Next**.



6. When the install confirmation window appears, click **Next**.



-
7. When the installation Complete window appears, click **Close** and finish the installation.



6.1.2.1. Start Program

When **IDIS Center** software is installed, **IDIS Center** and **IDIS Center Run as administrator** shortcut icons will be created on the desktop. **Run IDIS Center** program by double-clicking on **IDIS Center** or **IDIS Center Run as administrator** shortcut icon. If a removable eSATA HDD or SD (SDHC) memory card is connected to the **IDIS Center system**, you must double-click on **IDIS Center Run as administrator**. Double-click the **IDIS Center** for **iHDP** shortcut icon to use iHDP exclusively in an easier way.

6.1.2.2. Run as Administrator

You will need to launch the program by double-clicking on the **Run as administrator** icon. Once the program launches, enter the administrator information.



- **User ID:** Choose an administrator account or enter it manually
- **Password:** Enter the account password.
- **No password:** Check if there is no password for the account.
- **Save Account Information:** Saves the current account info for automatic login

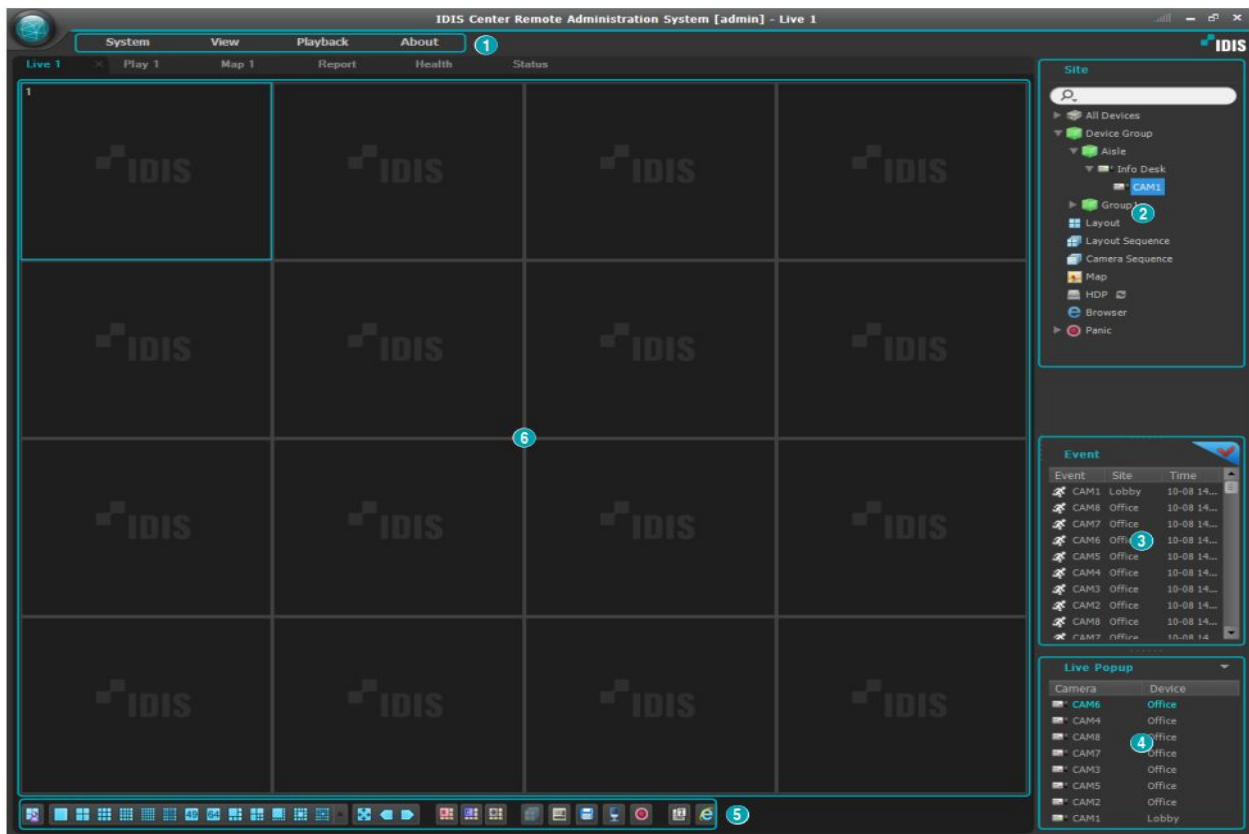
6.1.2.3. Device Registration


To use the functions provided by IDIS Center, you must first register a device and add the device to a device group.

- Select **System > IDIS Center Setup > Device** in the menu at the top of the screen.
- On the **Site** panel, click on **All Devices**, then click on the **+** button at the bottom of the Site List panel on the right.
 - A **Device Scan** window will appear on the screen.
 - **Scan Mode:** After selecting a scan mode, click on **Start Scan** button and the scan results will be displayed on the list.
 - **Auto Scan (LAN):** Shows the list of devices within the LAN.
 - **IP Address:** Enter the device's **IP address**. When registering multiple devices, you can enter a range of IP addresses to scan for multiple devices at once.

- **FEN:** If the device uses FEN, enter the device name that is registered on the FEN server.
- **Domain Name:** If the device uses **Domain Name Service (DNS)**, enter the device's domain name registered on the DNS server.
- Click **Add Devices** at the bottom of the **Device Scan** window.
 - A user authentication window will appear.
 - **Name/Address/Device Type** will show the name, IP address and type of the selected device.
 - **ID/Password** enters the User ID and Password set up on each device for remote access.
 - **Apply to All Devices:** If multiple devices sharing the same User ID and Password.
- Click **Device Group** on the **Site** panel and click **+** at the bottom. **Add Device Group** window will appear.
 - **Name:** Enter a name for the device group.
 - **Location:** Select a location for the device group.

6.1.2.4. System Menu



1	Menu	This is the menu bar. Refer to below for more details.
2	Site List	Used to connect to a registered site using drag & drop.
3	Live Event List	Shows instant events and callback events of registered devices. Click  button and then Emergency Event Panel will be displayed.
4	Live Popup List	Shows the list of current popup screens on IDIS Center.
5	Panel Toolbar/ Timetable	Shows the toolbar or time table depending on the panel.
6	Panel	Shows videos or list of the selected tab.

These are the highlighted main display screen menu. For further in detail instructions, you can download the manual [here](#).

6.2 Install IDIS Discovery

6.2.1. System Requirements

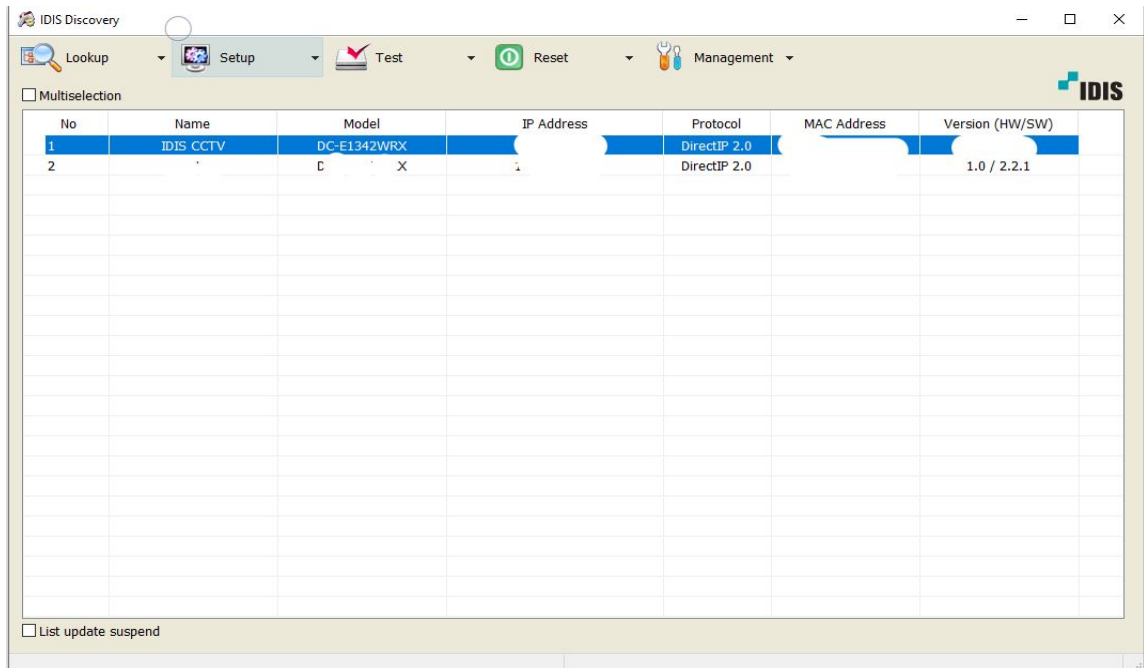
The system requirements for installation of IDIS Discovery are given below;

- **OS:** Microsoft Windows XP x86 (32 Bit) (Service Pack 3), Microsoft Windows Vista x86 (32 Bit) (Service Pack 1), Microsoft Windows 7 x86 (32 Bit).
- **CPU:** Intel Pentium IV (Celeron) 2.4GHz or better
- **RAM:** 512MB or higher
- **VGA:** AGP, Video RAM 8MB or higher (1024*768,24bpp or higher)


6.2.2. Installation Steps

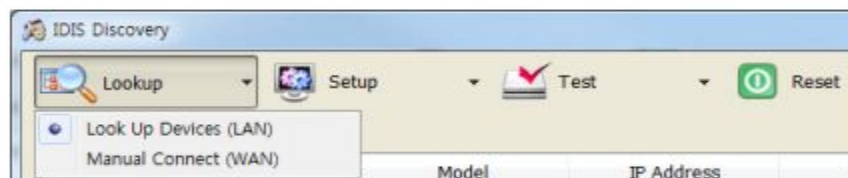
6.2.2.1. Run the Application

1. Download the IDIS Discovery program from the website [here](#).
2. Run IDIS Discovery program by double-clicking on the file.
3. Select the desired language option in the Language Options window.
4. In the main window that follows, you can connect to a product and change the product's settings.
 - Do not manually change the IP address of the PC while the IDIS Discovery program is running.



6.2.2.2. Lookup

You can find the product you wish to connect to. In the main screen, click the  **Lookup** icon. A find menu will appear on the screen.



You can use this menu to change IDIS Discovery program's language options or check the program version.

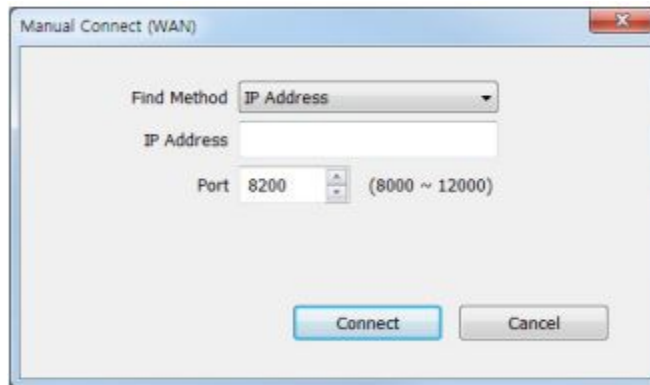
Look Up Devices (LAN)

A product can be found on the list below if it is connected via LAN. Select the product you wish to connect to.

Manual Connect (WAN)

If the product is connected via WAN, you can find the product by entering its address.

1. In the Find menu, select Manual Connect (WAN). A settings window will appear.

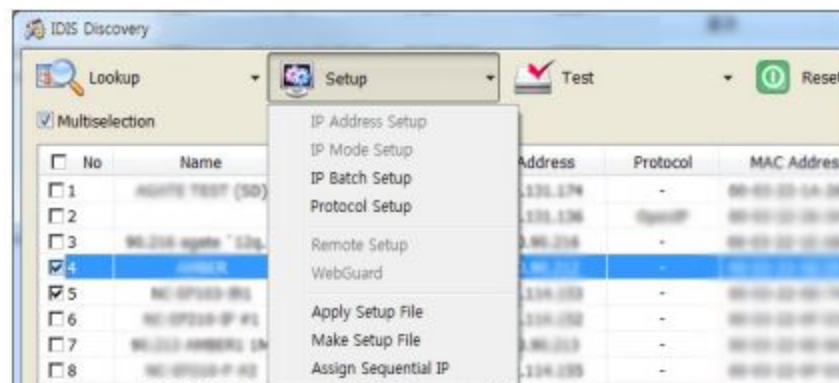


2. Select the search method and click **Connect**. The product details will appear on the main screen.
 - **IP Address:** Enter the IP address and port number of the product you wish to find.
 - **Domain Name:** If the product uses Domain Name Service (DNS), enter the product's domain name registered on the DNS server and port number.
 - **Use FEN:** If the product uses FEN (For Easy Network service), enter the name of the product registered on the FEN server, and enter the server's address and port number.

6.2.2.3. Setup

Changes device's settings.

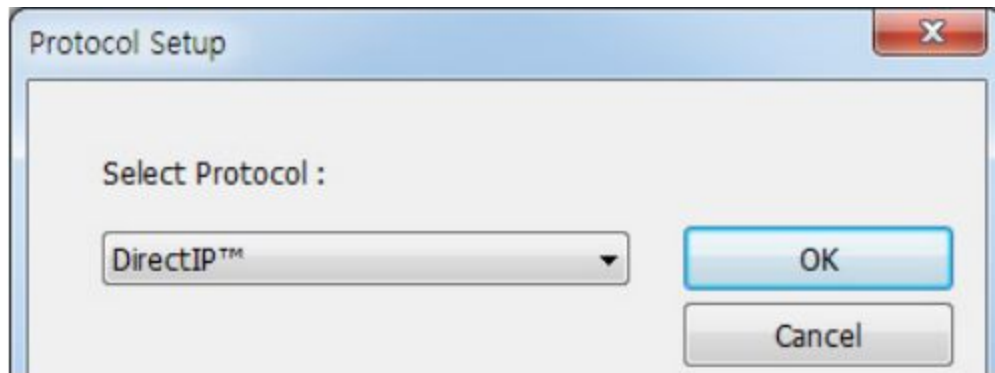
1. In the main screen, select the product you wish to change the settings of.
2. Click on the **Setup** icon. **Setup** menu will appear on the screen.



Protocol Setup

The protocol for products with DirectIP™ support can be changed.

1. Select the product in the main screen.
2. In the Settings menu, select **Protocol Setup**

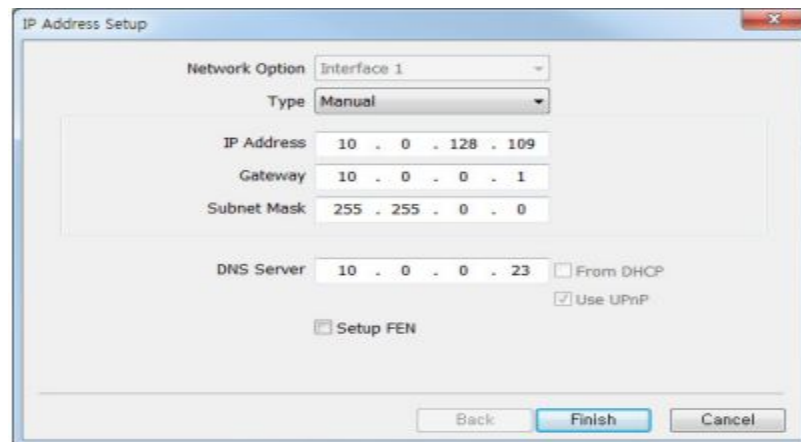


- **DirectIP™**: Used with DirectIP™ NVR to use the connect to the camera without additional network settings by the user. If DirectIP™ protocol is activated, IP Address setting operation will be disabled automatically.
- **IDIS**: Used to connect to a camera from a software previously installed on the PC or existing NVR using a network connection. Establishing the connection requires additional camera configuration.

IP Address Setup

Changes the product's IP address.

1. Select the product in the main screen.
2. In the setting menu, select **IP Address Setup**.



-
- **Network Option:** If there is more than one network adapter installed on the PC, select the network adaptor to be used to connect to the product.
 - **Type:** Select a network connection type from **Manual configuration**, **DHCP**, or **ADSL** and select the settings values for establishing a network connection.

After setting up the protocol and IP address, you can select Remote Setup for remotely accessing the product and IDIS Web is also available that allows users to monitor live videos transmitted from the product on the internet without installing any additional programs. It can be accessed anytime, anywhere using a common web browser. For more details, refer to the product's operation manual.

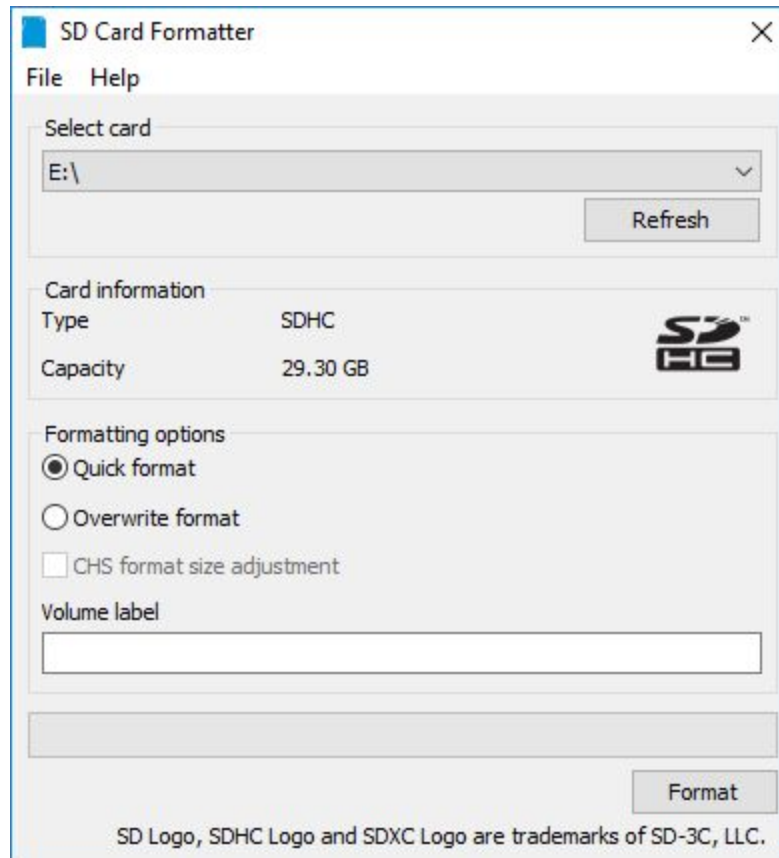
6.3. Install JetPack SDK

6.3.1. Write JetPack SDK to the microSD Card

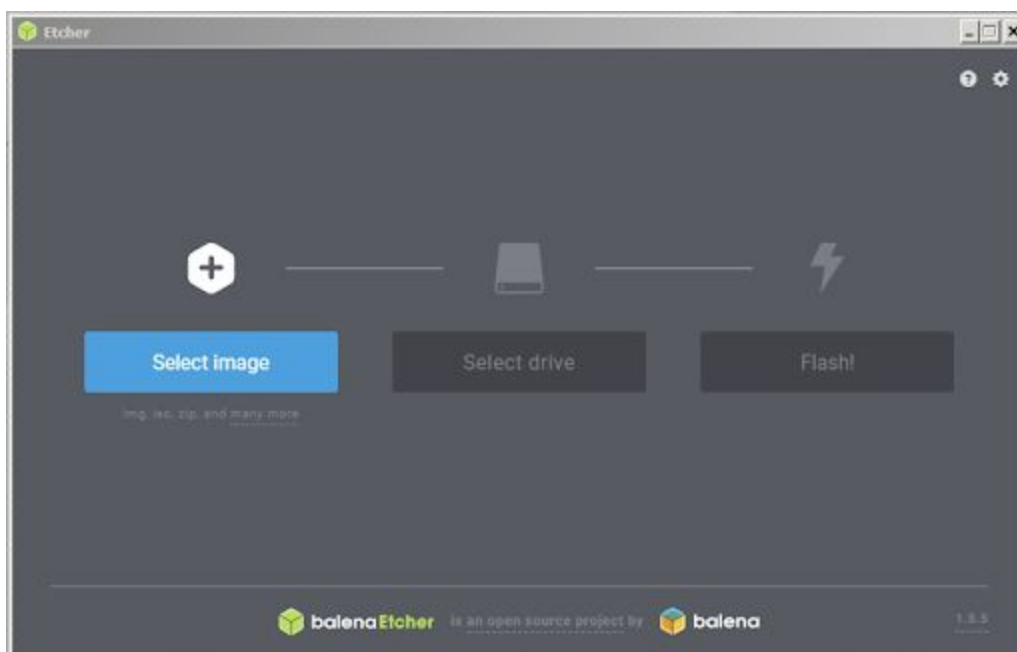
1. Download JetPack SDK from this [link](#).
2. Write the SDK to the microSD card by following the instructions below according to the computer's operating system:

6.3.1.1. Instructions for Windows

1. Format the microSD card using SD Memory Card Formatter:
 - 1.1. Download, install, and launch [SD Memory Card Formatter](#).
 - 1.2. Select card drive.
 - 1.3. Select "Quick format".
 - 1.4. Leave "Volume label" blank.
 - 1.5. Click "Format" to start formatting, and "Yes" on the warning dialog.



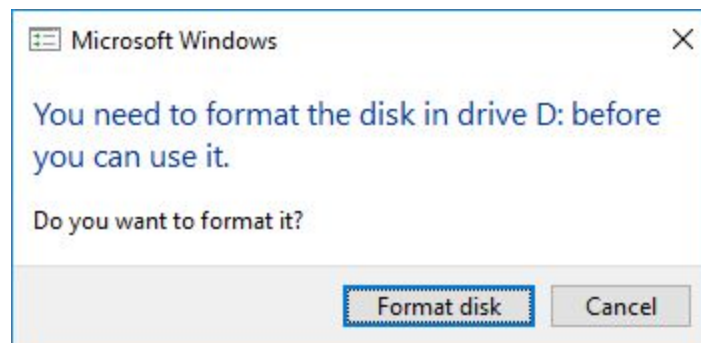
2. Use Etcher to write the JetPack SDK to the formatted microSD card:
 - 2.1. Download, install, and launch [Etcher](#) (choose "Download for Windows(x86|x64)").



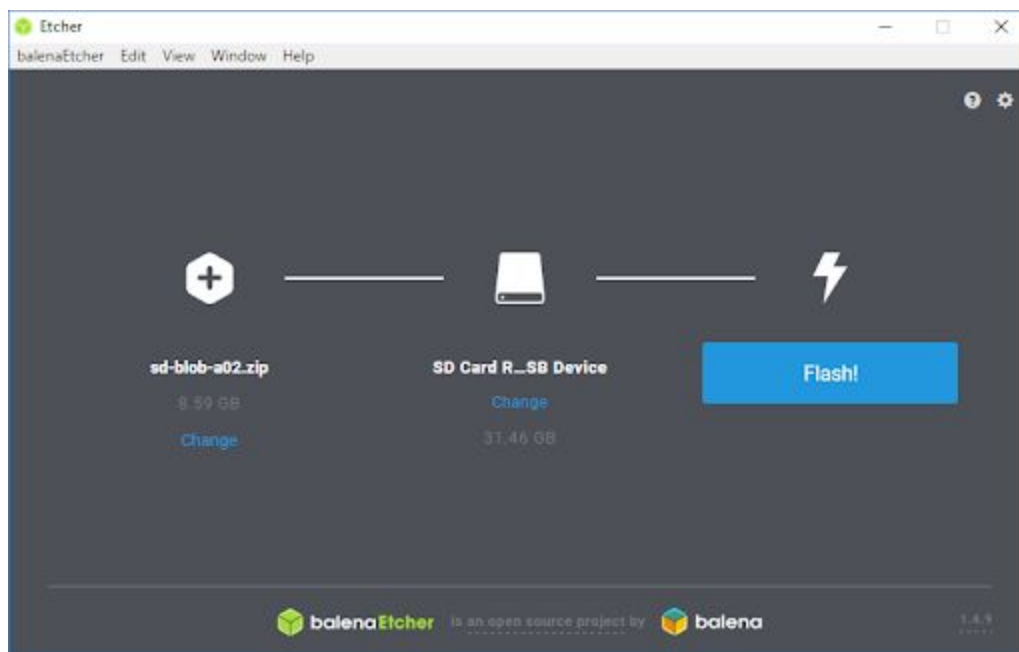
- 2.2. Click "Select image" and choose the JetPack SDK file downloaded earlier.

- 2.3. Insert the microSD cards if not already inserted.

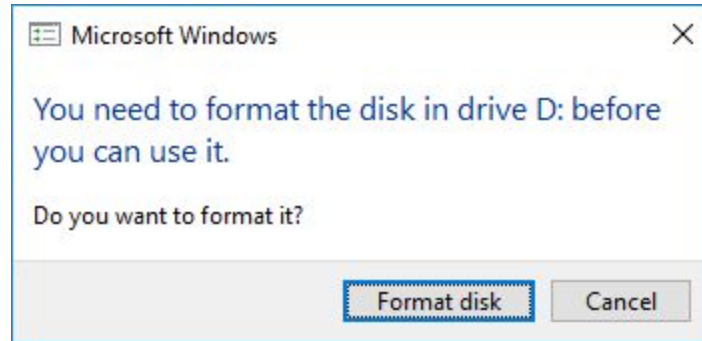
Note: Click Cancel if Windows prompts a dialog like this:



- 2.4. Click "Select drive" and choose the correct device.



- 2.5. Click "Flash!" It will take Etcher about 10 minutes to write and validate the image if the microSD card is connected via USB3.
- 2.6. After Etcher finishes, Windows may notify it doesn't know how to read the SD Card. Just click Cancel and remove the microSD card.

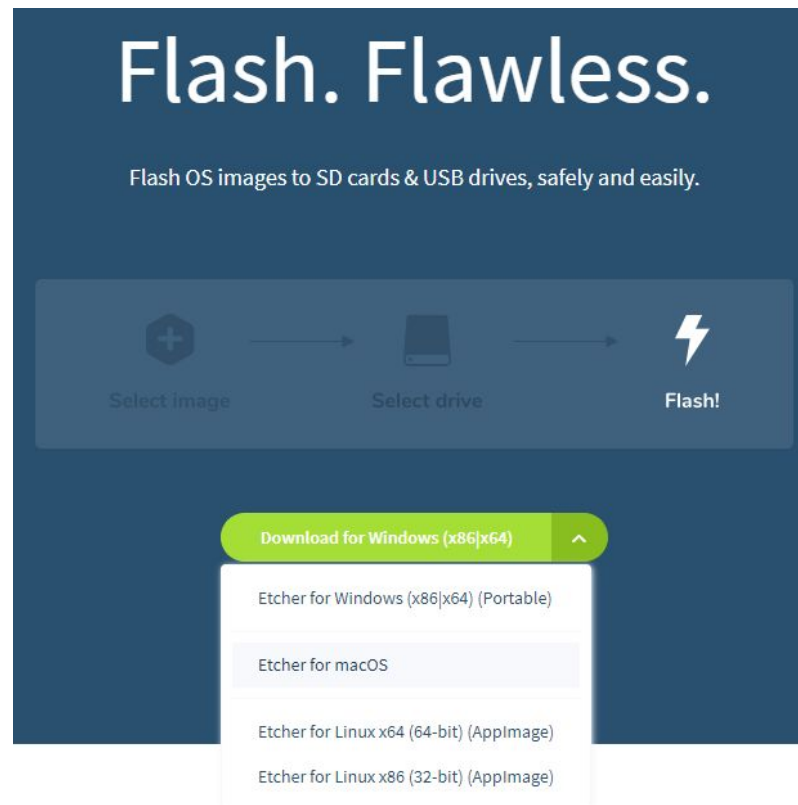


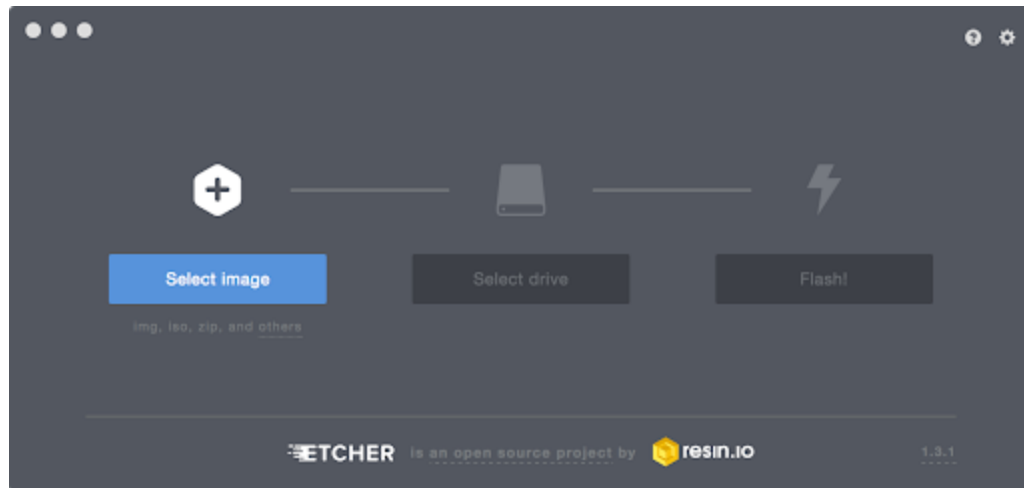
6.3.1.2. Instructions for MacOS

There are two options to write JetPack SDK to the microSD card: using a graphical program like Etcher, or using command line:

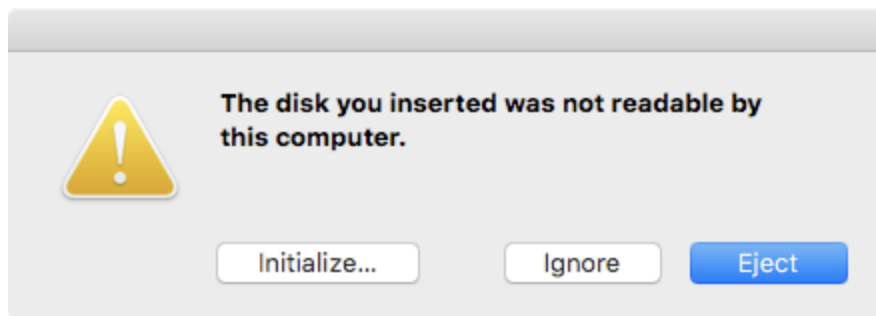
Etcher Instructions

1. Download, install, and launch [Etcher](#) (choose "Etcher for macOS").





2. Click “Select image” and choose the JetPack SDK file downloaded earlier.
3. Insert the microSD card. Click Ignore if the Mac shows this window:

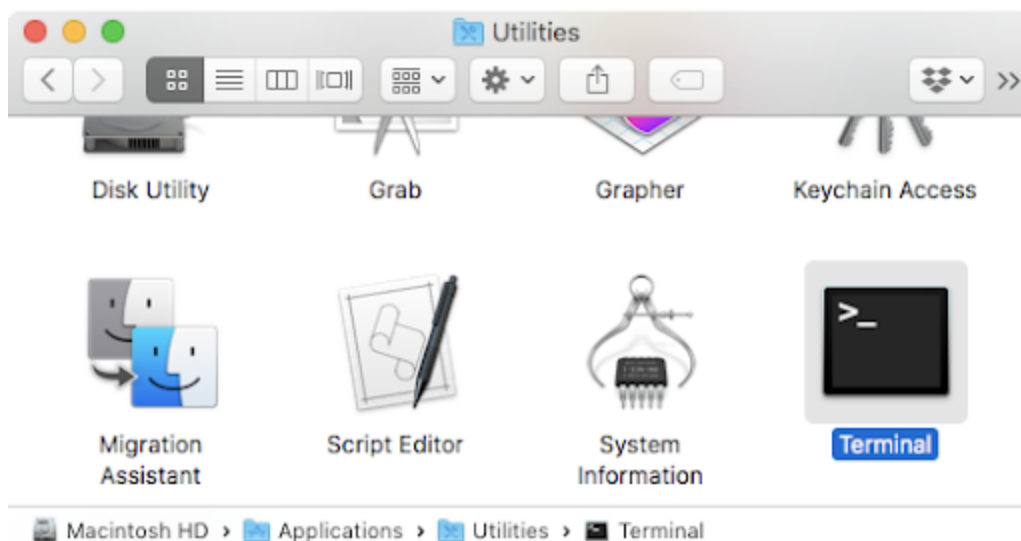


4. If there are no other external drives attached on the Mac, Etcher will automatically select the microSD card as target device. Otherwise, click “Select drive” and choose the correct device.
5. Click “Flash”. The Mac may prompt for username and password before allowing Etcher to proceed. It will take Etcher about 10 minutes to write and validate the SDK if the microSD card is connected via USB3.



Command Line Instructions

1. Open the Terminal app:



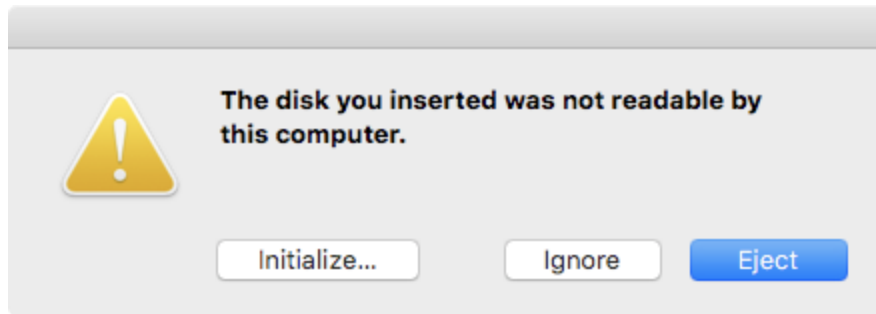
2. Use this command to list any external disk devices already attached to the Mac:

```
diskutil list external | fgrep '/dev/disk'
```

3. For example, if there is an USB drive already attached to the Mac, the result will look similar to this:



4. Insert the microSD card. Click “Ignore” if the Mac shows this window:



5. Use the same command as before to list external disk devices. The newly listed disk device is the microSD card (/dev/disk2 in this example):

```
Terminal
[$ diskutil list external | fgrep '/dev/disk' ]
/dev/disk3 (external, physical):
[$ diskutil list external | fgrep '/dev/disk' ]
/dev/disk2 (external, physical):
/dev/disk3 (external, physical):
$
```

6. Use this command to remove any existing partitions from the microSD card, ensuring MacOS will allow the SDK to be written to it. **BE VERY CAREFUL to specify the correct disk device.**

```
sudo diskutil partitionDisk /dev/disk<n> 1 GPT "Free Space" "%noformat%" 100%
```

For example:

```
Terminal
[$ sudo diskutil partitionDisk /dev/disk2 1 GPT "Free Space" "%noformat%" 100% ]
[Password: ]
Started partitioning on disk2
Unmounting disk
Creating the partition map
Waiting for partitions to activate
Finished partitioning on disk2
/dev/disk2 (external, physical):
#  TYPE NAME      SIZE  IDENTIFIER
0  GUID_partition_scheme  *32.0 GB  disk2
1  EFI EFI         209.7 MB  disk2s1
$
```

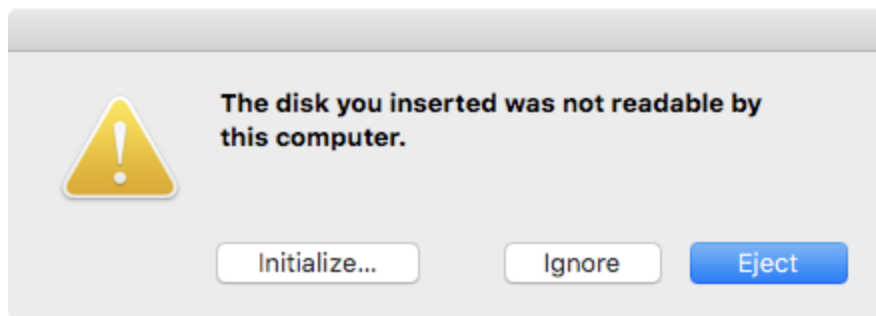
7. Use this command to write the zipped SDK to the microSD card. Note the use of /dev/rdisk instead of /dev/disk:

```
/usr/bin/unzip -p ~/Downloads/jetson_nano_devkit_sd_card.zip | sudo /bin/dd
of=/dev/rdisk<n> bs=1m
```

For example:

```
Terminal
$ /usr/bin/unzip -p ~/Downloads/jetson_nano_devkit_sd_card.zip |
|> sudo /bin/dd of=/dev/rdisk2 bs=1m
0+131072 records in
0+131072 records out
8589934592 bytes transferred in 302.955694 secs (28353765 bytes/sec)
$ █
```

8. There will be no indication of progress (unless you signal with CTRL-t). When the dd command finishes, the Mac will notify it cannot read the microSD card. Just click Eject:



6.3.1.3. Instructions for Linux

There are two options to write JetPack SDK to the microSD card: using a graphical program like Etcher, or using command line:

Etcher Instructions

1. Download, install, and launch [Etcher](#) (choose the compatible Linux version).

Flash. Flawless.

Flash OS images to SD cards & USB drives, safely and easily.



Select image



Select drive



Flash!

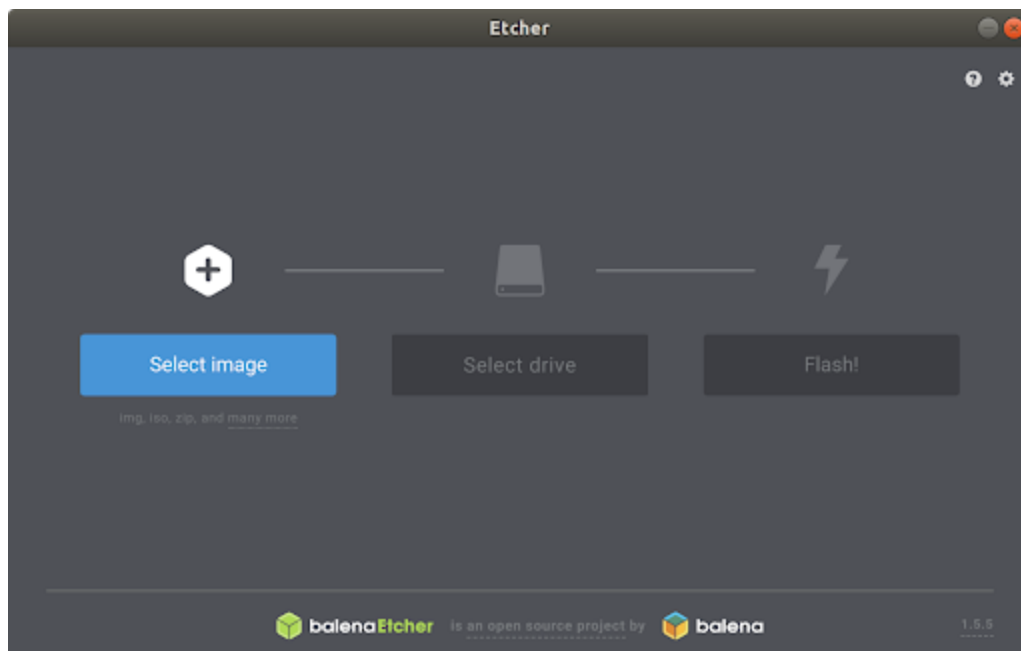
Download for Windows (x86|x64) ^

Etcher for Windows (x86|x64) (Portable)

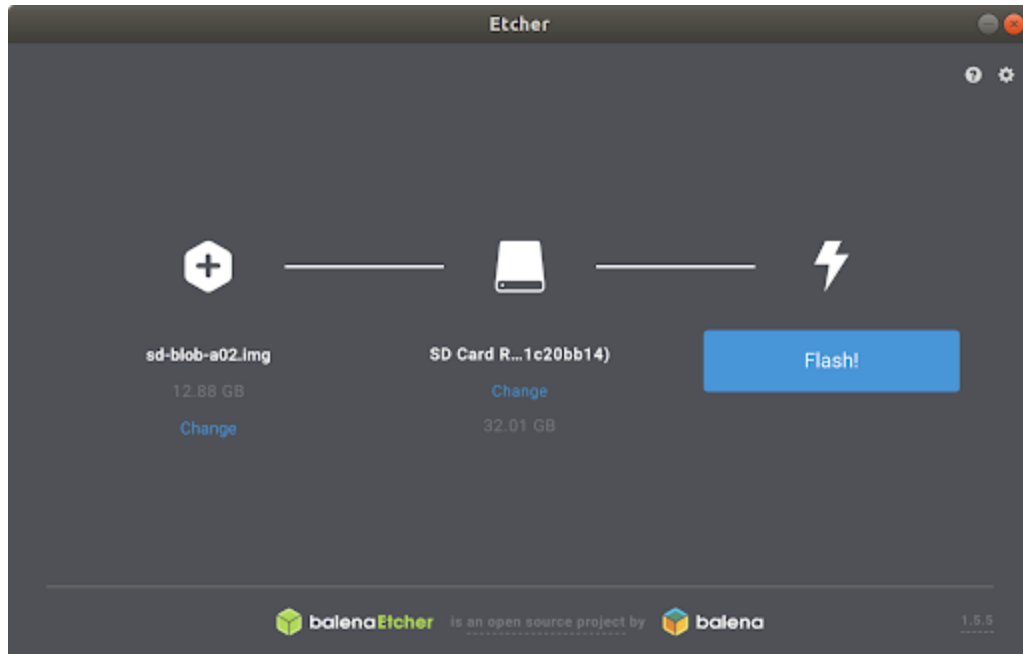
Etcher for macOS

Etcher for Linux x64 (64-bit) (AppImage)

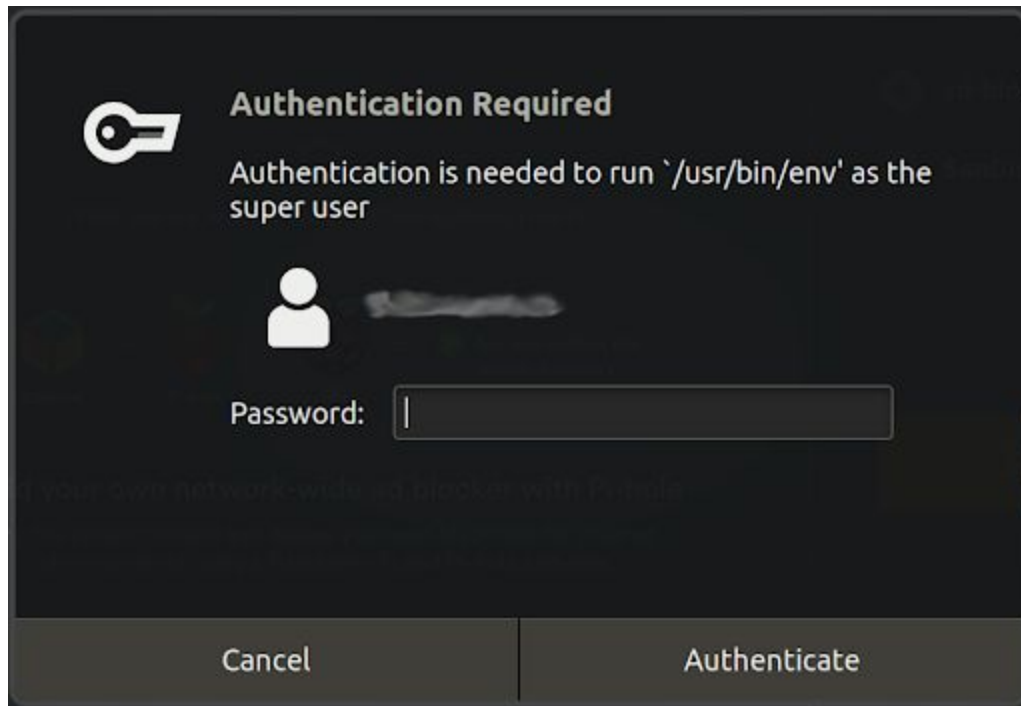
Etcher for Linux x86 (32-bit) (AppImage)



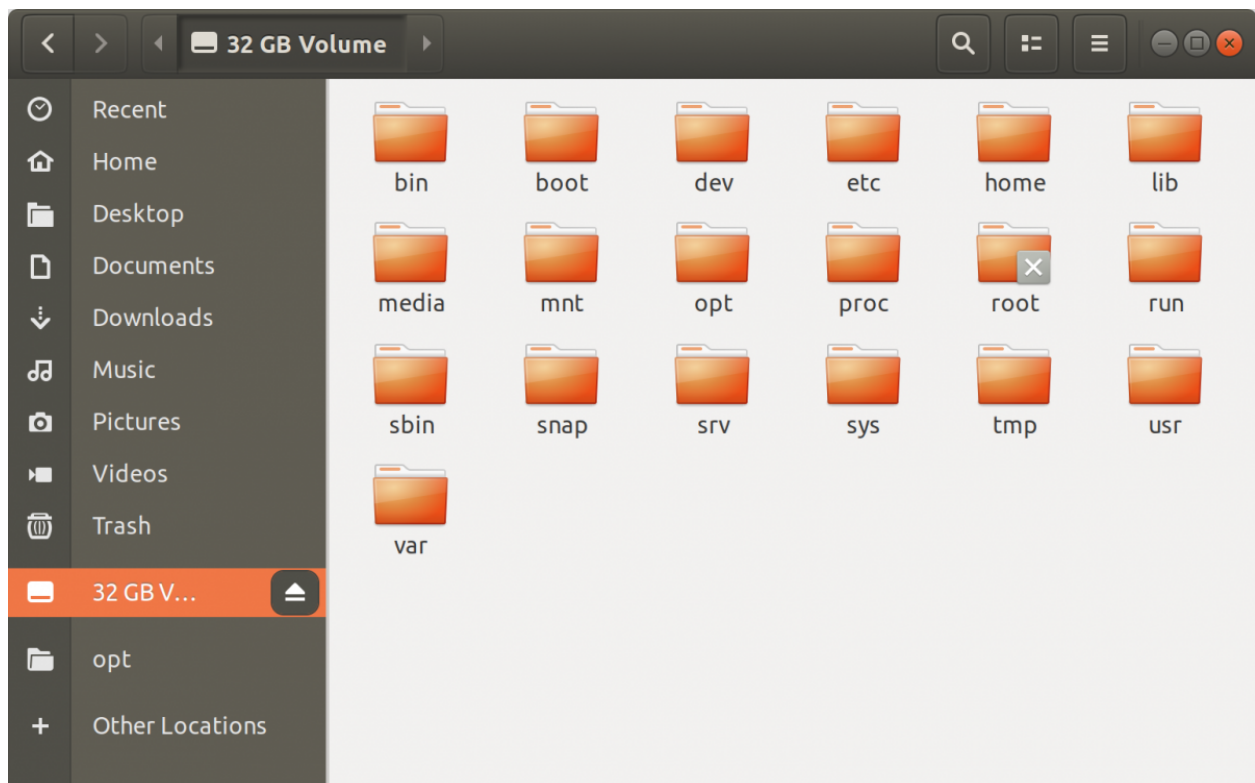
2. Click “Select image” and choose the JetPack SDK file downloaded earlier.
3. Insert the microSD card. If there are no other external drives attached, Etcher will automatically select the microSD card as target device. Otherwise, click “Change” and choose the correct device.



4. Click “Flash!”. The OS may prompt for username and password before it allows Etcher to proceed. It will take Etcher 10-15 minutes to write and validate the image if your microSD card is connected via USB3.



5. After Etcher finishes, eject the SD Card using Files application:



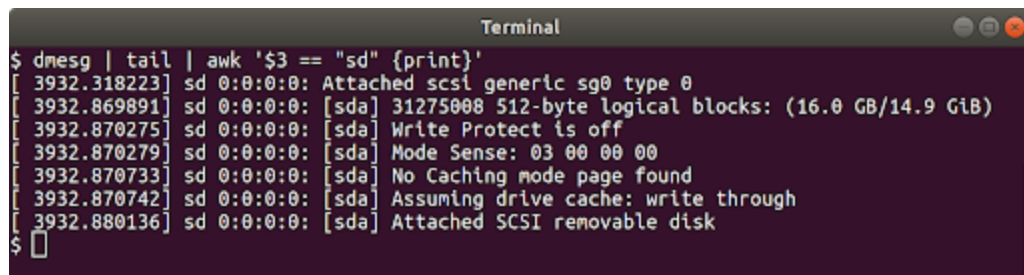
6. Physically remove the microSD card from the computer.

Command Line Instructions

1. Open the Terminal application by pressing Ctrl + Alt + t.
2. Insert your microSD card, then use a command like this to show which disk device was assigned to it:

```
dmesg | tail | awk '$3 == "sd" {print}'
```

In this example, we can see the 16GB microSD card was assigned /dev/sda:

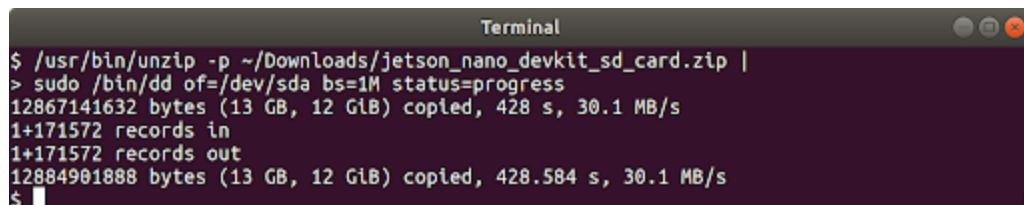


```
Terminal
$ dmesg | tail | awk '$3 == "sd" {print}'
[ 3932.318223] sd 0:0:0:0: Attached scsi generic sg0 type 0
[ 3932.869891] sd 0:0:0:0: [sda] 31275008 512-byte logical blocks: (16.0 GB/14.9 GiB)
[ 3932.870275] sd 0:0:0:0: [sda] Write Protect is off
[ 3932.870279] sd 0:0:0:0: [sda] Mode Sense: 03 00 00 00
[ 3932.870733] sd 0:0:0:0: [sda] No Caching mode page found
[ 3932.870742] sd 0:0:0:0: [sda] Assuming drive cache: write through
[ 3932.880136] sd 0:0:0:0: [sda] Attached SCSI removable disk
$
```

3. Use this command to write the zipped SD card image to the microSD card:

```
/usr/bin/unzip -p ~/Downloads/jetson_nano_devkit_sd_card.zip | sudo /bin/dd  
of=/dev/sd<x> bs=1M status=progress
```

For example:



```
Terminal
$ /usr/bin/unzip -p ~/Downloads/jetson_nano_devkit_sd_card.zip |  
> sudo /bin/dd of=/dev/sda bs=1M status=progress  
12867141632 bytes (13 GB, 12 GiB) copied, 428 s, 30.1 MB/s  
1+171572 records in  
1+171572 records out  
12884901888 bytes (13 GB, 12 GiB) copied, 428.584 s, 30.1 MB/s  
$
```

When the dd command finishes, eject the disk device from the command line:

```
sudo eject /dev/sd<x>
```

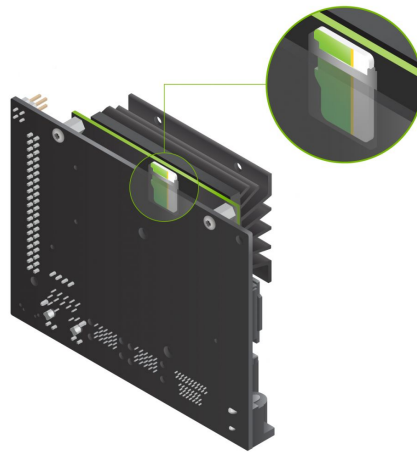
4. Physically remove the microSD card from the computer.

6.3.2. Setup and First Boot

To set up the developer kit, the monitor, keyboard, and mouse are required.

6.3.2.1. Setup Steps

1. Unfold the paper stand and place inside the developer kit box.
2. Insert the microSD card (with system image already written to it) into the slot on the underside of the Jetson Nano module.



3. Set the developer kit on top of the paper stand.
4. Power on the computer display and connect it.
5. Connect the USB keyboard and mouse.
6. Connect the Micro-USB power supply. The developer kit will power on and boot automatically.

6.3.1.2. First Boot

A green LED next to the Micro-USB connector will light as soon as the developer kit powers on. When booting the first time, the developer kit will take through some initial setup, including:

- Review and accept NVIDIA Jetson software EULA
- Select system language, keyboard layout, and time zone
- Create username, password, and computer name
- Select APP partition size—it is recommended to use the max size suggested

6.3.1.3. After Logging In

The output screen will look like this:

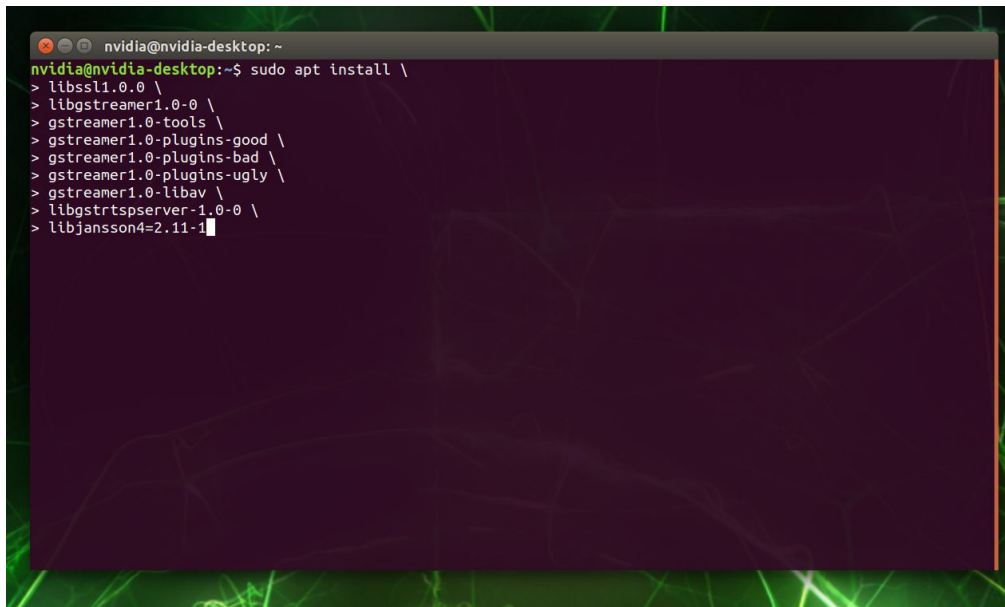


6.4. Install DeepStream dependencies

From the Jetson output screen, open the Terminal window.

In the Terminal window, enter and run the following commands to install the prerequisite packages:

```
$ sudo apt install \  
libssl1.0.0 \  
libgstreamer1.0-0 \  
gstreamer1.0-tools \  
gstreamer1.0-plugins-good \  
gstreamer1.0-plugins-bad \  
gstreamer1.0-plugins-ugly \  
gstreamer1.0-libav \  
libgststrtspserver-1.0-0 \  
libjansson4=2.11-1
```

A terminal window titled 'nvidia@nvidia-desktop: ~' showing the command 'sudo apt install' followed by a list of GStreamer plugins: libssl1.0.0, libgstreamer1.0-0, gstreamer1.0-tools, gstreamer1.0-plugins-good, gstreamer1.0-plugins-bad, gstreamer1.0-plugins-ugly, gstreamer1.0-libav, libgstrtspserver-1.0-0, and libjansson4=2.11-1. The cursor is at the end of the last line.

```
nvidia@nvidia-desktop: ~  
nvidia@nvidia-desktop:~$ sudo apt install \  
> libssl1.0.0 \  
> libgstreamer1.0-0 \  
> gstreamer1.0-tools \  
> gstreamer1.0-plugins-good \  
> gstreamer1.0-plugins-bad \  
> gstreamer1.0-plugins-ugly \  
> gstreamer1.0-libav \  
> libgstrtspserver-1.0-0 \  
> libjansson4=2.11-1
```

6.4.1. Install librdkafka (to enable Kafka protocol adaptor for message broker)

1. Clone the librdkafka repository from GitHub:

```
$ git clone https://github.com/edenhill/librdkafka.git
```

2. Configure and build the library:

```
$ cd librdkafka
```

```
$ git reset --hard 7101c2310341ab3f4675fc565f64f0967e135a6a
```

```
./configure
```

```
$ make
```

```
$ sudo make install
```

3. Copy the generated libraries to the deepstream directory:

```
$ sudo mkdir -p /opt/nvidia/deepstream/deepstream-5.0/lib
```

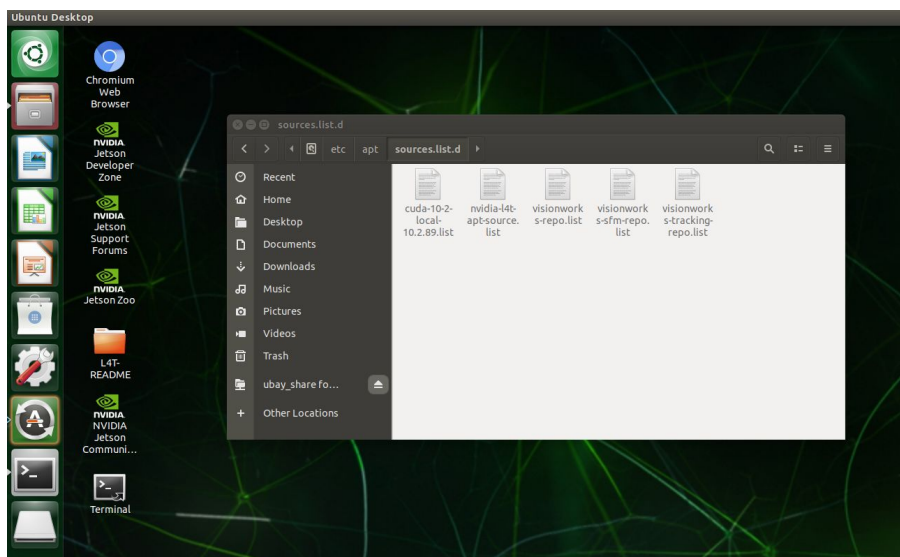
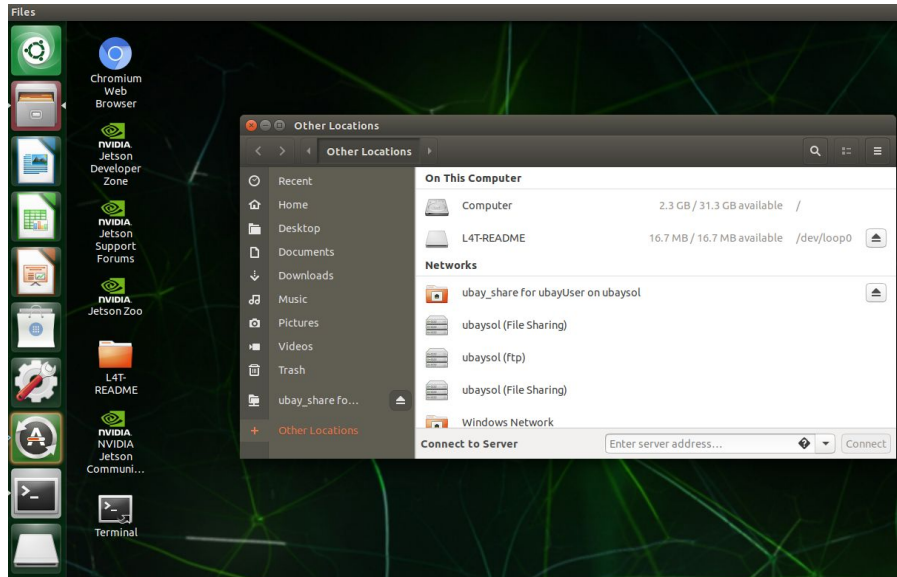
```
$ sudo cp /usr/local/lib/librdkafka* /opt/nvidia/deepstream/deepstream-5.0/lib
```

6.4.2. Install NVIDIA V4L2 GStreamer plugin

1. From the terminal window, enter and run the following command:


```
$ sudo chmod -R 777 /etc/apt/sources.list.d
```

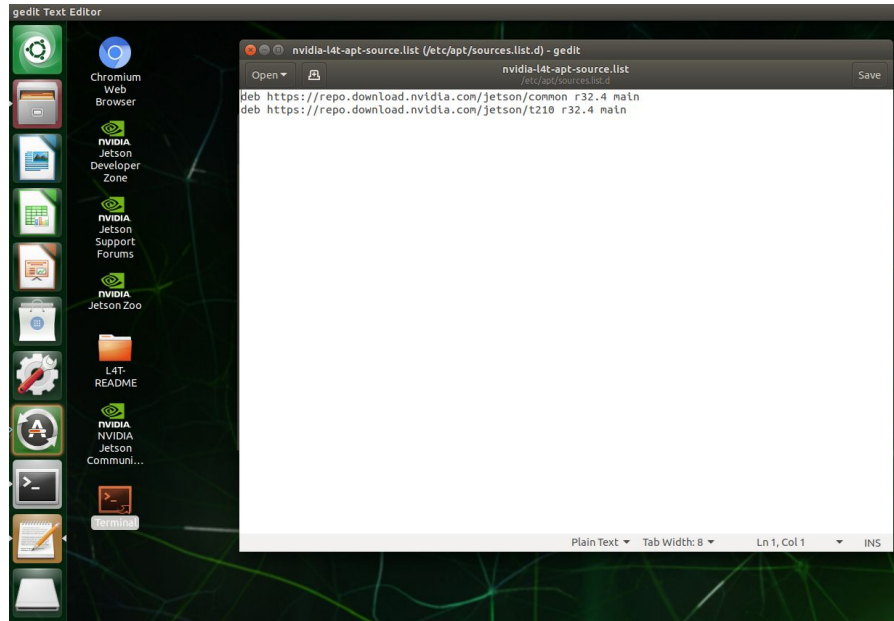
2. Click on Files icon on the taskbar, choose Other Locations -> Computer, then locate into directory /etc/apt/source.list.d



3. Open file nvidia-l4t-apt-source.list (apt source configuration file) in a text editor.
4. Change the repository name and download URL in the deb commands as shown below:

```
deb https://repo.download.nvidia.com/jetson/common r32.4 main
```

```
deb https://repo.download.nvidia.com/jetson/t210 r32.4 main
```



5. Save and close the source configuration file.
6. From the terminal window, enter and run the following commands:


```
$ sudo apt update
```

```
$ sudo apt install --reinstall nvidia-l4t-gstreamer
```

If apt prompts to choose a configuration file, reply **Y** for yes (to use the NVIDIA updated version of the file).

6.5. Install the DeepStream SDK

Direct to this [link](#) to download the DeepStream SDK (choose “I Agree To the Terms of the NVIDIA DeepStream SDK 5.0.1 Software License Agreement” to show the download link):

 **NVIDIA DEVELOPER** [HOME](#) [BLOG](#) [NEWS](#) [FORUMS](#) [DOCS](#) [DOWNLOADS](#) [TRAINING](#)

- DeepStream app control from edge or cloud with bi-directional IoT messaging
- Dynamic AI model update on the go to reduce app downtime
- Interoperability with models from [Transfer Learning Toolkit 2.0](#)
- Jetson Xavier NX support

Getting Started Resources

Downloads

☒ I Agree To the Terms of the [NVIDIA DeepStream SDK 5.0.1 Software License Agreement](#)

DeepStream 5.0.1 for Servers and Workstations

This release supports Tesla T4 and V100.

[Download .tar](#) [Download .deb](#) [Get NGC Container for Data Center](#)

DeepStream 5.0.1 for Jetson

This release supports Jetson TX1, TX2, Nano, NX and AGX Xavier.

Prerequisite: DeepStream SDK 5.0.1 requires the installation of [JetPack 4.4](#).

[Download .tar](#) [Download .deb](#) [Get NGC Container for Edge](#)

6.5.1. Method 1: Using the DeepStream 5.0 Jetson tar package

1. Download the DeepStream 5.0 Jetson tar package `deepstream_sdk_v5.0.1_jetson.tbz2`, by clicking on “Download .tar” from “DeepStream 5.0.1 for Jetson”:

Downloads

☒ I Agree To the Terms of the [NVIDIA DeepStream SDK 5.0.1 Software License Agreement](#)

DeepStream 5.0.1 for Servers and Workstations

This release supports Tesla T4 and V100.

[Download .tar](#) [Download .deb](#) [Get NGC Container for Data Center](#)

DeepStream 5.0.1 for Jetson

This release supports Jetson TX1, TX2, Nano, NX and AGX Xavier.

Prerequisite: DeepStream SDK 5.0.1 requires the installation of [JetPack 4.4](#).

[Download .tar](#) [Download .deb](#) [Get NGC Container for Edge](#)

2. Enter the following commands to extract and install DeepStream SDK:

```
$ sudo tar -xvf deepstream_sdk_v5.0.1_jetson.tbz2 -C /
```

```
$ cd /opt/nvidia/deepstream/deepstream-5.0
```

```
$ sudo ./install.sh
```

```
$ sudo ldconfig
```

6.5.2. Method 2: Using the DeepStream Debian package

1. Download the DeepStream 5.0 Jetson Debian package `deepstream-5.0_5.0.1-1_arm64.deb`, by clicking on “Download .deb” from “DeepStream 5.0.1 for Jetson”:

Downloads

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DeepStream 5.0.1 for Servers and Workstations

This release supports Tesla T4 and V100.

Download .tar

Download .deb

Get NGC Container for Data Center

DeepStream 5.0.1 for Jetson

This release supports Jetson TX1, TX2, Nano, NX and AGX Xavier.

Prerequisite: DeepStream SDK 5.0.1 requires the installation of [JetPack 4.4](#).

Download .tar

Download .deb

Get NGC Container for Edge

2. Enter the following commands to extract and install DeepStream SDK:

```
$ sudo apt-get install ./deepstream-5.0_5.0.1-1_arm64.deb
```

6.5.3. Method 3: Using the apt-server

Instead of directly downloading the installation file, DeepStream SDK can also be installed using the following steps:

1. Open file `nvidia-l4t-apt-source.list` (apt source configuration file) in a text editor.
2. Change the repository name and download URL in the deb commands shown below:
`deb https://repo.download.nvidia.com/jetson/common r32.4 main`
3. Save and close the source configuration file.
4. Enter the commands:

```
$ sudo apt update
```

```
$ sudo apt install deepstream-5.0
```





