Build Deep Learning Environment based on Docker

Hardware Info

- CPU: Intel i7 8750HQ
- GPU: Nvidia Geforce GTX 1060 (notebooks)
- Memory: 16GB

1. Install the Linux Operating System

At here we can choose Ubuntu16.04 as our Linux OS. It's easy to download it from this URL[1]. Here's a warning: you would better download it that is the format of ISO. Next, we need some tools to make BOOT U Disk. Here's a useful tool to recommend to you. It's called Rufus[2]. We can use BOOT U Disk to install OS into your computer. You only need to do it step by step.

2. Install Nvidia Driver Program

First, we need to download Driver Program from the official website of Nvidia[3]. You should choose the correct version of the Driver Program, that is very important. Please check the type of your GPU carefully.

You must remove all components about Nvidia. We can use the following command. If you never install any the components of Nvidia, you can ignore this step.

```
sudo apt-get remove --purge nvidia*
```

We should close the program called nouveau. We need to edit a configure file that called **blacklist.conf**. You can use the following command.

```
sudo gedit /etc/modprobe.d/blacklist.conf
```

Then, you need to add a line in this file. The additions are as follows: **blacklist nouveau.** Next, we need to reinitialize the kernel by the following command.

```
sudo update-initramfs -u
```

Finally, we reboot the computer. By using the following command to check whether the success of disabled.

```
lsmod | grep nouveau
```

Here's a warning: you would better close Secure Boot in your BIOS system. We need to use TTY interface to install Nvidia Driver. You can use the following key combinations to enter the TTY interface.

CTRL+ALT+F1

We need to modify the privilege of the driver file.

```
sudo chmod a+x NVIDIA-Linux-x86_64-410.xx.run
sudo ./NVIDIA-Linux-x86_64-410.xx.run -no-opengl-files -no-x-check -no-nouveau-check
```

You can use this command to check whether the success of the installation.

```
nvidia-smi
```

3. Install Docker

There are three methods about the installation of Docker, such as using the repository, using the script, using the package. We mainly use the repository to install Docker. If you have installed the old version of Docker already, you should use the following command to uninstall it.

```
sudo apt remove --purge docker docker-engine docker.io
sudo rm -f -r /var/lib/docker/
```

Next, we need to install some base-software with some simple commands.

```
sudo apt install apt-transport-https ca-certificates curl software-properties-common
```

If you install the above software successfully, then we must add docker's official GPG key.

```
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
```

In order to verify whether adding key successfully, you can use the following command.

```
sudo apt-key fingerprint 0EBFCD88
```

We need to add the repository about docker into the default repository, which operation uses the following command.

```
sudo add-apt-repository \
"deb [arch=amd64] https://download.docker.com/linux/ubuntu \
$(lsb_release -cs) \
stable"
```

When completing the above work, we start to install docker with two commands.

```
sudo apt-get update
sudo apt-get install docker-ce
```

We will introduce some commands about the installation of the docker, which will help you later. We can use the below command to look up all version of docker.

```
apt-cache madison docker-ce
```

We can also install the specified version of docker with the following command.

```
sudo apt-get install docker-ce=<VERSION>
```

For uninstalling docker, we can use these command to do it.

```
sudo apt remove --purge docker-ce

sudo rm -f -r /var/lib/docker
```

We can use the below command to add other users into the group of docker.

```
sudo usermod -aG docker $USER
```

4. Install Nvidia Docker

If you have nvidia-docker 1.0 installed: we need to remove it and all existing GPU containers.

```
docker volume ls -q -f driver=nvidia-docker | xargs -r -I{} -n1 docker ps -q -a -f volume={} | xargs -r docker rm -f

sudo apt-get purge -y nvidia-docker
```

We need to add the official key of Nvidia-Docker and update the default repository with nvidia's repository.

```
curl -s -L https://nvidia.github.io/nvidia-docker/gpgkey | sudo apt-key add -

curl -s -L https://nvidia.github.io/nvidia-docker/ubuntu16.04/amd64/nvidia-docker.list | sudo tee
/etc/apt/sources.list.d/nvidia-docker.list
```

Using the following command to finish the installation of nvidia-docker

```
sudo apt-get update && sudo apt-get install -y nvidia-docker2

sudo pkill -SIGHUP dockerd
```

We can get all kinds version of Nvidia Docker Image from this URL[4]. By the below command, we can get the image of Nvidia Docker that satisfy your requirement.

```
docker pull nvidia/cuda:8.0-cudnn5-devel-ubuntu16.04
```

5. Usage of Docker

We can use this command to look up all docker's images.

```
docker images -a
```

Next, we start to create a container by the following command.

```
docker run -it  -p 15901:5901 -v /home/your_name/work:/home/your_name/work -e
NVIDIA_VISIBLE_DEVICE=0,1 --name container_name --runtime=nvidia nvidia/cuda: 8.0-
cudnn5-devel-ubuntu16.04
```

At here, we need to expound the meaning of some parameters.

- "-p" indicates that the mapping of the port.

```
-p host-port:container-port
```

- "v" indicates that the mapping of the file directory.

```
-v host-file-directory:container-file-directory
```

- "e" indicates that using the specified GPU.
- "--name" is used to set container's name
- "--runtime" indicates that using the environment of GPU.

With the below command to start a container.

```
docker start -i container_name
```

With the below command to close a container.

```
exit
```

You must use it in the environment for docker. Note: when you use it, all process will stop running in the container.

If you don't want to stop all process after the closing container, you should use the combination key, such as "CTRL+P", "CTRL+Q". Using the following command will re-enter the container that you just exited.

```
docker attach your_container
```

6. Summary of Common Command of Docker

- set docker service auto-start when the machine starts

```
sudo systemctl enable docker
```

- start docker service

```
sudo systemctl start docker
```
or
```
sudo service docker start
```

- reload daemon service

```
sudo systemctl daemon-reload
```

- restart docker service

```
sudo systemctl restart docker
```
or
```
sudo service docker restart
```

- delete container

```
docker rm container_name
```

- delete docker images

```
docker rmi image_name
```

- look up process info

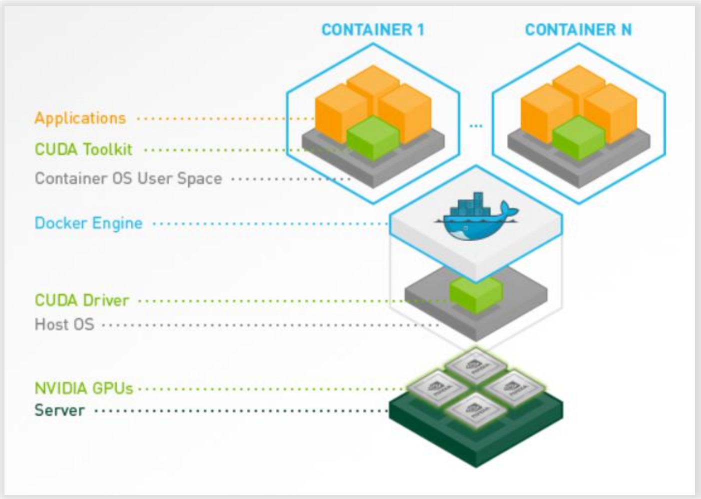
```
docker top container_name
```

- look up all container info

```
docker ps -a
```

- look up specified container info

```
docker inspect container_name
```



[1] Ubuntu[EB/OL].https://www.ubuntu.com/download

[2] Rufus[EB/OL]. https://rufus.ie/en_IE.html

[3] Nvidia[EB/OL].https://www.nvidia.cn/Download/index.aspx?lang=cn

[4] Nvidia-Cuda[EB/OL].https://hub.docker.com/r/nvidia/cuda/