安裝 NVIDIA Docker 2 來讓容器使用 GPU

2018-02-17 1376

Docker Container NVIDIA GPU

本篇主要介紹如何使用 NVIDIA Docker v2 來讓容器使用 GPU，過去 NVIDIA Docker v1 需要使用 nvidia-docker 來取代 Docker 執行 GPU image，或是透過手動掛載 NVIDIA driver 與 CUDA 來使 Docker 能夠編譯與執行 GPU 應用程式 image，而新版本的 Docker 則可以透過 –runtime 來選擇使用 NVIDIA Docker v2 的 Runtime 來執行 GPU 應用。
安裝前需要確認滿足以下幾點：

GNU/Linux x86_64 with kernel version > 3.10
Docker CE or EE == v18.03.1
NVIDIA GPU with Architecture > Fermi (2.1)
NVIDIA drivers ~= 361.93 (untested on older versions)

首先透過 APT 安裝 Docker CE or EE v17.12 版本：

```
$ curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
$ echo "deb [arch=amd64] https://download.docker.com/linux/ubuntu xenial edge"
$ sudo apt-get update && sudo apt-get install -y docker-ce=18.03.1~ce-0~ubuntu
```

接著透過 APT 安裝 NVIDIA Driver(v390.30) 與 CUDA 9.1：

```
$ wget http://developer.download.nvidia.com/compute/cuda/repos/ubuntu1604/x86_64
$ sudo dpkg -i cuda-repo-ubuntu1604_9.1.85-1_amd64.deb
$ sudo apt-key adv --fetch-keys http://developer.download.nvidia.com/compute/
$ sudo apt-get update && sudo apt-get install -y cuda
```

測試 NVIDIA Dirver 與 CUDA 是否有安裝完成:

```
$ cat /usr/local/cuda/version.txt
CUDA Version 9.1.85

$ sudo nvidia-smi
Tue Mar 13 06:10:39 2018
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 390.30                 Driver Version: 390.30                    |
|-------------------------------+----------------------+----------------------+
| GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|===============================+======================+======================|
|   0  GeForce GTX 106...  Off  | 00000000:01:00.0 Off |                  N/A |
|  0%   33C    P0    15W / 120W |      0MiB /  3019MiB |      2%      Default |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                       GPU Memory |
|  GPU       PID   Type   Process name                             Usage      |
|=============================================================================|
|  No running processes found                                                 |
+-----------------------------------------------------------------------------+
```

確認上述無誤後，接著安裝 NVIDIA Docker v2，這邊透過 APT 來進行安裝:

```
$ 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-doc
$ sudo apt-get update && sudo apt-get install -y nvidia-docker2=2.0.3+docker18.(
$ sudo pkill -SIGHUP dockerd
```

測試 NVIDIA runtime，這邊下載 NVIDIA image 來進行測試:

```
$ docker run --runtime=nvidia --rm nvidia/cuda nvidia-smi
...
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 390.30                 Driver Version: 390.30                    |
|-------------------------------+----------------------+----------------------+
| GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|===============================+======================+======================
|   0  GeForce GTX 106...  Off  | 00000000:01:00.0 Off |                  N/A |
|  0%   35C    P0    15W / 120W |      0MiB /  3019MiB |      2%      Default |
```

```
+-----------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                       GPU Memory |
|  GPU       PID   Type   Process name                             Usage      |
|=============================================================================|
|  No running processes found                                                 |
+-----------------------------------------------------------------------------+
```

透過 TensorFlow GPU image 來進行測試，這邊執行後登入 IP:8888 執行簡單範例程式:

```
$ docker run --runtime=nvidia -it -p 8888:8888 tensorflow/tensorflow:latest-gpu
...
2018-03-13 06:44:21.719705: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1
name: GeForce GTX 1060 3GB major: 6 minor: 1 memoryClockRate(GHz): 1.7845
pciBusID: 0000:01:00.0
totalMemory: 2.95GiB freeMemory: 2.88GiB
2018-03-13 06:44:21.719728: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1
2018-03-13 06:44:21.919097: I tensorflow/core/common_runtime/gpu/gpu_device.cc:9
```

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