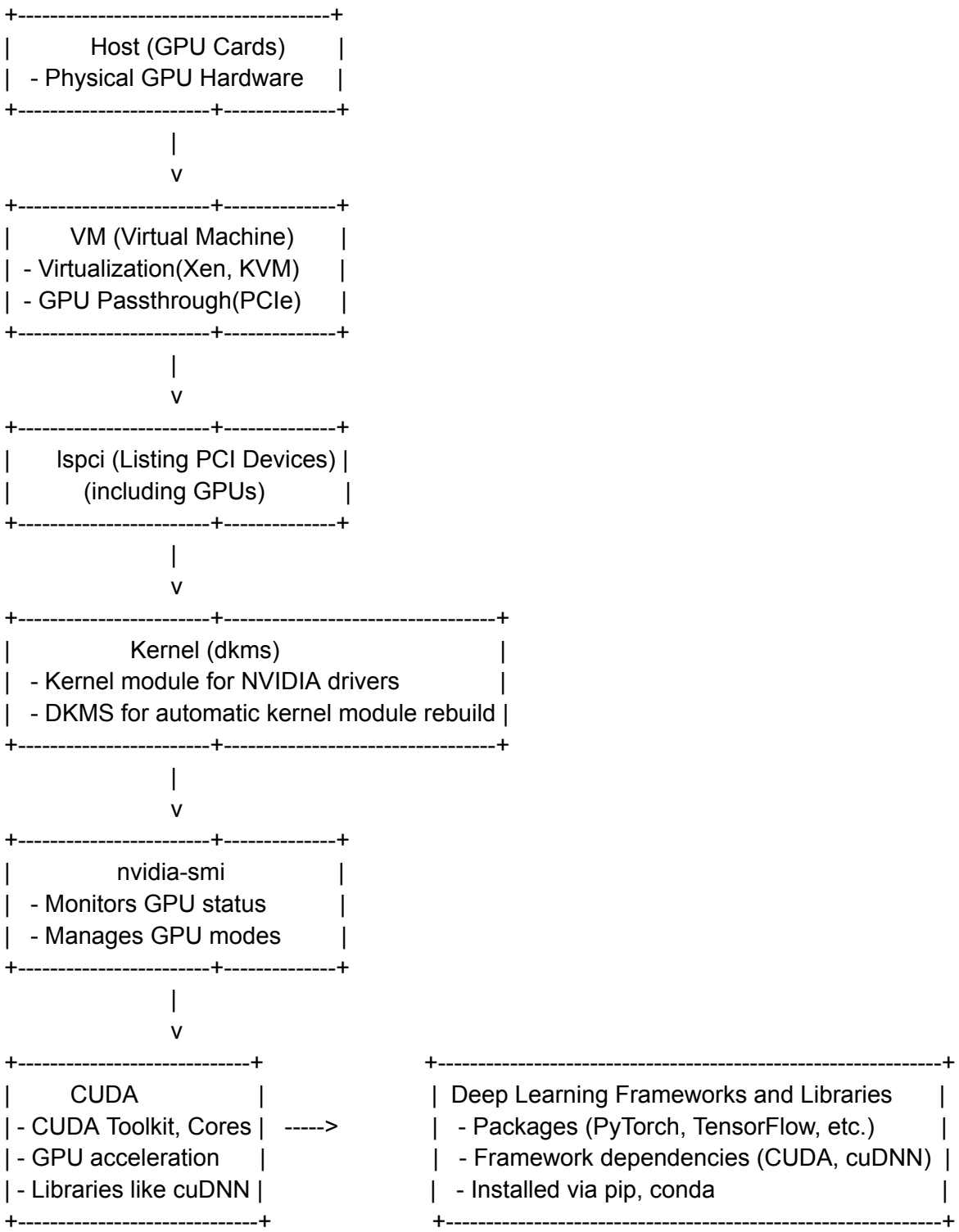
GPU

Architecture of GPU:



To setup GPU image including(drivers) refer below:

GPU and related Plans Post-processing

Types of cards:

Cards	Connectivity Device	Drivers Info
GDC HGX H200	NVSwitch	Nvidia Opensource Drivers + Fabric Manager
GDC HGX H100	NVSwitch	Nvidia Opensource Drivers + Fabric Manager
GDC/3 A100 40 GB	NVLink	Nvidia Opensource Drivers
GDC/3 A100 80 GB	NVLink	Nvidia Opensource Drivers
GDC/3 A100 80 GB,SXM	NVLink	Nvidia Opensource Drivers
GDC/3 A30	PCIe	Nvidia Opensource Drivers
GDC V100	PCIe	Nvidia Opensource Drivers
GDC T4	PCIe	Nvidia Opensource Drivers
GDC3 L40S	PCIe	Nvidia Licensed Drivers
GDC/3 A40	PCIe	Nvidia Licensed Drivers
GDC3 L4	PCIe	Nvidia Licensed Drivers

Note: Licensed drivers are suitable for Video rendering/Video Editing

If Nvidia-license is not activated, kindly check the DLS portal to ensure license is released.

Issues:

Core-dumped:

If any model encountered, core-dump we have to make sure the Host CPU model is updated in VM conf

Single Card:

Mostly single card issue occur in A10080 due to the presence of NVLink, which prevents the card to work in single mode

Thus to resolve the issue, we need to enable and create the MIG devices/slices

```
nvidia-smi
Mon Oct 16 12:43:55 2023
+---------------------------------------------------------------------------------------+
| NVIDIA-SMI 535.104.12             Driver Version: 535.104.12   CUDA Version: 12.2     |
|-----------------------------------------+----------------------+----------------------+
| GPU  Name                 Persistence-M | Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp   Perf          Pwr:Usage/Cap |         Memory-Usage | GPU-Util  Compute M. |
|                                         |                      |               MIG M. |
|=========================================+======================+======================|
|   0  NVIDIA A100-SXM4-80GB          On  | 00000000:01:01.0 Off |                   On |
| N/A   26C    P0              50W / 500W |      2MiB / 81920MiB |     N/A      Default |
|                                         |                      |              Enabled |
+-----------------------------------------+----------------------+----------------------+

+---------------------------------------------------------------------------------------+
| MIG devices:                                                                          |
+------------------+--------------------------------+-----------+-----------------------+
| GPU  GI  CI  MIG |                   Memory-Usage |        Vol|      Shared           |
|      ID  ID  Dev |                     BAR1-Usage | SM     Unc| CE ENC DEC OFA JPG    |
|                  |                                |        ECC|                       |
|==================+================================+===========+=======================|
|  0    0   0   0  |              2MiB / 81050MiB  | 98      0 |  7   0    5    1    1 |
|                  |              1MiB / 131072MiB |           |                       |
+------------------+--------------------------------+-----------+-----------------------+

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

Please run the following command in order to fix this issue:

nvidia-smi -mig 1
nvidia-smi mig -cgi 0 -C

For better performance, we would suggest you to run the following command after stopping any programs or services using the GPU:

nvidia-smi -pm 1

Dual cards:

Mostly in dual cards, alternate pci card issue might occur due to the presence of NVLink, which prevents both the cards to work simultaneously.

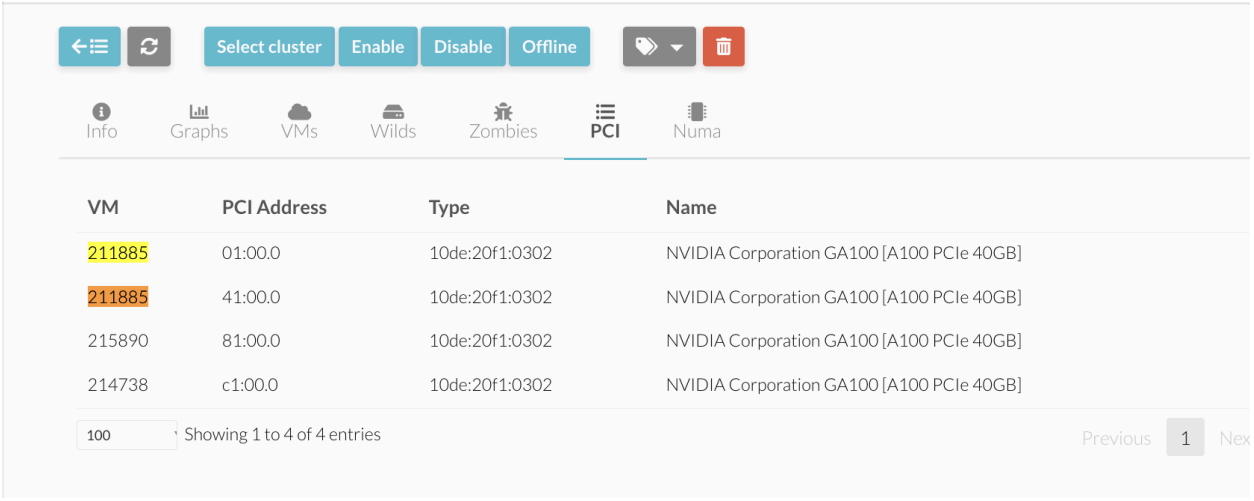
0 211885 01:00.0 10de:20f1:0302 NVIDIA Corporation GA100 [A100 PCIe 40GB]

1 211885 41:00.0 10de:20f1:0302 NVIDIA Corporation GA100 [A100 PCIe 40GB]

2 215890 81:00.0 10de:20f1:0302 NVIDIA Corporation GA100 [A100 PCIe 40GB]

3 214738 c1:00.0 10de:20f1:0302 NVIDIA Corporation GA100 [A100 PCIe 40GB]

Thus, to resolve the issue the cards to be deployed sequentially as [0,1] , [2,3] and not as [0,2] , [1,3] , [2,0] , [1,2] , [3,0]



8x-card issues:

Mostly in octal cards, Fabric Manager/Infiniband issue might occur due to the presence of NVSwitch, which prevents all the cards to work simultaneously.

Thus to resolve the issue, fabric manager/Infiband have to be installed on same driver version to work

Once done. Verify the working by GPU script:

Script #1:

```
import torch

print("Is cuda available?", torch.cuda.is_available())

print("Is cuDNN version:", torch.backends.cudnn.version())

print("cuDNN enabled? ", torch.backends.cudnn.enabled)

print("Device count?", torch.cuda.device_count())

print("Current device?", torch.cuda.current_device())

print("Device name? ", torch.cuda.get_device_name(torch.cuda.current_device()))

x = torch.rand(5, 3)
print(x)
```

Script #2:

```
import torch

def check_gpu_availability():
    if torch.cuda.is_available():
        num_gpus = torch.cuda.device_count()
        print("Number of available GPU(s): {}".format(num_gpus))
        for i in range(num_gpus):
            gpu_name = torch.cuda.get_device_name(i)
            print("GPU {}: {}".format(i, gpu_name))
    else:
        print("No GPU available, using CPU.")

if __name__ == "__main__":
    check_gpu_availability()
```

GPU Connectivity Devices:

Technology	Description	Examples of Supported GPU Cards	Usage/Use Cases
NVLink	A high-speed interconnect that enables GPUs to communicate directly with each other for high-bandwidth, low-latency data sharing.	GDC HGX H200, GDC HGX H100, GDC A100 80 GB, GDC A40, GDC A100 40 GB	Used in multi-GPU setups for tasks requiring large-scale parallel computing, such as AI training, scientific simulations, and machine learning.
NVSwitch	A scalable GPU interconnect system that allows GPUs to communicate with each other across larger setups than NVLink. It connects multiple GPUs in a high-performance network, typically in data centers.	GDC HGX H200, GDC HGX H100, GDC A100 80 GB	Suitable for multi-GPU nodes in data centers where large datasets need to be processed concurrently (e.g., AI model training with multiple GPUs).
RDMA (Remote Direct Memory Access)	A technology that allows direct memory access from one computer to another without involving the CPU, improving throughput and reducing latency.	GDC A100 80 GB, GDC A40, GDC L40S	Enables high-performance computing in distributed systems, used in machine learning clusters, storage solutions, and high-speed data transfer between nodes.
InfiniBand	A high-throughput, low-latency networking technology used in data centers for connecting servers, storage systems, and compute nodes.	GDC HGX H200, GDC HGX H100, GDC A100 80 GB, GDC V100	Commonly used in high-performance computing (HPC) environments, AI, deep learning, and clusters where fast communication between nodes is essential.