Int_GPU_and_the_DevCloud

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1 Walkthrough: Integrated GPU (IGPU) and the DevCloud

This notebook is a demonstration showing you how to request an edge node with an Intel i5 CPU and load a model on the integrated GPU using Udacity's workspace integration with Intel's DevCloud. This notebook is just to give you an overview of the process (you won't be writing any code). In the next workspace, you'll be given TODO items to complete.

Below are the six steps we'll walk through in this notebook:

1. Creating a Python script to load the model
2. Creating a job submission script
3. Submitting a job using the `qsub` command
4. Checking the job status using the `liveQStat` function
5. Retrieving the output files using the `getResults` function
6. Viewing the resulting output

Click the **Introduction to IGPU and the DevCloud** button below for a quick overview of the overall process. We'll then walk through each step of the process.

Introduction to IGPU and the DevCloud

IMPORTANT: Set up paths so we can run Dev Cloud utilities You *must* run this every time you enter a Workspace session.

```
In [1]: %env PATH=/opt/conda/bin:/opt/spark-2.4.3-bin-hadoop2.7/bin:/opt/conda/bin:/usr/local/sb
        import os
        import sys
        sys.path.insert(0, os.path.abspath('/opt/intel_devcloud_support'))
        sys.path.insert(0, os.path.abspath('/opt/intel'))
```

```
env: PATH=/opt/conda/bin:/opt/spark-2.4.3-bin-hadoop2.7/bin:/opt/conda/bin:/usr/local/sbin:/usr/
```

1.1 The Model

We will be using the `vehicle-license-plate-detection-barrier-0106` model for this exercise. Remember that to run a model on the IGPU, we need to use `FP16` as the model precision.

The model has already been downloaded for you in the `/data/models/intel` directory on Intel's DevCloud. We will be using the following filepath during the job submission in **Step 3**:

> **/data/models/intel/vehicle-license-plate-detection-barrier-0106/FP16/vehicle-license-plate-detection-barrier-0106**

2 Step 1: Creating a Python Script

The first step is to create a Python script that you can use to load the model and perform an inference. I have used the `%%writefile` magic command to create a Python file called `load_model_to_device.py`. This will create a new Python file in the working directory.

Note: Up until this point, we've been writing a Python script that hardcoded the device we were using to load the model on, `CPU`. We'll modify our Python script so it is more flexible and will allow us to pass in a device type as a command line argument.

Click the **Writing a Python Script** button below for a demonstration.

Writing a Python Script

```
In [2]: %%writefile load_model_to_device.py

        import time
        from openvino.inference_engine import IENetwork
        from openvino.inference_engine import IECore
        import argparse

        def main(args):
            model=args.model_path
            model_weights=model+'.bin'
            model_structure=model+'.xml'

            start=time.time()
            model=IENetwork(model_structure, model_weights)

            core = IECore()
            net = core.load_network(network=model, device_name=args.device, num_requests=1)
            print(f"Time taken to load model = {time.time()-start} seconds")

        if __name__=='__main__':
            parser=argparse.ArgumentParser()
            parser.add_argument('--model_path', required=True)
            parser.add_argument('--device', default=None)

            args=parser.parse_args()
            main(args)
```

```
Writing load_model_to_device.py
```

2.1 Step 2: Creating a Job Submission Script

To submit a job to the DevCloud, we need to create a shell script. Similar to the Python script above, I have used the `%%writefile` magic command to create a shell script called `load_gpu_model_job.sh`.

This script does a few things. 1. Writes stdout and stderr to their respective .log files 2. Creates the `/output` directory 3. Creates `DEVICE` and `MODELPATH` variables and assigns their value as the first and second argument passed to the shell script 4. Calls the Python script using the MODELPATH and DEVICE variable values as the command line argument 5. Changes to the /output directory 6. Compresses the stdout.log and stderr.log files to output.tgz

Note: Our shell script now takes two command line arguments.

Click the **Creating a Job Submission Script** button below for a demonstration.

Creating a Job Submission Script

```
In [3]: %%writefile load_gpu_model_job.sh


        exec 1>/output/stdout.log 2>/output/stderr.log

        mkdir -p /output

        DEVICE=$1
        MODELPATH=$2

        # Run the load model python script
        python3 load_model_to_device.py  --model_path ${MODELPATH} --device ${DEVICE}

        cd /output

        tar zcvf output.tgz stdout.log stderr.log
```

```
Writing load_gpu_model_job.sh
```

2.2 Step 3: Submitting a Job to Intel's DevCloud

The code below will submit a job to an **IEI Tank-870** edge node with an Intelő i5 processor and IGPU. We will load the model on the GPU.

Note: In addition to specifying the model path, we'll also pass in a device type argument of GPU to load our model on the IGPU. As a reminder, when running a model on an IGPU, the model precision we'll need is FP16.

The !qsub command takes a few command line arguments: 1. The first argument is the shell script filename - load_gpu_model_job.sh. This should always be the first argument. 2. The -d flag designates the directory where we want to run our job. We'll be running it in the current directory as denoted by .. 3. The -l flag designates the node and quantity we want to request. The default quantity is 1, so the **1** after nodes is optional. 4. The -F flag let's us pass in a string with all command line arguments we want to pass to our Python script.

Note: There is an optional flag, -N, you may see in a few exercises. This is an argument that only works on Intel's DevCloud that allows you to name your job submission. This argument doesn't work in Udacity's workspace integration with Intel's DevCloud.

In the cell below, we assign the returned value of the !qsub command to a variable job_id_core. This value is an array with a single string.

Once the cell is run, this queues up a job on Intel's DevCloud and prints out the first value of this array below the cell, which is the job id.

Click the **Submitting a Job to Intel's DevCloud** button below for a demonstration.

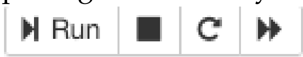
Submission of Job onto GPU

```
In [4]: job_id_core = !qsub load_gpu_model_job.sh -d . -l nodes=1:tank-870:i5-6500te:intel-hd-53
        print(job_id_core[0])
```

```
QeyFT3j2bt0DucdNTZF0QSqhK9F6iR8g
```

2.3 Step 4: Running liveQStat

Running the `liveQStat` function, we can see the live status of our job. Running the this function will lock the cell and poll the job status 10 times. The cell is locked until this finishes polling 10 times or you can interrupt the kernel to stop it by pressing the stop button at the top:



- `Q` status means our job is currently awaiting an available node
- `R` status means our job is currently running on the requested node

Note: In the demonstration, it is pointed out that `W` status means your job is done. This is no longer accurate. Once a job has finished running, it will no longer show in the list when running the `liveQStat` function.

Click the **Running liveQStat** button below for a demonstration.

Running liveQStat

```
In [5]: import liveQStat
        liveQStat.liveQStat()
```

2.4 Step 5: Retrieving Output Files

In this step, we'll be using the `getResults` function to retrieve our job's results. This function takes a few arguments.

1. `job id` - This value is stored in the `job_id_core` variable we created during **Step 3**. Remember that this value is an array with a single string, so we access the string value using `job_id_core[0]`.
2. `filename` - This value should match the filename of the compressed file we have in our `load_gpu_model_job.sh` shell script. In this example, filename shoud be set to `output.tgz`.
3. `blocking` - This is an optional argument and is set to `False` by default. If this is set to `True`, the cell is locked while waiting for the results to come back. There is a status indicator showing the cell is waiting on results.

Note: The `getResults` function is unique to Udacity's workspace integration with Intel's DevCloud. When working on Intel's DevCloud environment, your job's results are automatically retrieved and placed in your working directory.

Click the **Retrieving Output Files** button below for a demonstration.

Retrieving Output Files

```
In [6]: import get_results

        get_results.getResults(job_id_core[0], filename="output.tgz", blocking=True)
```

```
getResults() is blocking until results of the job (id:QeyFT3j2bt0DucdNTZF0QSqhK9F6iR8g) are read
Please wait...Success!
output.tgz was downloaded in the same folder as this notebook.
```

2.5 Step 6: Viewing the Outputs

In this step, we unpack the compressed file using `!tar zxf` and read the contents of the log files by using the `!cat` command.

`stdout.log` should contain the printout of the print statement in our Python script.

```
In [7]: !tar zxf output.tgz
```

```
In [8]: !cat stdout.log
```

```
Time taken to load model = 40.77278256416321 seconds
```

```
In [9]: !cat stderr.log
```

```
load_model_to_device.py:13: DeprecationWarning: Reading network using constructor is deprecated.
  model=IENetwork(model_structure, model_weights)
tar: stdout.log: file changed as we read it
```

```
In [ ]:
```