Running Jupyter through a container on ARC3 with custom image from localhost

1) Via VPN (if working remotely) log in to ARC3.

```
ssh username@arc3.leeds.ac.uk
```

2) Request an interactive session.

```
qrsh -l coproc_k80=1,h_rt=1:0:0 -pty y /bin/bash -i
```

`coprok_k80` indicates a resource request for half GPU, which on ARC3 is 12 cores, 64 GB and one k80. If you request two, you will be using the entire GPU.
`h_rt` is hard runtime, requesting usage for a specific length of time (h:m:s). The maximum time allowed is 48 hours (48:0:0). If you require a longer session, you should submit a job instead – see Martin to do that.
`-pty` makes the scheduler allocate the GPU to you.

If you do not require an interactive session, then submitting a job is probably better.

After you enter this request, you will either see a message tellling you that your request cannot be granted (no GPU's are available), or your prompt will change, showing your request has been granted:

```
[sc16rsmy@login1.arc3 ~]$ qrsh -l coproc_k80=1,h_rt=1:0:0 -pty y /bin/bash -i
[sc16rsmy@db12gpu1.arc3 ~]$
[sc16rsmy@db12gpu1.arc3 ~]$
```

Here, we now have access to db12gpu1.arc3 for one hour.

3) Load the modules you need.

In this case we are using tensorflow with GPU, which requires version 2.3 or higher of Singularity.

```
module load cuda
module load test singularity/2.3
module list
```

You can list all the modules to ensure everything has been loaded correctly. Note that soon (check with Martin) singularity 2.3.1 will be the default version, so we will not need to load test.

4) Start Jupyter without a browser.

```
singularity shell --nv /nobackup/containers/your_image.img -c "export
XDG_RUNTIME_DIR="";/opt/conda/bin/jupyter notebook --notebook-dir=$HOME --
ip='*' --port=8887 --no-browser"
```

Note: the port needs to be unique. If you get a permissions error, you may have forgotten the --nv flag and the export command. If you want a custom image, you will need to write your own Dockerfile inside a Linux Virtual Machine, build your container, and then scp the container image to ARC3. This is because building a container on ARC3 requires root permissions, but anyone can run a container from a pre-built image. The HPC centre at Leeds uses singularity on top of Docker for security reasons, so you will need to convert the Dockerfile into a singularity one. Alternatively, you can bother Martin until he makes you your own custom image, haha.

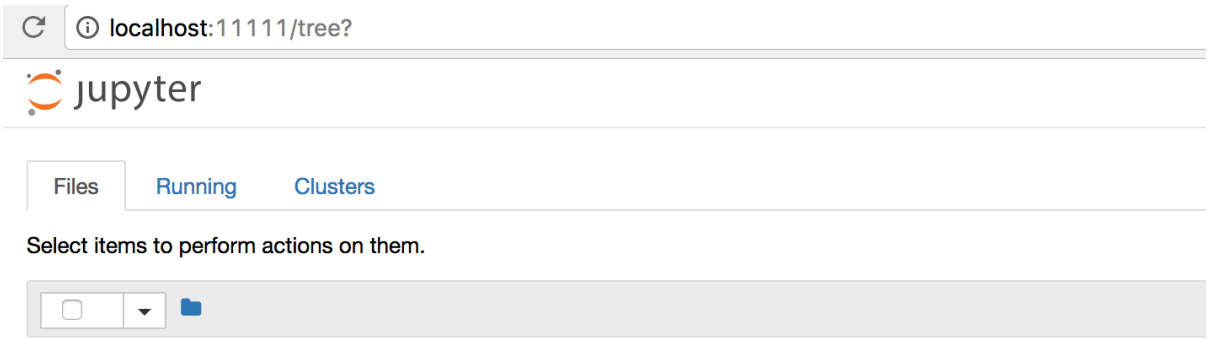
5) In a separate terminal window, set up local ssh port forwarding.

```
ssh -L 11111:your_gpu:8887 username@arc3.leeds.ac.uk
```

Here, our gpu is `db12gpu2`. Use the same unique port you specified for Jupyter. The 11111 is the local port; you can set this to whatever you like.

6) Access Jupyter via your local browser.

Now, you can go to localhost:11111/ and access your Jupyter notebook.



This doc was written after meeting with Martin Callaghan who can be contacted at M.Callaghan@leeds.ac.uk.