

1. Preparation

Before you begin, you should have an AWS account, Key Pairs (.pem file), Access Keys (Access Key Id and Secret Access Key). Go to AWS website for [Key Pair Creation](#) and [Access Key management](#) if you do not have one. You will also need the JSON file, to create the stack, on your local computer. Contact our administrator to get the JSON template file if you do not have one.

2. Create Stack on AWS

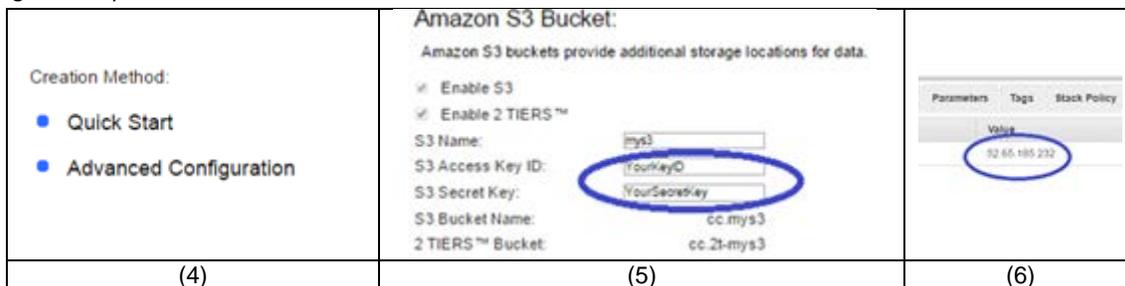
Please refer to related guidelines both at [AWS website](#) and [CloudyCluster™ website](#) to create a stack. Login, Select the cloud site (1), and Select Cloud Formation (2) on <https://console.aws.amazon.com> page.



Select Create Stack option and Create New Stack. Select “Upload a template to Amazon S3” (3) and choose your JSON file (stored on your computer) to upload for “Select Template” part.

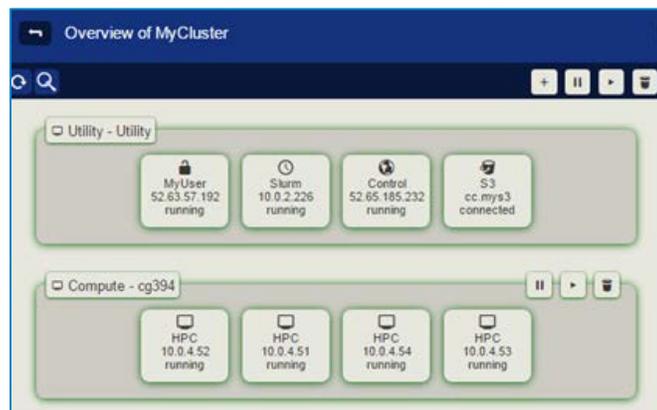
3. Create Cluster with CloudyCluster™

For following steps please refer to the [CloudyCluster™ website](#) on cluster creation. Review your settings, check the “I Acknowledge..” check box, select the "Create" and wait to complete. After the environment is built, launch your new built cluster; copy the InstanceIP (6) from CloudFormation window, paste it in the browser and go. Select “Choose File” and upload the .pem file. Select Overview and push “+” fill in data and press “Quick Start”, which has been added with 2 TIERS™ system items by now, as shown in picture (4). You can see 2 TIERS™ is enabled (5). Fill in your Access Key Id and Access Secret Key (5). Use lower case letters and numbers for S3 name. Follow CloudyCluster™ website to create your cluster other steps. After filling all the details review the information provided in the Final Review, as you will begin to incur charges when you click the "Create Environment" button.



*** Be aware that after you build your clusters, fees might be charged. Make sure your instances are stopped (managed in CloudyCluster™) when you are not using them.**

Click the “Overview” button and wait (5-10 minutes) until the outline highlight color turn to all green (7), you can begin to use your cluster, you will need to wait for some time before it finishes. Now your initial cluster is spinning up.

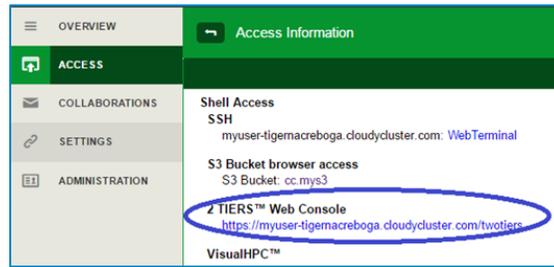


(7)

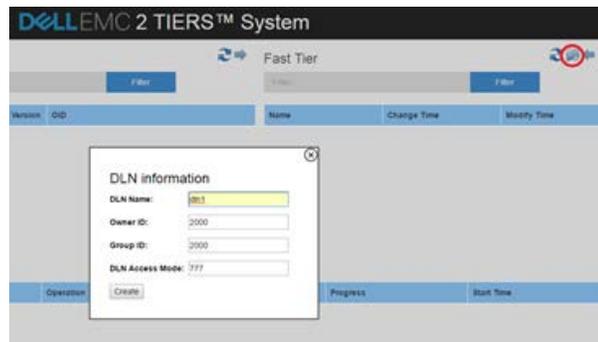
4. Use 2 TIERS™ System with Web Console

Now your cluster is running, and you can login our web console to use 2 TIERS™ system.

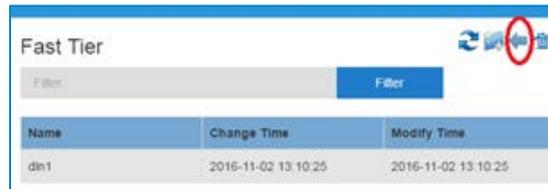
- 4.1 Click “Access” menu item and choose your cluster, then click the link under “2 TIERS™ Web Console” and use your CloudyCluster™ user/password to login.



- 4.2 After you log in to 2 TIERS™ system web console, you can click the file folder icon at the right top to create a DLN. You could create a DLN by clicking the file folder icon in the right top. For root access use UID=0 and GID=0. For other users, it will be auto-populated with the specific user credentials.



- 4.3 After DLN creation finishes, your DLN will be shown in “Fast Tier” list, which mean the DLN is on fast tier now. Then you can select the DLN and click on the “Unload DLN” button.



- 4.4 After unloading DLN, the DLN will appear in “Capacity Tier” list, which mean the DLN has been persisted to capacity tier.



- 4.5 Select the DLN and click the “Load DLN” button to promote the DLN to fast tier. When you have different versions for a single DLN, we recommend that you press the refresh button above “Capacity Tier” list to make sure latest version for the DLN is listed and selected before loading.



- 4.6 The DLN will be shown in both in “Fast Tier” and “Capacity Tier” lists, which means it has been promoted to fast tier from capacity tier. A simple DLN creation, unload and load procedures are done by now.



5. Schedule and Run Applications with Slurm on 2 TIERS™ System

Following is an example to run a MPI benchmark mdtest with Slurm on 2 TIERS™ system.

5.1 Upload application to AWS Login machine

Since login node in the CloudyCluster™ system has a public IP, you can get an application code from github on the Login node. Use github to get the application (mdtest in this example) on the Login node:

```
$ git clone https://github.com/MDTEST-LANL/mdtest
```

5.2 Build and copy binary on AWS Login node machines

After the source code is downloaded, login in to the terminal of Login node build the application binary and copy the binary to OrangeFS. For mdtest, you can use following command to compile and build:

```
/opt/mpich/bin/mpicc -Wall -Dlinux -D_FILE_OFFSET_BITS=64 -D_LARGEFILE_SOURCE=1
-D_USE_LARGEFILE64=1 -g -o mdtest mdtest.c -lm
```

You should have a shared directory /mnt/orangefs on login node and all the compute nodes. Now copy your application binary (mdtest in our example) to /mnt/orangefs/mdtest.

5.3 Prepare Slurm script file; mdtest.slurm

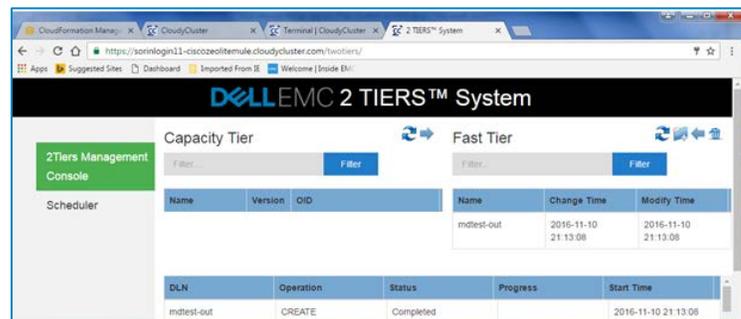
Following is an example of a Slurm script file to run mdtest, save it as a file in your local machine.

```
#!/bin/bash
#SBATCH --workdir=/mnt/orangefs/mdtest-slurm-md
#SBATCH -n 16
#SBATCH -N 8
#SBATCH -bb="size=1G"
#BB stage_in DLN=mdtest-out
#BB stage_out DLN=mdtest-out
/opt/mpich/bin/mpirun /mnt/orangefs/mdtest -n 400 -F -w 1024 -d /mnt/orangefs/mdtest-out
```

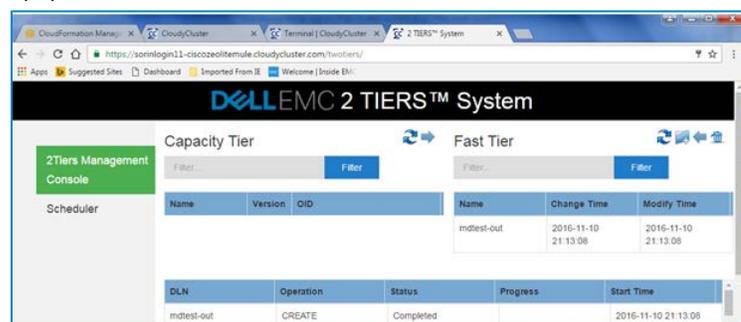
Before running the script create the Slurm working directory /mnt/orangefs/mdtest-slurm-md. The output files with the results of the run will be written to the Slurm working directory.

5.4 Create DLN with WebGUI

Before using WebGUI to run the Slurm job, the DLN should be created. Use step 4.2 to create a DLN named *mdtest-out*.



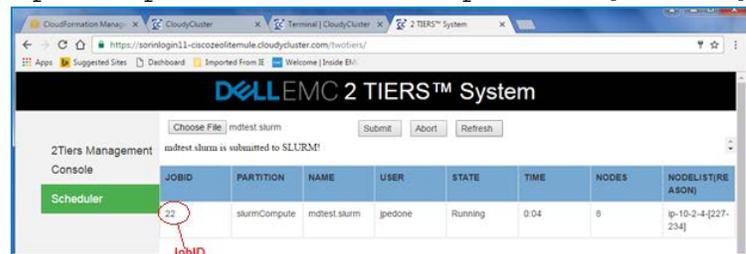
After this unload the DLN to CT (s3).



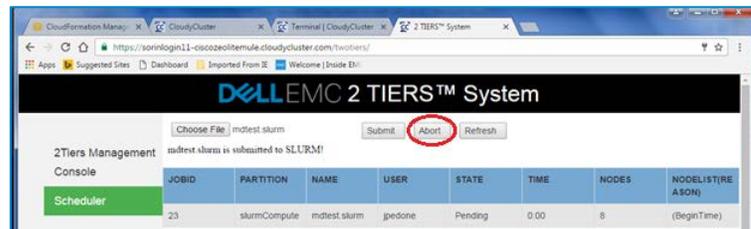
5.5 Run script from WebGUI

After creating DLN, now you can start to run the Slurm job. Click “Scheduler” item at the left side on 2 TIERS™ system web console, click “Choose File” button to select the script file saved at step 5.3, and then click the “Submit” button. The mdtest job will be shown in the job list. During the job run check availability of compute resources before starting the run using slurm *sinfo* command. Check that the resources are allocated correctly during the job running:

```
$ sinfo
PARTITION AVAIL TIMELIMIT NODES STATE NODELIST
slurmCompute* up infinite 8 alloc ip-10-2-4-[227-234]
```

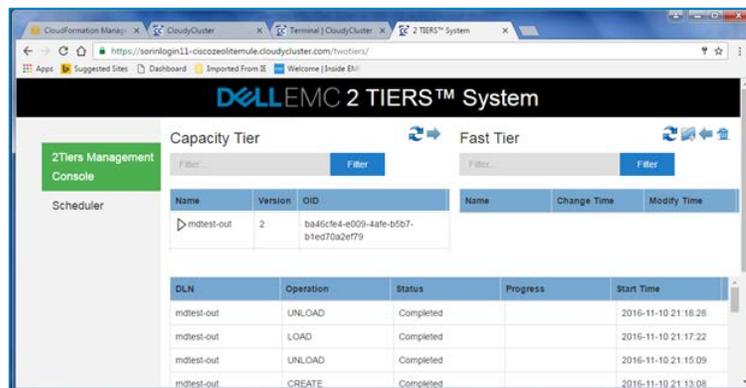


In case that the resources allocated do not match the script you can abort the job by highlighting the running job line and pressing Abort button.



5.6 Check the progress of Slurm job by refreshing the display

After the job finishes, you can login to login node terminal to check the result. In the WebUI you will now see a new version of the DLN in the CT marked as version 2.

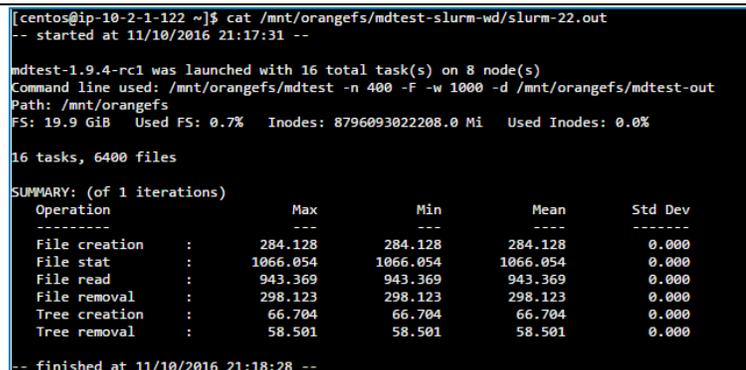


Note that all the DLN operations; CREATE, UNLOAD, LOAD, UNLOAD have completed and there is no DLN left in the FT.

5.7 Check out the result file

The results of the run will be saved in the file called: slurm-xx.out, where xx is the job ID of the scheduled job, 22 in the example of 5.5. You can check the output file in the Slurm working directory:

```
$ ls /mnt/orangefs/mdtest-slurm-wd/slurm-* -la
-rw-r--r--. 1 jpedone jpedone 1040 Nov 10 21:18 /mnt/orangefs/mdtest-slurm-wd/slurm-22.out
```



When you finished the run and the experiment do not forget to pause all the instances to reduce cost incurred.