

# JASMIN Workshop: Exercise 05: Batch run a script on LOTUS

## Scenario

Having established (in exercise 4) that I can extract the total cloud cover ("TCC") variable from a single ERA-Interim file I now wish to extract that data from an entire month.

## Objectives

Write script(s) to batch up separate processes that run CDO to extract the "TCC" variable from a series of ERA-Interim files. Each run of the script will loop through 4 x 6-hourly files for one day. I will run it 30 times, once for each day in September 2018. Each run will be sent to the LOTUS cluster.

## JASMIN resources

- LOTUS batch processing cluster
- Space to store the output file: `/group_workspaces/jasmin2/workshop/users/$USER/ex05`
- Access to the CDO (Climate Data Operators) tool
- Read-access to the ERA-Interim data set in the CEDA archive - requires a CEDA account

## Local resources

- SSH client (to login to JASMIN)

## Instructions

1. Start ssh-agent session and add JASMIN private key
2. SSH to a scientific analysis server
3. Write an `"extract-era-data.sh"` wrapper script that calls the CDO extraction command
4. Write a script, called `"submit-all.sh"`, to loop over dates from **01/09/2018** to **02/09/2018** and submit the `"extract-era-data.sh"` script to LOTUS for each day
5. Run the `"submit-all.sh"` script
6. Examine which jobs are in the queue
7. Examine the standard output and standard error files
8. Modify `"submit-all.sh"` so that it will run for all 30 days in September 2018
9. Re-run the `"submit-all.sh"` script
10. Examine which jobs are in the queue
11. Kill one of the jobs - just to see how it is done

## Review

This exercise demonstrates how to:

- Create a script that takes an argument to process a single component (day) of an overall task.
- Create a wrapper script that loops through all the components that need to be processed.
- Submit each component as a LOTUS job using the `"bsub"` command.
- Define the command-line arguments for the `"bsub"` command.
- Use other LSF commands, such as `"bjobs"` (to monitor progress) and `"bkill"` (to kill jobs).

## Alternative approaches and best practice

- Build up in stages before running your full workflow on LOTUS
- Write the output to a "scratch" directory
- Specify the memory requirements for your job
- *Have any files been accidentally left on the system? (E.g. in `/tmp/`)*

# Cheat sheet for Exercise 05: Batch run a script on LOTUS

1. Start ssh-agent session and add JASMIN private key

```
exec ssh-agent $SHELL
ssh-add ~/.ssh/id_rsa_jasmin
```

2. SSH to a scientific analysis server

```
ssh -A <username>@jasmin-login1.ceda.ac.uk
ssh jasmin-sci5 # Could use sci[123456]
```

3. Write an "extract-era-data.sh" wrapper script that calls the CDO extraction command, that:

- a. Takes a date string ("YYYYMMDD") as a command-line argument
- b. Locates the 4 x 6-hourly input file paths for the date provided
- c. Activates environment containing the CDO tool
- d. For each 6-hourly file:
  - i. Defines the output file path
  - ii. Run the CDO tool to extract the "TCC" variable from the input file to the output file
- e. If you are stuck, you can use the script located at:

/group\_workspaces/jasmin2/workshop/exercises/ex05/code/extract-era-data.sh

[ Source:

<https://github.com/cedadev/jasmin-workshop/blob/master/exercises/ex05/code/extract-era-data.sh> ]

4. Write a script, called "submit-all.sh", to loop over dates from 01/09/2018 to 02/09/2018 and submit the "extract-era-data.sh" script to LOTUS for each day:

- a. You will need to define the following LOTUS directives:
  - i. Standard output file - please ensure this is unique to each job by including the "%J" variable in the file name.
  - ii. Standard error file - please ensure this is unique to each job by including the "%J" variable in the file name.
  - iii. Queue name:
    1. During the workshop you can use queue: "workshop"
    2. Default queue for new users: "new\_users"
    3. Default queue for established users: "short-serial"
  - iv. Job duration - to allocate a maximum run-time to the job, e.g.: "00:05"

- b. The Help page on submitting LOTUS jobs is here:

<https://help.jasmin.ac.uk/article/113-submit-jobs>

- c. And use the "bsub" command to submit each job.

- d. If you need some advice you can use the script at:

/group\_workspaces/jasmin2/workshop/exercises/ex05/code/submit-all.sh

[ Source:

<https://github.com/cedadev/jasmin-workshop/blob/master/exercises/ex05/code/submit-all.sh> ]

5. Run the "submit-all.sh" script
6. Examine which jobs are in the queue
  - a. Type "bjobs" to review any running jobs.
7. Examine the standard output and standard error files.
8. If you are happy that the job is doing the right thing, now modify "submit-all.sh" so that it will run for all 30 days in September 2018.
9. Re-run the "submit-all.sh" script.
10. Examine which jobs are in the queue
11. Kill one of the jobs whilst it is still running - just to see how it is done:
  - a. Use the "bkill" command:

```
bkill <job_id>
```

## Alternative approaches and best practice

- Build up in stages before running your full workflow on LOTUS:
  - This is really good practice!
    - 1. Check your code - is it *really* doing what you think it is doing?
    - 2. Run locally (on a "sci" server) for one iteration.
    - 3. Run for one or two iterations on LOTUS.
    - 4. Check everything ran correctly on LOTUS.
    - 5. Submit your full batch of jobs to LOTUS.
- Write the output to a "scratch" directory.
  - There are two main scenarios in which you might write the output to a scratch directory:
    - 1. You only need to store the output file for temporary use (such as intermediate files in your workflow).
    - 2. You want to write outputs to scratch before moving them to a GWS.
  - The Help page (<https://help.jasmin.ac.uk/article/176-storage#diskmount>) tells us that there are two types of scratch space:
    - /work/scratch – supports parallel writes
    - /work/scratch-nompio – does NOT support parallel writes
  - Since we do not need parallel write capability, we can use the "nompio" version.
  - You need to set up a directory under "/work/scratch-nompio" as your username:

```
MYSCRATCH=/work/scratch-nompio/$USER  
mkdir -p $MYSCRATCH
```
  - Then you would write output files/directories under your scratch space, e.g.:

```
OUTPUT_FILE=$MYSCRATCH/output.nc  
...some_process... > $OUTPUT_FILE
```
  - When you have finished with the file, tidy up (good practice).

```
rm $OUTPUT_FILE
```

- Do not leave data on the "scratch" areas when you have finished your workflow.
  - Please remove any temporary files/directories that you have created.
  - You cannot rely on the data persisting in the "scratch" areas.
- Specify the memory requirements of your job:
  - If your job has a significant memory footprint:
    - Run a single iteration on LOTUS and review the standard output file to examine the memory usage.
    - You can then reserve a memory allocation when you submit your subsequent jobs.
    - See help pages:  
<https://help.jasmin.ac.uk/article/115-how-to-estimate-job-resources>  
<https://help.jasmin.ac.uk/article/112-how-to-allocate-resources#memcontrol>
- *Have any files been accidentally left on the system? (E.g. in /tmp/)*
  - It is important to clean up any temporary files that you no longer need.
  - Please check whether the tools you use have left any files in "/tmp/".