

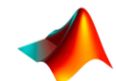


# TUTORIAL 01:

## CREATE THE WORKING ENVIRONEMENT

# OBJECTIVES

- Review some basic instructions to **prepare the working environment**
- Discover the CHPC **cluster** called LENGAU
- Log onto the super-computer
- Copy the CROCO and CROCO\_TOOLS directories
- Test your working environment   

# USEFUL DOCUMENTS

## BASIC LINUX COMMANDS

Here is a list of commands and softwares we will use throughout the CROCO Training week.

### 1: Basic Linux commands



Linux command	Description	Linux command example
<b>cd</b>	Change director with a specific path	<b>cd</b> lustre/croco; cd ..;
<b>clear</b>	Clear the screen	<b>clear</b>
<b>cp</b>	Copy file(s)	<b>cp</b> path1/file1 path2/file2
<b>diff</b>	Compare the content of files	<b>diff</b> file1 file2
<b>exit</b>	Log out of Linux	<b>exit</b>
<b>grep</b>	Find a string of text in a file	<b>grep</b> "NBPROCS" file1
<b>head</b>	Display the heading of a file	<b>head</b> file1
<b>ls</b>	List contents of a directory	<b>ls</b> path1/directory1
<b>ln</b>	Create a symbolic link	<b>ln -sf</b> /mnt/lustre lustre
<b>mv</b>	Move file(s) or rename file(s)	<b>mv</b> path1/file1 path2/file2
<b>mkdir</b>	Create a directory	<b>mkdir</b> directory
<b>rm</b>	Delete file(s)	<b>rm</b> file1
<b>rmdir</b>	Remove an empty directory	<b>rmdir</b> directory
<b>tail</b>	Display the end of a file	<b>tail</b> file1
<b>tar</b>	Store, list, or extract file in an archive	<b>tar</b> file1
<b>scp</b>	Copy file(s) from/to a distant machine	
<b>ssh</b>	Connect to a distant machine	<b>ssh</b> login@lengau.chpc.ac.za
<b>vi</b>	Edit file(s) with simple text editor	<b>vi</b> file1

### 2: List of useful softwares and how to execute them

- Text editor: **nedit**
  - ↳ Execute **nedit file1**
- To pre- and post- process CROCO files: Matlab (<https://mathworks.com>)
  - ↳ Execute **matlab**
- To display the header of a NetCDF file: NetCDF library
  - ↳ Execute **ncdump -h my\_NetCDF\_file.nc**
- To inspect a NetCDF file: Ncview
  - ↳ Execute **ncview my\_NetCDF\_file.nc**
- To manipulate NetCDF files: NCO tools
  - ↳ Concatenate files: **ncrcat CROCO\_avg\*.nc My\_CROCO\_file.nc**
  - ↳ Extract a variable: **nccks -v Myvar My\_CROCO\_file.nc My\_CROCO\_Myvar.nc**

## LENGAU CLUSTER AT CHPC

The main system at the CHPC for high performance computing is a cluster supercomputer called Lengau — cheetah in seTswana. This peta-scale system consists of Dell servers, powered by Intel processors, using FDR InfiniBand by Mellanox and is managed by the Bright Cluster Manager.



### 1: The Cluster

- The CHPC's Dell Linux cluster has been up and running since 2014.
  - ↳ The system is a homogeneous cluster, comprising Intel 5th generation CPUs. As of March 2017 it has 1368 compute nodes with 24 cores and 128 GiB memory (360 nodes have only 64 GiB) each, and five large memory "fat" nodes with 56 cores and 1 TiB each, all interconnected using FDR 56 Gb/s InfiniBand accessing 4 PB of shared storage over the Lustre filesystem.
- The cluster has both NFS and the Lustre filesystems over Infiniband:

Mount Point	File System	Size	Quota	Backup
/home	NFS	80Tb	15GB	NO
/mnt/lustre/users	lustre	4PB	None	NO

### 2: The installed softwares/libraries

- CHPC uses the GNU modules utility, which manipulates your environment, to provide access to the supported software in /apps.
  - ↳ Directly in your **.bashrc**, we will load the following modules to use the associated software/libraries: Matlab, Ncview, Intel Fortran Compilers, NCO tools, ...

Command	Description
<b>module purge</b>	Remove all loaded modules
<b>module avail</b>	List of available modules
<b>module list</b>	List currently loaded modules
<b>module help</b>	Give information of a particular module file's operations

### 3: Job Scheduler

- The CHPC cluster uses **PBSPro** as its job scheduler. With the exception of interactive jobs, all jobs are submitted to a batch queuing system and only execute when the requested resources become available. All batch jobs are queued according to priority. A user's priority is not static: the CHPC uses the "Fairshare" facility of PBSPro to modify priority based on activity. This is done to ensure the finite resources of the CHPC cluster are shared fairly amongst all users.

PBS Pro commands	Description	PBS command example
<b>qsub</b> [script file]	Job submission	<b>qsub</b> run_croco.pbs
<b>qstat-u</b> login	Job status (for user)	<b>qstat -u</b> sillig (or the alias <b>qs</b> )
<b>qstat-f</b> [job_id]	Extended job status	<b>qstat -f</b> 10098976
<b>qdel</b> [job_id]	Job deletion	<b>qdel</b> 10098976
<b>qstat-Q</b>	List of usable queues	

# STEP 1: Logging onto the HPC cluster

- From a terminal/konsole:

```
ssh -X login@lengau.chpc.ac.za
```

```
ssh -X login@scp.chpc.ac.za
```

- Practice some basic Linux commands: **cd** and **ls**
- If your lustre directory does not exist:

```
ln -sf /mnt/lustre/users/login lustre
```



# STEP 2: Requesting some interactive nodes

- Replace your **.bashrc** file with mine:

```
cp /home/apps/chpc/earth/CROCCO_Workshop/  
CROCO_TRAINING_Basic/3_Some_files/.bashrc ~/
```

```
source ~/.bashrc
```



- Request one node with the alias command **qsubi1**

```
qsubi1
```



- Go back to your lustre directory.

# STEP 3: Copying the source code of the CROCO model

- In your **lustre** directory, copy **CROCO** source code:

```
cp -r /home/apps/chpc/earth/CROCCO_Workshop  
/CROCO_TRAINING_Basic/1_CROCO_code/croco-v2.0.1 .
```

- List the content of the **croco-v2.0.1** directory:

```
cd croco-v2.0.1; ls
```

NODES

- Go back to your lustre directory.

# STEP 4: Copying the source code of the CROCO tools

- In your **lustre** directory, copy **CROCO\_TOOLS** source code:

```
cp -r /home/apps/chpc/earth/CROCCO_Workshop  
/CROCO_TRAINING_Basic/2_CROCO_tools/croco_tools-v2.0.1 .
```

- List the content of the **croco\_tools-v2.0.1** directory:

```
cd croco_tools-v2.0.1; ls
```

NODES

- Go back to your lustre directory.

# STEP 5: Testing MATLAB Software

- Copy two files into your **lustre** directory:

```
cp /home/apps/chpc/earth/CROCCO_Workshop  
/CROCO_TRAINING_Basic/3_Some_files/TP* .
```

- Start Matlab:

```
matlab -nodesktop
```

NODES

- Launch the test script:

```
TP0_test_script
```





# STEP 6: Exiting

- Exit Matlab:

```
exit
```



- Give back the compute node:

```
exit
```



- Logoff the Lengau cluster:

```
exit
```

