Using Cirrus

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Getting a Cirrus account

If you are a student on EPCC's MSc programmes, you will be given an account on Cirrus as part of your induction.

If you are on another programme, you need to apply for an account on Cirrus.

Software requirements

You need access to the Secure Shell (SSH) and you need to be able to display X11 Linux graphical applications on your laptop.

Linux users

- Check you can open a command-line terminal (shell) window.

Mac users

- Check you can open a Mac terminal.
- Download and enable **XQuartz** https://www.xquartz.org/.

Windows users

There are many SSH clients available for Windows. We strongly recommend you install **MobaXterm** https://mobaxterm.mobatek.net/, a free terminal for windows including an SSH client and X11 graphics support and SSH client.

- Visit https://mobaxterm.mobatek.net/download.html.
- Under Home Edition, click Download now.
- Click MobaXterm Home Edition (Installer edition).
- Extract the `MobaXterm_Installer` zip file and double-click the `MobaXterm_installer msi` file.

Create an account on the Cirrus Administration web site (SAFE)

To create an account on SAFE:

- Visit SAFE https://safe.epcc.ed.ac.uk/.
- Click Create an account.
- Complete the Registration form:
    - You **must** use your University e-mail address for your SAFE account. Please **check** and **double-check** that your email address is correct when you register for SAFE. If you type it in wrong, or use the wrong email address, then you will not be able to apply for a Cirrus account as there will be no way to contact you!

    - By default, Nationality will be listed as "United Kingdom". You **must** change this to be your own nationality.

Once your SAFE account has been created, you will be emailed an automatically-generated password.

Change your SAFE password:

- Visit SAFE https://safe.epcc.ed.ac.uk/ and log in using your SAFE password.
- Select Your details => Change website password.
- Enter a New password.
- Enter a New password (again).
- Click Change.

Create an SSH key

To create an account on Cirrus itself you need to create an SSH key and upload this to SAFE.

Note that, although you will need to copy the **public** version of your key (`id_rsa.pub`) to websites and other systems. The only copy of your **private key** should be the original one on your own machine.

Linux/Mac users

- Open a command-line terminal (shell) window.
- Run:

```
$ ssh-keygen -t rsa -C "YOUR-EMAIL-ADDRESS"
```

- When prompted to `Enter file in which to save the key (<PATH-TO-YOUR-HOME-DIRECTORY/.ssh/id_rsa)`, accept this default and press enter.
- When prompted, enter a passphrase. Your key **must** be protected by a passphrase.
- A public key (`id_rsa.pub`) and private key (`id_rsa`) will be created in your `.ssh/` folder.

Windows users

- Double-click MobaXterm icon to start MobaXterm.
- Select Tools => MobaKeyGen (SSH key generator).
- Select Type of key to generate: RSA
- Click Generate.
- Follow the on-screen instructions.
- Enter:
    - Key comment: YOUR-EMAIL-ADDRESS
    - Key passphrase: Enter a passphrase. Your key **must** be protected by a passphrase.
    - Confirm passphrase: Enter your passphrase again.
- Click Save public key, and save to file `cirrus_pub.ppk`.
- Click Save private key, and save to file `cirrus.ppk`.
- You also need to save a copy of the public key at the top of the window - titled "Public key for pasting into OpenSSH authorized_keys file" - into a file. Open a text editor (e.g. Notepad), cut-and-paste **all** the

text from the window, and save to a file called `id_rsa.pub`. Make sure you copy *all* the contents. This should look something like:

```
ssh-rsa ...VERY-LONG-STRING-OF-RANDOM-CHARACTERS... == rsa-key-20200214
```

- or:

```
ssh-rsa ...VERY-LONG-STRING-OF-RANDOM-CHARACTERS... == YOUR-EMAIL-ADDRESS
```

Create an account on Cirrus

Apply for a Cirrus machine account on SAFE:

- Visit SAFE https://safe.epcc.ed.ac.uk/ and log in using your SAFE password.
- Select Login accounts => Request login account.
- Select Project:
  - The project code you should select depends on which programme you are doing and the school that is running it:
    - Students on EPCC's MSc on-campus programmes, select `dc134`.
    - Students on EPCC's MSc online programmes, select `dc034`.
    - Students on other programmes doing individual EPCC **semester 1** MSc courses, select `dc135`.
    - Students on other programmes doing individual EPCC **semester 2** MSc courses, select `dc136`.
- Click Next.
- You should see a page with Cirrus selected.
- Click Next.
- Enter Requested username. This **must** be your UUN (e.g. s1234567). If you already have an account on Cirrus (from another course or project) then replace 's' with 't' (e.g. t1234567) or 'u' (e.g. u1234567) or another letter.
- For SSH public key, click Choose file and select your file that you created above, `id_rsa.pub`.
- Click Request.

Note that, if using Linux, you may need to turn on the "show hidden files" option to see your `.ssh` directory in the file chooser.

Once your account request is approved (which is done by EPCC's MSc staff), and your account is created (which is an automated process), you will receive an email. You can then get your Cirrus password.

If you do not receive an email, please check your spam folders. If you are reading email using a local client, then check your spam folder on https://www.office365.ed.ac.uk as it may have been collected by your University email spam filter. Alternatively:

- Visit SAFE https://safe.epcc.ed.ac.uk/ and log in using your SAFE password.
- Select Login accounts => YOUR-USER-NAME@cirrus menu option.

- If the Status is New or Pending then an account still has to be created. If the Status is Active your account has been created.

Retrieve your Cirrus password from SAFE:

- Visit SAFE https://safe.epcc.ed.ac.uk/ and log in using your SAFE password.
- Select Login accounts => YOUR-USER-NAME@cirrus menu option.
- Click View Login Account Password to view your password.

Note that the password your retrieve from SAFE is an initial **one shot password** which you will have to change when you first log in. Note also that it **will not be updated** to reflect any subsequent password changes you make on Cirrus.

Accounts and passwords

You will now have two usernames and three passwords:

- Username and password for the Cirrus SAFE. These are used for accessing the Cirrus SAFE website only.
- SSH key passphrase for accessing Cirrus. This is used for accessing Cirrus.
- Cirrus username and password for Cirrus. This is also used for accessing Cirrus.

Connecting to Cirrus

You do not need to be logged into the University VPN (virtual private network) to connect to Cirrus.

Linux/Mac users

Run:

```
$ ssh -Y YOUR-USER-NAME@login.cirrus.ac.uk
```

(the `-Y` flag allows remote programs, especially graphical applications, to open windows on your local machine).

You will be prompted for your SSH key passphrase.

Once this is accepted you will then be prompted for your Cirrus password.

The **first time you log in** you will be asked to change your password:

```
WARNING: Your password has expired.
You must change your password now and login again!
Changing password for user s1234567.
(current) LDAP Password:
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
Connection to login.cirrus.ac.uk closed.
```

Your "LDAP password" is the one-shot password you retrieved from the SAFE.

Note that, when you type in your new password, no characters will be displayed on the screen, i.e. you **will not** see **********.

You will be logged off, and you can then log back on using your new password.

Windows users using MobaXterm

Create a session configuration (you only need to do this once):

- Double-click MobaXterm icon to start MobaXterm
- Click Session icon
- Click SSH tab
- Enter Remote host: login.cirrus.ac.uk
- Click/check Specify username
- Enter: YOUR-USER-NAME
- Click Advanced SSH settings tab
- Click/check Use private key, and select your `cirrus.ppk` file
- Click/check X11-Forwarding
- Click OK

Under User sessions, double-click login.cirrus.ac.uk.

You will be prompted for your SSH key passphrase.

Once this is accepted you will then be prompted for your Cirrus password.

The **first time you log in** you will be asked to change your password:

```
WARNING: Your password has expired.
You must change your password now and login again!
Changing password for user s1234567.
(current) LDAP Password:
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
Connection to login.cirrus.ac.uk closed.
```

Your "LDAP password" is the one-shot password you retrieved from the SAFE.

Note that when you type in your new password no characters will be displayed on the screen, i.e. you **will not** see **********.

You will be logged off, and you can then log back on using your new password.

Uploading additional SSH keys to SAFE

You can upload additional SSH keys as follows:

- Visit SAFE https://safe.epcc.ed.ac.uk/ and log in using your SAFE password.
- Select Login accounts => YOUR-USER-NAME@cirrus menu option.
- Click Add Credential.
- Click Next.
- Click Choose file and select your SSH key file, `<KEY>.pub`.

More information

For more information, see:

- EPCC SAFE Documentation https://epcced.github.io/safe-docs/.
- Upload public part of key pair to SAFE https://cirrus.readthedocs.io/en/master/user-guide/connecting.html?highlight=ssh-keygen#upload-public-part-of-key-pair-to-safe.
- Connecting to Cirrus https://cirrus.readthedocs.io/en/master/user-guide/connecting.html).

Passphrases and security

Your private key **must** be protected by a passphrase. If this is not the case then anyone that gets access to your machine can also then get access to Cirrus.

Do **not** share your passphrase with anyone. Treat it as you would your passwords!

Job submission on Cirrus

You will have your own sub-budget on Cirrus, if you are submitting batch jobs. Your budget code is the project code - `dc134` or `dc034` or `dc135` or `dc136` - combined with your student number e.g. `dc134-s1234567` or `dc034-s1234567` or `dc135-s1234567` or `dc136-s1234567`. You should use your own budget code in any PBS batch job scripts.

Software on Cirrus

This section summarises some of the software available on Cirrus and used within the Programming Skills course.

Some of the packages on Cirrus require one or more modules to be loaded first. Once you have loaded a module you don't need to load it again for the duration of your session.

Editors

```
$ emacs
$ vi
$ nano
```

Compilers and interpreters

GCC/GFORTRAN 6.3.0:

```
$ module load gcc
$ gcc
$ gfortran
```

Java 14.0.1:

```
$ module load java/jdk-14.0.1
$ javac
$ java
```

Anaconda Python 2.7.16 and related packages:

```
$ module load anaconda/python2
$ python
$ nosetests
$ pytest
$ py.test # Deprecated alias for py.test. pytest is preferable.
$ ipython
$ conda
$ pip
$ pylint
$ pycodestyle
```

Python 3.6.6 and related packages:

```
$ module load anaconda/python3
$ python
$ nosetests
$ py.test
$ ipython
$ conda
$ pip
$ pylint
$ pycodestyle
```

If switching from `anaconda/python2` to `anaconda/python3`, or vice versa, you will first have to unload the currently loaded Python module. This can be done using `module unload MODULE-NAME` (for example, `module unload anaconda/python2`)

R 3.6.3:

```
$ module load R
$ R
$ Rscript
```

Integrated development environments

```
$ module load eclipse/2020-09
$ eclipse
```

Rstudio is not available on Cirrus.

Build tools

GNU Make 4.2.1:

```
$ make
```

CMake 3.17.3:

```
$ module load cmake
$ cmake
```

Apache ANT https://ant.apache.org/:

```
$ module load ant
```

ANT can alternatively be downloaded and installed in your home directory:

- Download:

```
$ curl -LO https://downloads.apache.org/ant/binaries/apache-ant-1.10.8-bin.tar.gz
$ tar -xvf apache-ant-1.10.8-bin.tar.gz
```

- Set PATH and load Java module:

```
$ module load java/jdk-14.0.1
$ export PATH=~/apache-ant-1.10.8/bin:$PATH
```

- Run ANT:

```
$ ant
```

- Add the `export` and `module load` commands to your `.bash_profile` file so that the `PATH` is set and the modules are loaded every time you log in or create a new bash shell.
- For full installation instructions see ANT's web site.

Debuggers

```
$ module load gdb
$ gdb
```

Profilers

```
$ module load valgrind
$ valgrind
```

Intel VTune:

```
$ module load intel-vtune-19/2019.0.2.570779
$ amplxe-cl
$ amplxe-gui
```

Alternatively module `intel-vtune-18/2018.4.0.573462` can be used.

gprof:

```
$ gprof
```

DDT:

```
$ module load forge
$ ddt
```

Version control

```
$ module load svn
$ svn

$ git
```

File transfer

```
$ curl
$ wget
$ ssh
$ scp
$ sftp
```

Bundling

```
$ tar
$ zip
$ unzip
$ gzip
$ gunzip
```

Images

```
$ module load ImageMagick
$ display
$ animate
```

Show available modules

```
$ module avail -t
```