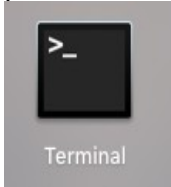
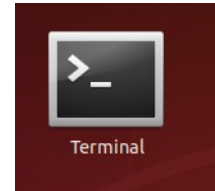


Accessing the Teaching Linux Farm remotely from Mac or Linux systems

Many/most of the software required for taught courses is available on the department's teaching Linux farm, which can be accessed from home machines (desktop or laptop). This uses a *Secure Shell* connection (SSH). Both Mac and Linux systems typically include an `ssh` client as part of the standard installation – Windows systems may require additional software to be installed to provide this functionality.



For both Mac and Linux systems, the first step is to start a **Terminal** application. This will display a terminal window, where commands can be given to the local system. (The screenshots shown here are from a Linux system – the behaviour on a Mac will be very similar)



There are (currently) eight systems making up the teaching Linux farm – these are named `lxfarm01.csc.liv.ac.uk` through to `lxfarm08.csc.liv.ac.uk`.

The available software and configuration of these systems should be exactly the same – you can choose any one of these machines. If a particular machine is not available (or seems overloaded), simply disconnect and choose a different one.

SSH connection

To connect to one of these systems, type the command `ssh` into the **Terminal** window, together with your University username, and the name of the chosen machine (separated by the @ sign). Then press Return

A screenshot of a terminal window titled 'daves@dts3: ~'. The menu bar shows 'File Edit View Search Terminal Help'. The prompt is 'daves@dts3:~\$' and the command 'ssh daves@lxfarm03.csc.liv.ac.uk' is being entered at the end of the line.

(Note that if your username on the local machine happens to be the same as your University username, then you can omit the *username@* element. But if in any doubt, keep it in)

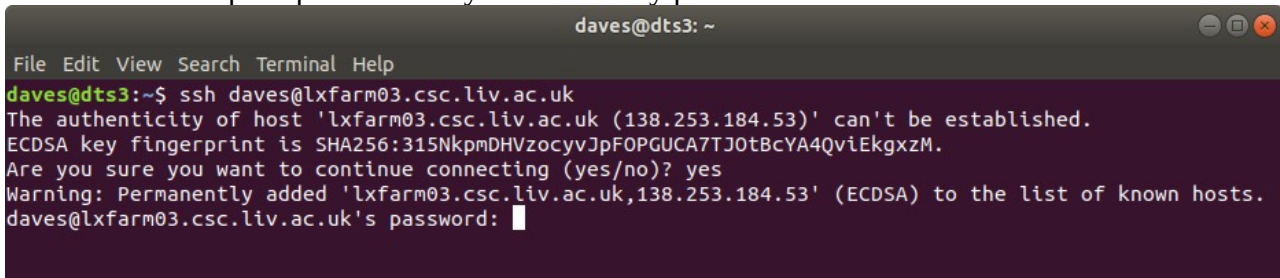
The very first time that you connect to a particular machine, you will be asked to confirm that this is the system you expect – in most circumstances this *digital fingerprint* is pretty meaningless, so just type **yes** (followed by Return)

A screenshot of a terminal window titled 'daves@dts3: ~'. The menu bar shows 'File Edit View Search Terminal Help'. The prompt is 'daves@dts3:~\$' and the command 'ssh daves@lxfarm03.csc.liv.ac.uk' has been executed. The output shows: 'The authenticity of host 'lxfarm03.csc.liv.ac.uk (138.253.184.53)' can't be established. ECDSA key fingerprint is SHA256:315NkpmDHVzocyvJpFOPGUCA7TJ0tBcYA4QviEkgxzM. Are you sure you want to continue connecting (yes/no)? yes'.

The next time you connect **to the same machine**, the fingerprint will be checked automatically, and you should not be prompted for this again (as long as the fingerprint matches).

If you choose a different system within the teaching Linux farm, then you'll get a similar prompt for that new machine (but with a different fingerprint).

You will then be prompted to enter your University password.



```
daves@dts3: ~  
File Edit View Search Terminal Help  
daves@dts3:~$ ssh daves@lxfarm03.csc.liv.ac.uk  
The authenticity of host 'lxfarm03.csc.liv.ac.uk (138.253.184.53)' can't be established.  
ECDSA key fingerprint is SHA256:315NkpmDHVzocyvJpFOPGUCA7TJ0tBcYA4QviEkgxzM.  
Are you sure you want to continue connecting (yes/no)? yes  
Warning: Permanently added 'lxfarm03.csc.liv.ac.uk,138.253.184.53' (ECDSA) to the list of known hosts.  
daves@lxfarm03.csc.liv.ac.uk's password: █
```

Note that this whole connection is encrypted, so the password (or anything else you type) cannot be intercepted or read while crossing the Internet. This is the same idea as secure web pages (**https**)

Two factor authentication

Following an increase in security exploits targeting universities in recent weeks, there is now a second authentication step required before you can start using these systems.

Once you have supplied the username and (correct) password, you will be asked to select a *Duo Push* challenge to a registered device (typically a mobile phone or tablet) and confirm this request via a dedicated app running on that device.



```
daves@dts3: ~  
File Edit View Search Terminal Help  
daves@dts3:~$ ssh daves@lxfarm03.csc.liv.ac.uk  
Password:  
Duo two-factor login for daves  
  
Enter a passcode or select one of the following options:  
  
1. Duo Push to +XX XXXX XXXXXX  
2. Duo Push to Android  
3. SMS passcodes to +XX XXXX XXXXXX (next code starts with: 2)  
  
Passcode or option (1-3): █
```

Alternatively, you will have the option to generate a challenge code, sent by SMS text message to your registered phone, which should then be entered on the terminal.

Note that in both cases, you will need to have registered your phone (and/or other device) with the University two-factor authentication scheme before starting to use the teaching farm systems. This can be done via the URL <https://duoenrolment.liverpool.ac.uk/>

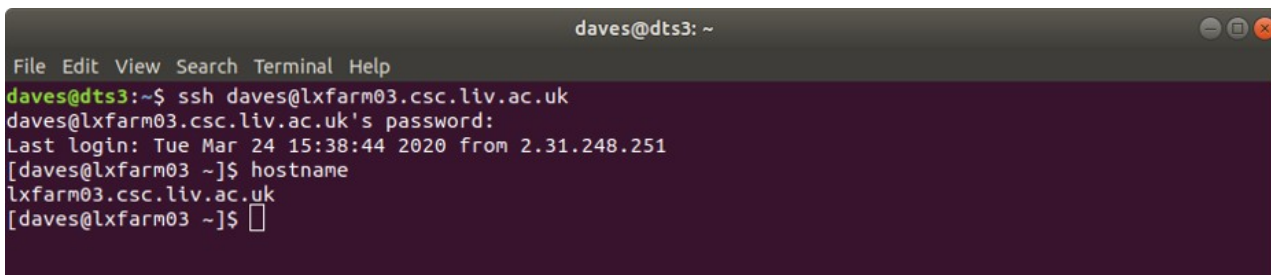
The system `lxfarm08.csc.liv.ac.uk` is configured slightly differently, and will not offer this choice of options – instead it will automatically send the challenge to the primary registered device. This is to aid with SSH-tunnelling services (such as MySQL Workbench, or remote file editing) where the terminal prompts are not always visible or interactively accessible.

There is more information about the University's Duo two-factor authentication mechanism at <https://s.liv.ac.uk/708>

Shell session

Once you have confirmed the login request (either via the *Duo mobile* app, or the SMS code), you will be logged into the chosen system, and can run Linux commands on that machine. For text-based commands, the output will be shown in the same **Terminal** window – graphical commands *should* open up a new window on your local display. If this does not happen (and you need to run such a graphical application), then disconnect from the Linux system (see below), and re-connect using the command

```
ssh -X username@lxfarmNN.csc.liv.ac.uk
```



```
daves@dts3: ~
File Edit View Search Terminal Help
daves@dts3:~$ ssh daves@lxfarm03.csc.liv.ac.uk
daves@lxfarm03.csc.liv.ac.uk's password:
Last login: Tue Mar 24 15:38:44 2020 from 2.31.248.251
[daves@lxfarm03 ~]$ hostname
lxfarm03.csc.liv.ac.uk
[daves@lxfarm03 ~]$
```

Note that immediately after logging in, you will be informed of the time and source (IP address) of the last successful login session. (Note that one consequence of introducing the Duo two-factor authentication is that this will now *always* be reported as a numeric IP address).

If you do not recognise this connection, please inform the CS technical team immediately by emailing CSC-HELPDESK@liverpool.ac.uk You may also wish to change your password.

When reporting this, or any other issue with the system, it is extremely helpful to include details of which Linux machine you were using (which should now appear as part of the command prompt), and the date & time any problem occurred. If you're not sure which system you're on, the command `hostname` will also show this information (*see above*).

When you have finished with the session, use the command `exit` to disconnect, and return you to the local machine. You can then close the **Terminal** window, as usual.

Note that closing the **Terminal** window *without* first `exit`ing from the Linux system may leave processes running on that Linux farm machine, and could cause problems in the future.

File Transfers

A very similar procedure can be used to transfer files between your home machine, and the University systems.

Instead of the (local) command `ssh {username}@lxfarm{NN}.csc.liv.ac.uk`, issue the command `sftp {username}@lxfarm{NN}.csc.liv.ac.uk`
Then log in as before (including the Duo Push validation). This will then give you a file transfer session, rather than the terminal session described above.

There are four main actions that might be required: listing the files in the current directory (either on the local machine, or the remote system), reporting which the current directory actually is (both local and remote), changing this current directory (local and remote), and transferring a given file or files (in either direction).

The commands to perform these actions are as follows:

	<i>Local (home machine)</i>	<i>Remote (LXFarm)</i>
List files	<code>ls</code>	<code>! ls</code>
Report current directory	<code>pwd</code>	<code>! pwd</code>
Change current directory (use <code>cd ..</code> to move up a level)	<code>cd {directory}</code>	<code>lcd {directory}</code>
Upload file (local → remote)	<code>put {file}</code>	
Download file (remote → local)	<code>get {file}</code>	
Close connection	<code>exit or quit</code>	