

Accessing Research systems remotely from Mac or Linux systems

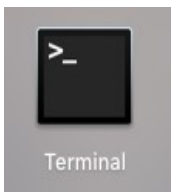
Unlike the department's teaching Linux farm, which can be accessed directly from home machines (desktop or laptop), connecting to research systems on the departmental internal network is a multi-stage process, using a *Secure Shell* connection (SSH). Both Mac and Linux systems typically include an `ssh` client as part of the standard installation – Windows systems may require additional software to be installed to provide this functionality.

Increased security measures

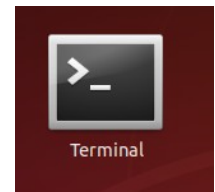
Unfortunately, following an increase in security exploits targeting universities, the departmental research systems are now only accessible if you first set up a VPN connection via the University's Cisco AnyConnect system. This needs to be done before attempting to connect to the SSH gateway systems described below. See <https://www.liverpool.ac.uk/csd/vpn/> for more details. Note that this will also trigger a Duo 2-Factor Authentication challenge.

Alternative it is possible to set up a *departmental VPN connection* to the departmental internal network, which avoids the need to go via the SSH gateway systems altogether. This approach is documented separately – see the document [VPN \(Linux\)](#) or [VPN \(Mac\)](#) in the section [Guides](#) on the departmental intranet server for more details.

Terminal connection



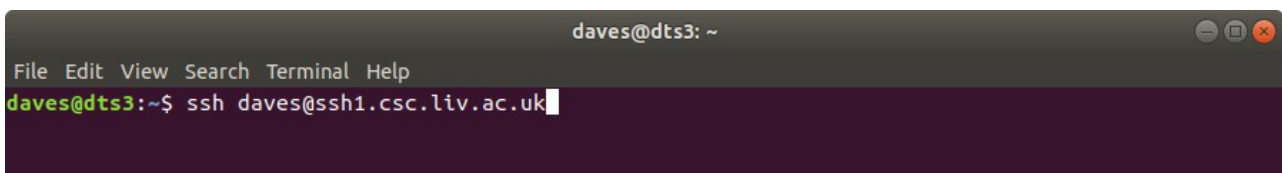
For both Mac and Linux systems, the first step is to start a **Terminal** application. This will display a terminal window, where commands can be given to the local system. (The screenshots shown here are from a Linux system – the behaviour on a Mac will be very similar)



There are two SSH gateway systems providing access into the departmental internal network – these are named `ssh1.csc.liv.ac.uk` and `ssh2.csc.liv.ac.uk`.

The available software and configuration of these two systems are slightly different – however their primary purpose is simply to provide a stepping stone to other systems within the department. They can handle simple processing tasks, but anything more demanding should be run on more powerful or specialist equipment. If either machine is not available, please use the other one (and report the problem to the technical staff).

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

A screenshot of a terminal window. The title bar reads 'daves@dts3: ~'. The menu bar includes 'File Edit View Search Terminal Help'. The prompt is 'daves@dts3:~\$' and the command 'ssh daves@ssh1.csc.liv.ac.uk' is entered.

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

The very first time that you connect to one of these machines, 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)

```
daves@dts3: ~
File Edit View Search Terminal Help
daves@dts3:~$ ssh daves@ssh1.csc.liv.ac.uk
The authenticity of host 'ssh1.csc.liv.ac.uk (138.253.184.141)' can't be established.
RSA key fingerprint is SHA256:tMSnnEettgsunjNqYAR79+PAhYiSHhnoOzeGPV4gZac.
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 connect to the other gateway system, then you'll get a similar prompt for that machine (but with a different fingerprint).

You will then be prompted to enter your *departmental* password.

```
daves@dts3: ~
File Edit View Search Terminal Help
daves@dts3:~$ ssh daves@ssh1.csc.liv.ac.uk
The authenticity of host 'ssh1.csc.liv.ac.uk (138.253.184.141)' can't be established.
RSA key fingerprint is SHA256:tMSnnEettgsunjNqYAR79+PAhYiSHhnoOzeGPV4gZac.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'ssh1.csc.liv.ac.uk,138.253.184.141' (RSA) to the list of known hosts.
daves@ssh1.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**)

Once you have supplied the (correct) password, you will be logged into the chosen system, and can run simple 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@sshN.csc.liv.ac.uk`

```
daves@dts3: ~
File Edit View Search Terminal Help
daves@dts3:~$ ssh daves@ssh1.csc.liv.ac.uk
The authenticity of host 'ssh1.csc.liv.ac.uk (138.253.184.141)' can't be established.
RSA key fingerprint is SHA256:tMSnnEettgsunjNqYAR79+PAhYiSHhnoOzeGPV4gZac.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'ssh1.csc.liv.ac.uk,138.253.184.141' (RSA) to the list of known hosts.
daves@ssh1.csc.liv.ac.uk's password:
Last login: Thu Mar 26 12:03:18 2020 from 2.31.248.251
*
*
*
[daves@ssh1 ~]$ hostname
ssh1
[daves@ssh1 ~]$ █
```

Note that immediately after logging in, you will be informed of the time and source (IP address or hostname) of the last successful login session. 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.

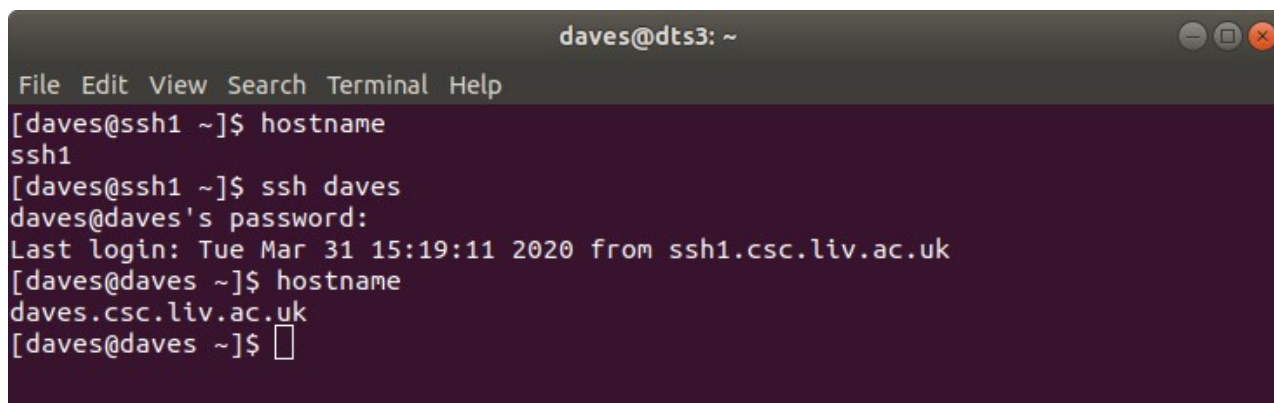
When reporting this, or any other issue with the system, it is extremely helpful to include details of which Linux machine you were using (which should typically appear as part of the command prompt), and the date & time any problem occurred. If you're not sure which system you're on, the command `hostname`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

Connection to internal systems

Having connected to the SSH gateway machine, the next step is to make a second *SSH* connection to the target system. This will commonly be a personal desktop machine (typically running Linux or MacOS), or a dedicated research group server – see your research group lead or supervisor for more information about any such resources available to you. The department also has a number of general-purpose research systems available for staff/PhD use. These include:

O/S	Host names	
Scientific Linux	lxfarm01 .. lxfarm08	<i>RedHat-based enterprise O/S – currently v7.9 Student teaching Linux provision</i>
CentOS	centos01 .. centos04	<i>RedHat-based enterprise O/S – currently Rocky Linux v8.5</i>
Fedora	fedora01 .. fedora08	<i>RedHat-based development OS - updated annually Currently Fedora 32 (01..04) and Fedora 34 (05..08)</i>
Ubuntu	ubuntu01 .. ubuntu08	<i>Debian-based LTS release – updated biennially Currently v18.04 (01..04) and v20.04 (05..08)</i>

Connect to the selected machine in the same way as before - `ssh {host}` or `ssh -X {host}`
Note there is no need to specify the username explicitly (unless this is different on the target system).



```
daves@dts3: ~
File Edit View Search Terminal Help
[daves@ssh1 ~]$ hostname
ssh1
[daves@ssh1 ~]$ ssh daves
daves@daves's password:
Last login: Tue Mar 31 15:19:11 2020 from ssh1.csc.liv.ac.uk
[daves@daves ~]$ hostname
daves.csc.liv.ac.uk
[daves@daves ~]$
```

When you have finished with the session, use the command `exit` to disconnect from the internal system, and return you to the SSH gateway machine. Then type `exit` again to disconnect from that, 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`ting cleanly may leave processes running on the internal and/or gateway machines, and could cause problems in the future.