An Introduction to the Computing Facilities at the Department of Computer Science and Technology

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This document describes the computing facilities available to staff, research students and longer-term visitors at the University of Cambridge Department of Computer Science and Technology. It is intended to tell you what exists, how it is used, and who to see for more information.

If you're new to the lab, please read the entire document – it will save you time in the long run.

You will likely discover lots of important things which are not written down here and should be. When you do, tell **Chris Hadley**, so that the document can be improved for future users.

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Passwords

The variety of pieces of paper with passwords that may have been handed to you in your first few days can be confusing for new arrivals. This section should help you make sense of them.

The Department is (obviously) part of the University - some services we run ourselves, and some are run by the University Information Service, commonly known as **the UIS** (or **CS**, as they used to be called the Computing Service). For that reason, there are several passwords that you might need to access these various services, some of which will be provided for you automatically and some of which you may need to request.

You will be allocated a University unique identifier made up of your initials followed by some digits (e.g. Fred Bloggs might be *fb123*). This identifier is called a **CRSID**. If you already had one of these through previous associations with the University, then it should not have changed. If you are accidentally allocated two different identifiers, please tell sys-admin so that the error can be corrected. All of the services, ours and those run by the University Information Service, make use of your CRSID.

You will also be allocated a **Department account**. In return for a signature, you will be given a login name (your CRSID) and an initial password. This password is required for you to login to machines housed in the Department (although note that it does not apply to machines in the second floor Intel Lab). We use a unified account system, so the same password will work on both Windows and Linux machines. We request that you **change this password** as soon as you can to one that you can remember easily. We suggest that you do this on a Windows machine rather than a Linux machine because the Linux `passwd` command is not very user-friendly – if there is a problem with the password you try, it will either fail silently or give an "Authentication token manipulation error", which is not of much use. The usual reason passwords fail is because they are not strong enough, try something stronger, see the **Security section**. On a Windows machine, type *Ctrl-Alt-Del* and select *Change a password*, and follow the instructions.

The UIS

The other password you will be given is a **UIS password**. Many web-based services provided by the University use an authentication system called Raven, so this is generally known as the **Raven password**. You should set this at https://password.csx.cam.ac.uk/ and at the same time configure password recovery. Other University Information Service services, such as the Exchange Online email system will use the same password (note that you may not necessarily have access to this depending on your status). An introductory booklet about the University Information Service is available from the Information Service Reception in the Roger Needham Building (which is next door to the William Gates Building), or you can find information about them at https://help.uis.cam.ac.uk. Application forms for Information Service accounts are available from Information Service Reception, or may have been set up for you in advance. Remember to quote your CRSID on any forms you fill in. The UIS also provides a High Performance Computing service.

Machines

As described above, when you arrive at the Department, you will have (or will be given on request) accounts on a large number of machines, including some which share the name **slogin-serv.cl.cam.ac.uk** – running varieties of Linux. These machines are connected to our Ethernet, and in general can be accessed from anywhere else within the department. They also provide a standard machine for users who do not have a workstation with all the facilities available on standard managed systems or who may want to perform certain tasks on a standard machine.

You may have been allocated a desktop machine – but not always, because nowadays people often prefer to work on a laptop. This should all have been arranged in advance.

Depending on what research you are doing and who you are working with, you may need **accounts on other machines**. Nearly all machines in the building run some variety of UNIX or Windows. Many of them are used for particular purposes by the research groups that obtained them. It may be possible to get an account on such a machine even if you are not doing related research, but you should bear in mind that the primary use of the machine will have priority. There are also a number of machines which provide core services; accounts on these are not generally available.

The **ssh-remote.cl.cam.ac.uk** machine can be used for login from the internet: users wanting to connect from outside the department are not normally able to ssh directly to their workstations for security reasons (there are some exceptions, and with KDC access via VPN they can go in directly). However, ssh-remote does allow login.

For more details of these machines and the services that they provide, see http://www.cst.cam.ac.uk/local/sys/platforms/linux.

Before you commit yourself to using a particular machine for your research, you should ask whether that machine or something compatible is likely to be available for your entire stay at the Computer Laboratory. There is nothing more embarrassing than finding yourself without a machine on which to do the final part of your research.

If we know in advance which **research group** you are joining, you may have been given accounts on the appropriate machines already. If not, you will need to ask the person in charge of the group which owns the machine. Once you have cleared it with the appropriate person, the account will normally be added by sys-admin. All of the machines are under central management even though the group which paid for them has the final say in who uses them. Nowadays, it is not unusual for users to be given a virtual machine on request.

In addition to the departmental machines, you may want an account on **machines run by the University Information Service**. The UIS runs a "Managed Cluster service" (https://help.uis.cam.ac.uk/service/desktop-services/mcs) which may be of use to people who need to use PCs or Macs. There are MCS areas in various locations throughout the University, including SW11 in the William Gates Building.
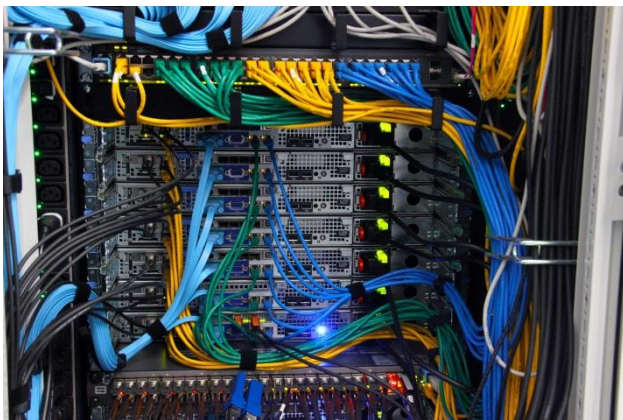
Managed vs Unmanaged Machines

The default allocation for long-term (ie not ACS) users is a laptop, which is an **unmanaged** machine. That is, it is setup and has some routine management by system administrators, but the user has root access, can add required software etc. There is a fine distinction between managed and unmanaged, and users of managed machines can perform most system administrative tasks themselves. The distinction is fairly plain as managed systems get their credentials from our Active Directory whereas unmanaged systems do not.

For users of **Linux systems**, managed systems will have their password systems and Kerberos credentials, as well as printer configurations managed by us. Managed machines will also use our automounter system to allow access to the central file server (filer). Users of such managed machines do not have the root password because there isn't one, but it is possible to gain privilege using the `sudo` command. There is also the `cl-asuser` command which allows the registered user of the machine to run a number of *safe* commands with raised privileges without typing a password. So, for example, it is usually possible to install software yourself: see http://www.cst.cam.ac.uk/local/sys/unix/software-install

Alternatively, you may opt to have an **unmanaged machine**, on which you will be entirely responsible for the system administration yourself. Be aware, however, that opting to do it all yourself means that you will restrict the amount of help that we are able to give you, and that if you run into problems, you may be largely on your own. Incoming services (ie ssh) are blocked. Unmanaged systems do not sit on the main lab VLAN, and do not have filesystems auto-mounted. We would expect users on unmanaged systems to comply with common-sense security procedures, e.g. install security updates to software, do not create accounts for people outside the lab, etc.

Windows and other non-UNIX Machines

For people who want access to a Windows system merely to run Office applications such as Microsoft Word we run a Windows Terminal Server, a **Windows Server** running in Terminal Services mode allowing remote connections. Linux users typically access this facility using the `cl-rdesktop` command to connect to the server *desktop.cl.cam.ac.uk*, while Windows users can use the Remote Desktop Connector application to access the server.

The service is provided primarily for access to Microsoft Office applications for occasional use. Additional applications are only added to the server if there is widespread support for them (see http://www.cst.cam.ac.uk/local/sys/platforms/windows). If you need help with this facility, send email to win-admin@cl.cam.ac.uk. If you think you need more than the Windows Terminal Server can provide, discuss the matter with your supervisor.

For many users it is simpler to use the web based Office365 facilities (https://office365.com) and then click on the **Sign in** icon at the top right and use your Raven identity.

Support is available for Windows 10, and such systems are usually centrally managed. Central infrastructure provision includes SQL Server. All Microsoft products need to be licensed. Please contact win-admin@cl.cam.ac.uk if you need a product that is not already installed on your machine. Visual Studio and Azure are available for use, and an Office Campus Agreement will enable you to obtain Office software.

No formal support is offered for User owned machines whether Windows, Macs, or even some version of UNIX, but see the next section for advice on connectivity.

User-owned machines

It is not uncommon for people to bring their own machines into the lab. Mostly they will be used with the wireless network *Eduroam*, or in some cases *Internal-CL* (which is the lab's own wireless network). Please talk to one of the Computer Officers if you wish to attach it to the lab wired network. If nothing else, it may need to have DHCP servers set up to supply its IP configuration, and there may be other issues to consider, such as security and consistency with lab software. It will be placed on a separate virtual network from the rest of our machines.

In the first instance, to request a connection please complete the form at https://dbwebserver.cl.cam.ac.uk/UserSelfService

If you are running a Windows-based machine we require you to run up to date anti-virus software, and also be up to date with all security hotfixes. Free anti-viral software is available via the University Information Service: see
https://help.uis.cam.ac.uk/service/security/antivirus

Conditions of Use and Terms of Service

All the machines in the Department are used subject to the conditions of the University Information Strategy and Services Syndicate. You can get a copy of the rules from Information Service Reception, or you can read them online in the University Information Service Information Server. Remember that there are **laws governing the use of computers**, in particular the General Data Protection Regulations and the Computer Misuse Act. From your point of view, the most important things to remember are:

- o **Don't use other people's accounts**, or allow your account to be used by anyone else.
- o **Respect people's privacy**, and all copyright and licencing restrictions. Ability to do something does not imply permission.
- o **Behave sensibly**, especially in the use of shared resources.

Whilst it is not absolutely forbidden, we do not think very highly of people who use our machines to play games. Such activities must not impede or annoy other people in any way. A **small** amount of recreational or private use of computing facilities is acceptable.

Our server machines normally run 24 hours a day, 7 days a week. **Any problems** which arise will usually be dealt with promptly during normal office hours, but there is no formal staff cover at night, weekends, public holidays etc.

Security

We have a **unified password system** that keeps passwords in sync on our UNIX and Windows machines (or most of them, those using krb5 authentication). If you change your password on one machine, it will change on all of them to which you are allowed to login which use krb5. We do not support different passwords on different machines. Your password is not the same as any other you might have on UIS machines, Hermes (the legacy UIS Mail Service), Exchange Online, Raven, or the MCS, and it will not propagate to or from them if changed.

We ask you to choose a **sensible password** (8 characters, not a word, mixed case, and with one or two non-alphabetic characters). You should not tell your password to anyone, and you should change it if you believe that someone else has discovered it.

Although we try quite hard to keep intruders out of our systems, there is no strong enforcement of *internal* security. In particular, the Lab systems are not suitable for the storage of sensitive personal data covered by the General Data Protection Regulations. You may protect your files as you wish, but we do not encourage extensive use of **read protection**, as it makes it harder for people to help you in case of any problems. If you change the protection mode of your home directory, you should not rely on this as the only protection for your files.

Lab machines use **Kerberos**, a computer network authentication protocol, which allows machines and users communicating over the network to prove their identity to one another in a secure manner. This system uses tickets, normally automatically obtained when logging on at the workstation console, to authenticate user NFS access to the filer. This is a complex system, and in most cases there are many ways to do things. For details, see http://www.cst.cam.ac.uk/local/sys/ssh/overview.

Connecting from outside the lab

We occasionally have trouble with people trying to break into our machines from outside. As a result, we are quite careful about login sessions that originate outside the Lab network. This is both because we are bound by software licence agreements to keep proprietary code reasonably secure and because people would be annoyed if someone from outside managed to destroy important data.

There are several different methods for connecting to lab machines while away. These are summarised at http://www.cst.cam.ac.uk/local/sys/network/remote-access.

A Virtual Private Network, or **VPN**, is a means of extending a private network over a public link, so in our context it is a way of making your home machine or laptop appear to be on the University or department network. The Department has its own VPN service which will provide you with a global IP address within our network, known as **VPN2**. All members of the department (not including short-term visitors or collaborators without a CRSID) should be automatically granted access to this service, see the link above for further details. In addition, there is a Generic VPN service operated by the UIS which will get you an IP address in CUDN-private IP space.

People can not login directly to most lab machines from outside the department using ssh unless they have a VPN connection, there are exceptions. See http://www.cst.cam.ac.uk/local/sys/ssh/.

 For resilience, each service is provided by a number of machines. **If a connection fails**, try again, and it may try another server. If it repeatedly fails, try appending `0` or `1` to the name (e.g. `ssh-remote-0`, `ssh-remote-1`), to access a particular instance of the service. The services may share machines, but users should not rely on this.

File systems

All user file spaces, both UNIX and Windows, are housed on a file server, (except on GPU virtual machines where your home will be local). This means that it is possible to access your Windows space (if you have one) from within UNIX and vice versa.

Every member of the Lab has a **personal home directory** called `/homes/`CRSid under Linux. Although we have quite a lot of disc space, we also have a lot of people, so we have to manage the space carefully. Furthermore, we have a limited backup capability which imposes restrictions on the amount of backed-up filespace we can allocate each user. You will find that you have a **filespace quota** for your home directory, which limits the amount of material you have on disc. You will probably find your default quota adequate, but if you require more, your quota can be increased (within reason) to give you enough space to do your work. Before asking for an increase, you should check your files carefully for wasted space.

Your home directory is backed up regularly. If you need to access the backups (known as snapshots), see http://www.cst.cam.ac.uk/local/sys/filesystems/snapshots for more information. User access to snapshots is easy, you are unlikely to need sysadmin assistance.

Space that is not backed up is available as well: see http://www.cst.cam.ac.uk/local/sys/filesystems/ for more information. **Remember to be especially careful with data in space that is not backed up.**

In addition to personal directories, research groups may have **group directories** for shared material. These are accessed by names beginning `/usr/groups/` (UNIX) or \\filer\groups (Windows). Do not store personal files in group areas.

Networks

The various machines are connected to the Ethernet. It appears in offices as a set of 4 network sockets in the floor boxes which also house power sockets. The network sockets are not enabled by default and need to be set up by a system administrator. **If you need a socket enabled**, go to https://dbwebserver.cl.cam.ac.uk/UserSelfService/

select *Request a network connection* and fill in the details requested.

Note that there are a number of **VLAN**s in use for various purposes and the switch port to which a socket is connected will need to be assigned to the correct VLAN. For that reason if you move a connection yourself you are unlikely to end up with a connection that gives the connectivity that you require. Contact the system administrators for help.

There are several **wireless networks** available in the William Gates Building:

o   **eduroam** is available to both Cambridge users and visitors who have appropriate credentials from a participating institution. It is the preferred network for people wanting CUDN connectivity from wireless devices. To find out how to set up eduroam, please visit https://help.uis.cam.ac.uk/service/wifi

o   **Internal-CL** is the local wireless network intended for users who need a Lab IP address. Authentication is similar to eduroam.

o   **UniOfCam** can be used by anybody with a Raven account, and it is also possible for us to issue temporary tickets for visitors, conferences etc. All members of staff may issue short term tickets for their guests; longer-term and bulk tickets are available from the system administrators or Reception.

o   **wgb** offers an "open access" network, with the intention to offer a courtesy internet service for visitors to the building. Please do not use this network simply because it is the easiest to connect to. It is by far the lowest bandwidth and slowest option.

Workstations and logging in

Workstations should be switched off when not in use for extended periods (e.g. over the weekend or overnight). The `slogin-serv` machines can be used when your machine is off, and most machines can be switched on remotely – contact sys-admin for details, or see http://www-dyns.cl.cam.ac.uk/cgi/raven/boot-mc.cgi

If the monitor has its own power switch it is a good idea to turn that off when it is not in use for a substantial period, such as a week or more.

If you use ssh to login to another machine you may be asked for your `ssh` key pass phrase on the relevant machine, which should not be echoed to the screen as you type it. However, most of our machines use Kerberos so the passphrase is not needed.

If the login attempt fails, you are not told why. This is a standard security feature. It could be a wrong identifier or password, an attempt to log in from an unauthorised location, or one or two more obscure reasons. If you cannot log in after several attempts, contact one of the experts who will check logs to see why it is failing. Please give us the time of the connection and the output of "ssh –v".

Logging out and powering off

Logging out is not at all difficult, but we do ask people to do it. Unattended idle sessions are a security risk, they consume system resources, and impede some system maintenance activities. We do not expect you to log out if you are just going for a cup of coffee or a short meeting, but you really should log out at the end of your working week. We do not like seeing multi-week sessions.

E-Mail

The Department requires that everyone (with a computer account or an office here) be readily accessible via email.

Note that local mail is not available for visitors, who should continue to use their home institution's email account, to which mail arriving here will be forwarded.

You have several options of University mail address through which others may contact you:

- *CRSid*@cam.ac.uk — this type of address is available to all members of the university, and you manage it using a Raven-protected access page. This e-mail address will become inactive once you leave the University.
- *CRSid*@cl.cam.ac.uk or *CRSid*@cst.cam.ac.uk (both are valid) — this type of address is available to staff, visitors and PhD students of the Computer Laboratory. It will remain active after you leave the University (unless there is a problem with email delivery). As such it is better to use this for publications. By default, all incoming mail is redirected to your @cam.ac.uk address; if you are a member of academic or assistant staff, you can control that through the user mail administration page at https://dbwebserver.cl.cam.ac.uk/forwarding

For details, see http://www.cst.cam.ac.uk/local/sys/mail/.

If you have an Exchange Online account you can access your e-mail using Outlook, Mac Mail or a web browser. IMAP utilities should not be used as they do not work reliably.

If you have problems with remote mail or need help with finding out correct addresses, contact email-admin@cst.cam.ac.uk.

Please be aware that our accounts are frequently subject to phishing attacks (eg spoof invoices which may look like they come from a college, department or funding body), which can be very convincing. See https://help.uis.cam.ac.uk/stay-safe-online and try to complete the Online cyber security training there as soon as possible.

Printers and scanners

The Department has a number of public printers of different types. Most are colour laser printers, but we also have several B&W laser printers, A3 printers, multifunction printers, and a poster printer. All printing on departmental printers is free of charge.

You can print from the wired network or from *eduroam* or *Internal-CL*, but not from *wgb* or *UniOfCam*. Note that you do not necessarily need a Department account to print.

How you connect depends on your OS, see https://www.cst.cam.ac.uk/local/sys/printers for details.

Any problems with departmental printers should be reported to the mailing list **printing@cl.cam.ac.uk**. This includes toner out, paper jams, strange error messages and stuck queues.

Which printer should I use?

Usually the nearest – there are colour laserjet printers in most alcoves around the building. However, there are some specialised printers:

- o For **A3 B&W** printing, please use *poplar* or *palm*.
- o To **copy and/or scan** documents, use *holly* or *elm*.
- o For **colour A3** printing, please use *birch*, *holly*, or *elm*.
- o To print **posters**, use *gum* – see https://www.cst.cam.ac.uk/local/sys/printers/gum/ for further instructions.

The printers *palm*, and *poplar* have an extra-large paper tray and are thus recommended for larger jobs. They also have stapler attachments.

Please do not print large jobs in the middle of the day. If printing a large number of pages, please periodically check whether the printer has enough paper.

Customisation

Many UNIX programs are customisable to suit personal preferences. This is a powerful and useful facility, but it needs to be used sensibly. The more you customise, the less likely it is that you will be able to get help when you have a problem, because other people will not understand your world. You may also find that you have a lot of work to do to keep your customisation up to date when new versions of the underlying programs are installed.

A particular danger is picking up extensive customisation from other people. This can be a quick way of getting started with something, but remember that the person you got it from is quite likely to leave the Lab before you do, perhaps leaving you without support. If you do pick up customisation from friends, take the time to understand what you have installed. Note that it is easy to lock yourself out of the X window system by setting up your customisation badly.

GPUs

The department - and the broader University - has a variety of resources for general-purpose GPU-based computation (using CUDA, OpenCL or similar). See http://www.cst.cam.ac.uk/local/sys/resources/gpu/

Questions, and how to get help

When you have a problem or a question, try your best to find out the answer for yourself before bothering other people. Even if you do not find the answer, you are likely to learn other useful things.

On UNIX systems, the `man` command allows you to access the on-line manual. For example, if you want to know about the `ssh` command, type `man ssh`. The `man` command can tell you about all the UNIX commands, system calls, C library routines and various other things. If you don't know the name of the manual entry you want, type e.g. `man -k wombat` for a list of all entries that have to do with wombats.

The other place to look for documentation is in the departmental webpages. Most local modifications are documented and URLs for this are given throughout this document. A good starting point is http://www.cst.cam.ac.uk/local/sys/

Other useful sources of information are:

- o **Roommates and others in your group**

The people you actually work with can be a valuable source of help. It is not their job to help you, of course, but most people will be prepared to give some assistance to a newcomer.

- o **Your supervisor**

Whether your supervisor can help with day-to-day problems will depend very much on whether he or she routinely uses the systems you are having trouble with. It is definitely worth a try, because your supervisor should at least understand what you are trying to do.

- o **The Experts**

Certain questions are best directed by email to a rôle address (see last page, as well as http://www.cst.cam.ac.uk/local/sys/mail/roles/). This is because questions directed to an individual might go unanswered if that person is away, or it might save that individual having to forward your question if you have not sent it to the person best equipped to deal with it. Many of these addresses run a ticketing system - you will be returned a ticket number in acknowledgement when you email them.

People often contact us and say "there's a problem with my machine" without telling us the name of the machine. We can guess or try to work it out, but it saves a lot of time if you tell us. If it isn't obvious there is almost always an inventory sticker somewhere on the machine which will say (or give an Inventory number, which is just as good).

Please do not assume all machines are identical as far as software goes – they are not. Even if you are absolutely certain your problem is a general one, it is probably still a good idea to say which machine or machines you know it to be a problem with. As well as saying which machine, also give details, e.g. cut and paste an example, and try to make it easy to reproduce the problem.

System Administrators

The rôle addresses mentioned above are preferred, but if you do need to speak to a specific person:

- **Nick Batterham**
Userid: nb110 Phone: 35445 Room: GC12
Technician. Knows how to fix a wide variety of equipment.

- **Piete Brooks**
Userid: pb22 Phone: 34659 Room: GC16
Knows about Linux PCs, mail, and wide and local area communications.

- **Stewart Carswell**
Userid: stc40 Phone: 63799 Room: SE15
Knows about Drupal, Moodle, and databases.

- **Mark Cresham**
Userid: mdc56 Phone: 35444 Room: SS26
Knows about general system administration, Windows, Linux, and AV.

- **Chris Hadley**
Userid: ckh11 Phone: 34686 Room: GC09
Knows about printers and printing problems, networks.

- **Jiang He**
Userid: jh347 Phone: 34759 Room: GC12
Knows about IP phones, basic Unix, Windows & networks. Sets up operating systems for Unix and Windows machines.

- **Daniel Porter**
Userid: drp35 Phone: 34620 Room: GC09
Knows about Windows, Apple, mail, servers, Microsoft Applications, databases

- **Malcolm Scott**
Userid: mas90 Phone: 63658 Room: FN16
Knows about datacentre facilities, networks, GPUs

Online Information Services

The Department's websites are:

http://www.cl.cam.ac.uk/ and http://www.cst.cam.ac.uk/

These hold pages for all the main research groups as well as system and departmental information and maps of the buildings.

General local information is provided by the Information Service:

http://help.uis.cam.ac.uk/

If you have an account on a machine in cl.cam.ac.uk, you can export your own personal files to your webpage. Details at:

https://www.cst.cam.ac.uk/local/sys/web/personal

For any questions or help, contact:

network-admin@cl.cam.ac.uk
System Administration – Networks

telephone-admin@cl.cam.ac.uk
For requests or problems relating to telephones

printing@cl.cam.ac.uk
For problems (e.g. toner out) with printers

email-admin@cl.cam.ac.uk
For problems with e-mail

moving@cl.cam.ac.uk
For when anything needs to be moved except
computing equipment

moving-machine@cl.cam.ac.uk
For when computing equipment needs to be moved

reception@cl.cam.ac.uk
Departmental Reception Desk

safety@cl.cam.ac.uk
For matters relating to Health and Safety

building-services@cl.cam.ac.uk
For reporting routine problems with the building

sys-admin@cl.cam.ac.uk
For general System Administration matters