Using the Computing Resources at Gatsby - Part 1

October 5, 2012

Contents

1 Printers and Printing

The Unit has a number of printers at its disposal;

Printer	Features	Class Queue	Notes
HP LaserJet P2055c	Basic, A4 mono laser	'ps5'	
HP kyocera1 Colour Laser Printer	A4 colour laser	'kyocera1'	
KM BizHub C353	A4/A3, Multifunction printer/copier	'bizhub353'	Leased, we pay per sheet (0.4p mono, 5
HP LaserJet P2055d	Basic, A4 mono laser	Not networked	visitors access

The networked printers are all accessed via a central print server and are listed on the print server pages. When using the printers it is preferable to use the classes as queue names as these will remain constant even when the underlying physical printer changes.

The central printer server is based on CUPS which uses the Internet Printing Protocol (IPP). The Linux clients also use CUPS. As this is a central system, every machine sees the same queues and has the same defaults.

Please read Appendix A for printer problems and consumables.

1.1 Linux printing commands (CUPS)

Full CUPS documentation is online. Frequently used commands are listed here.

- How do I check the status of an `lpr` print job ?

Use the `lpq` command, e.g;

```
lpq -Pps5
```

- How do I cancel an `lpr` print job ?

Use `lpq` to get the job number and use the `cancel` command; e.g.

```
cancel 1256
```

You can also cancel jobs via the web interface.

- How do I print duplex and select paper-size or trays ?

```
lpr -Pps5 -o sides=one-sided                      filename
lpr -Pps5 -o sides=two-sided-long-edge            filename
lpr -Pps4 -o media=A4,MultiPurpose,Transparency   filename
```

- How do I print many pages to a side (N-up) ?

```
lpr -Pps5 -o number-up=4
```

The utility`psnup` is also available.

- How do I activate the stapler on the photocopier?

The printer options can be discovered like this;

```
lpoptions -pbizhub353 -l | grep -i staple
 Staple/Staple: *None 1Staple(Left) 1Staple(Right) 2Staples
```

So to select one staple, applied to the left, do this;

```
lpr -Pbizhub353 -o Staple="1Staple(Left)" somepaper.pdf
```

1.2 Customising

The `lpoptions(1)` command saves the options for your printers. Like the `lpr` command, it accepts printer options using the `-o` argument:

```
lpoptions -o prettyprint
lpoptions -o media\section{A4 -o sides}two-sided-long-edge
lpoptions -p ps4 -o media\section{A4 -o scaling}100
```

Once saved, any subsequent `lpr` command will use them when you print.

1.3 Printing from the Wired Laptop Network

- See wireless **Wireless** for printing from GatsbyWPA.

You need to configure your OS to point to the printer server '`gate`'. The printer '`ps4`' is used as an example here but the other printer names are valid.

- Linux/CUPS: edit `/etc/cups/client.conf` so that is has '`ServerName gate`'
- Windows: Add network printer, URL `http://gate:631/printers/ps4`, any Postscript driver should work.
- Mac OS X: IPP printer, name '`gate`', queue '`printers/ps4`'

If you are having problems, a useful test is to use http://gate:631/ in your browser (provided the proxy setting is off) but also see the section on GatsbyPrinterProblems.

2 Modules System

The modules system is a package which enables easy control of your path and other environment variables. Its primary purpose is to allow you to chose between different versions of applications, e.g. where a new version of Matlab is introduced you might prefer to use an earlier one.

To find out which packages are available do;

```
 % module avail

 In directory /opt/modulefiles:

 /opt/Modules/modulefiles

NAG/cll6a23dhl  matlab/r2011b   pgi-32/12.3
cuda/2.3        matlab/r2012a   sage/4.8
mathematica/8.0 pgi/12.3        sage-all/4.8
```

The modules listed are various packages (possibly with their version numbers) or default settings.

To see what you have loaded more explictly, then do;

```
% module list
Currently loaded modules:
 1) default
 2) latex2html
```

To add a new package to your path use the 'add' option, e.g. for the default version of Matlab ;

```
% module add matlab
```

You can also load an explicit version of the package;

```
% module add matlab/6.1
```

To remove a package from your path do;

```
% module rm matlab
```

The module `cwd` adds '`.`' (i.e. the current working directory) to your path. This is generally advisable.

2.1 Shell Startup

Of course, these commands can be initiated at login or for every shell instantiation - just add the module commands to your shell's startup file, e.g.

```
You can also use them interactively as required.
```

3 Matlab

Matlab (and many other added packages) are stored under the `/opt` directory. This directory is local to your machine so it may not have identical contents to other machines.

There are usually a few versions of Matlab available - typically the most recent one, the previous version and perhaps a test version. This allows people to chose the version that is most appropriate (i.e. has least bugs).

Matlab should be on your path and this is controlled using the GatsbyModules 'modules' system which allows you to pick which version you want to use.

If the modules system isn't working, you can always invoke Matlab directly e.g.;

```
/opt/matlab-R2012a/bin/matlab -nojvm
```

3.1 NAG Toolbox

The NAG Toolbox for MATLAB is usually installed with all our MATLAB Versions.

NAG Toolbox

3.2 64-bit versus 32-bit

The x86-64 machines can run both 32-bit and 64-bit binaries but Matlab will default to the 64-bit version. You can force it to chose a particular architecture using;

```
matlab -arch="glnx86"
```

You could also invoke it with `linux32`.

3.3 Keyboard Shortcuts

These should be the same as your wiki:TechShellShortcuts shell shortcuts.

See also; Matlab Unix Requirements, GatsbyMatlabFAQ!!!! Gatsby Matlab FAQ

4 SSH - The Secure Shell

4.1 What is SSH ?

In keeping with the Unix tradition, SSH is the name of a protocol as well as the client that uses that protocol. To avoid confusion the Unix client will be referred to as `ssh`. The SSH protocol provides for the secure, encrypted transmission of information between computers without divulging passwords in clear text (in the way that `ftp` and `telnet` do, for example). It is therefore preferable to use SSH wherever possible.

A feature of ssh is that it stores the public keys of machines to which you connect. If this public key changes then ssh will warn you. This could be because someone has set-up a machine to intercept your connections or it could be because the key has changed legitimately.

An SSH client provides command-line access just as `telnet` or `rsh`, which it closely resembles.

4.2 Where can I get SSH clients ?

A GatsbySshJava Java client is available for accessing the Unit]. This will work with most WWW browsers under any operating system that supports Java and is suitable for use from kiosks and cafes. Please see the GatsbyPassword section on passwords.

All recent Unix and Linux distributions should provide `ssh` by default. For free, native SSH clients for Unix and Windows look at;

- OpenSSH
- OpenSSH (Windows)

Windows users can also use `ssh` within Cygwin.

4.3 How can I transfer files securely?

Use `scp` from any Unix/Linux machine or within Cygwin on Windows.

There is a free graphical client called WinSCP for Windows.

Also the MindTerm GatsbySshJava Java ssh client can do file transfers.

4.4 How can I avoid retyping my password ?

See .

You should **never use an empty passphrase**.

4.5 What else can SSH do ?

Tunnelling ! See the GatsbySshTunnel Gatsby notes on tunnelling .

4.6 X11 Forwarding

OpenSSH supports both untrusted (-X) and trusted (-Y) X11 Forwarding. Untrusted (-X) X11 Forwarding is more secure but not all applications will work in a low privilege environment. If you find this is the case (and you trust the computer you are connecting to) then trusted (-Y) X11 Forwarding should work.

Service	Port	Gatsby Host
SMTP mail	25	mail.gatsby.ucl.ac.uk
IMAP mail	143	mail.gatsby.ucl.ac.uk
WWW proxy	3128	proxy.gatsby.ucl.ac.uk
RDP (WTS)	3389	acorn.gatsby.ucl.ac.uk
IPP (printing)	631	caxton.gatsby.ucl.ac.uk

5 SSH Tunnelling

SSH tunneling allows you to use Gatsby-hosted services remotely, from any Internet connection, just as if you were using a Gatsby machine internally. You can use the same, consistent settings at home, in a WiFi enabled train or cafe, at a conference and on the internal laptop networks (wired or wireless).
Many SSH clients can perform what is known as port-forwarding or tunnelling. Most Internet services use so-called well-known ports where each protocol has their own unique port number. You can use an SSH client to securely convey traffic for many of these services (including X11, SMTP, IMAP and WWW) by forwarding them from one end of a secure connection to another (usually from the remote end to the local end). All you need to know is the port number where the service is provided. For suitable SSH clients see GatsbySsh.

This means that if you are only permitted an SSH connection to a particular network, you can **tunnel** further services out through the SSH connection and so get much more access than just the basic SSH. This means that although there is no IMAP access from outside the Unit, for example, you can persuade an SSH client to forward the internal one to your local machine so that it can be accessed.

In the case of 'ssh', invoking forwarding looks like this;

```
% ssh -L localhost-portnumber:remote-host-name:remote-host-port-number
```

You can have multiple `-L` options and thus forward many ports at once. Other SSH clients will have different mechanisms for switching on tunnelling but the principles (and thus the required fields) are the same.

The localhost port numbers are arbitrary but they must be higher than 1024 and less than 65535. It is a good idea to keep them around 8000 as they are unlikely to be used already and consistency will help you remember which is which.

5.1 Compression

The majority of SSH clients also implement compression. This will help over low-bandwidth connections and should be used where possible although there might be additional latency.

5.2 Well-known Services

Here are some of the ports for the well-known services followed by some examples of how to forward them.

5.3 Example 1 - IMAP

To read IMAP mail via the Gatsby Unit from an external Unix machine one can;

```
% ssh -L 8143:mail.gatsby.ucl.ac.uk:143 ssh.gatsby.ucl.ac.uk
```

This recreates "mail"'s port 143 on your home machine at port 8143. You will have to configure your IMAP client to use the non-standard port in that case. You can use port 110 locally provided you don't have a local IMAP daemon running and that you run `ssh` as 'root'. This is because ports numbered less than 1024 are special, priviledged ports.

5.4 Example 2 - WWW

To be able to access WWW subscription services (like journals) where a UCL domain-name is required, you can set up your home machine so that it uses the Gatsby WWW Proxy to fetch pages for you. You create a local port at 8080 and forward those to the WWW Proxy at port 3128. You will need to configure your browser so that it uses the `localhost` port `8080` as a WWW proxy.

```
% ssh -L 8080:proxy.gatsby.ucl.ac.uk:3128 ssh.gatsby.ucl.ac.uk
```

5.5 Example 3 - X11

Another example, the Unix "ssh" client will forward the X11 connection (and create an appropriate "DISPLAY" environment variable. This should be enabled by default but you can switch it on explicitly with "-X".

```
ssh -X username@ssh.gatsby.ucl.ac.uk
```

OpenSSH supports both untrusted (-X) and trusted (-Y) X11 Forwarding. Untrusted (-X) X11 Forwarding is more secure but not all applications will work in a low privilege environment. If you find this is the case (and you trust the computer you are connecting to) then trusted (-Y) X11 Forwarding should work.

5.6 Example 4 - IPP Printing (CUPS)

Using the IPP printer queue under CUPS;

```
% ssh ssh.gatsby.ucl.ac.uk -L8631:caxton.gatsby.ucl.ac.uk:631
```

- Edit `/etc/cups/cupsd.conf`, set "`BrowsePoll localhost:8631`"
- You may need to restart the CUPS daemon (`/etc/init.d/cups restart`) if this is a new setting.
- You should comment out the `ServerName` entry in `/etc/cups/client.conf` , if any.

5.7 Example 5 - Remote Windows Terminal Service (WTS / RDP)

To access the Gatsby WTS service remotely, e.g.;

```
% ssh ssh.gatsby.ucl.ac.uk -L8989:wts.gatsby.ucl.ac.uk:3389
```

Your RDP client (`rdesktop` or Windows Remote Desktop Connection) then needs to be told to connect to `localhost:8989`.

5.8 Example 6 - Combining Mail, Printing, Web and WTS

A single script that handles a few protocols;

```
#!/bin/bash
#
# Change 'username' (or remove it)
#
# You will need to change the client application configs to use 'localhost' and
# the port number listed, e.g. IPP printing to localhost port 8631
#
ssh username@ssh.gatsby.ucl.ac.uk -L8989:wts.gatsby.ucl.ac.uk:3389    \
                                  -L8631:caxton.gatsby.ucl.ac.uk:631  \
                                  -L8080:proxy.gatsby.ucl.ac.uk:3128  \
                                  -L8143:mail.gatsby.ucl.ac.uk:143    \
                                  -L8025:mail.gatsby.ucl.ac.uk:25
#
```

5.9 I didn't understand any of that ! Could you explain it again ?

Computers linked together on the Internet have unique addresses, called IP addresses. These allow network traffic to be directed specifically to them. In addition to the IP address, there are also associated 'ports' - these are numbers which correspond to specific services or applications that are available at that network address. Think of them as analogous to door numbers within a specific building.

To keep things simple, there is a standard set of port numbers for the so-called 'well-known services' which means that the same service on multiple machines will be available at the same port number (although obviously the IP addresses themselves will differ). For example, the web server is usually found at port 80.

Using SSH you can make a port on your local computer be directed to one on a remote computer. Thus you can point applications (like an e-mail package) towards using your local machine and ssh will redirect those requests to a remote computer (over a secure connection).

6 Gatsby laptop Networks - Wired and Wireless Network Access

6.1 Laptop Networks

These are two networks which staff, students and visitors may conditionally connect their laptops to. These are administered locally - the **Wireless laptop** network and the **Wired laptop** network.

- All users, irrespective of affiliation, are subject to the general rules and regulations of the unit. The Connecting Equipment to the College Network is most relevant.
- You are not permitted to connect to any other network or to interfere with the workstation or other infrastructure connections.
- Your laptop must be fully patched and up-to-date and, if Windows based, must have a current virus scanner. See GatsbyRecommends.
- Only Internet Protocol (IP) traffic is permitted on these networks and you must use the IP address provided by DHCP.
- There is no need to register MAC addresses to use either network.
- Both networks lie outside the Gatsby firewall and have a firewall of their own for protection.

6.2 Wired Laptop Network

This is a 100/10 Base-T wired ethernet network. IP addresses are provided using DHCP.

This network lies outside the Gatsby Unit's private network and is protected by its own firewall. You will not have full network access until you have authenticated. Until then any WWW (http) access will fetch an authentication page (with details similar to this page).

6.2.1 Authentication

You must authenticate before network access is granted. At present, this is achieved by using an SSH client to connect to the host `gate`, and using the username `access` and the password `access`;

```
ssh gate -l access
Password: access
```

In future, this will change to your Gatsby username and password. Watch this space for notifications of changes.

6.2.2 Notes

- Your DNS settings must accept the default domain name for this to work, otherwise you will not connect to the correct machine. If you cannot access `gate`, then check your DNS settings. Your default domain should be `wireXX.gatsby.ucl.ac.uk` where `XX` is a two digit number.
- If the ssh session is terminated you will lose the network connection.
- The !!!!!!!!!!!!!!!!!!ssh have details on how to obtain an ssh client.
- After authentication you may have the authentication WWW page cached. You will probably need to refresh your browser to get rid of this page. This is usually done by holding the SHIFT key and using the reload /refresh button.
- 'Only a very limited number of common protocols are supported', including IMAP, http and ssh.

6.2.3 Printing

Please refere to printing printing document for instruction on printing on wired laptop network.

6.2.4 Problems

- Check the connection and activity LEDs on your ethernet card.
- Do you get an IP address via DHCP ?
- If you rapidly connect and disconnect your laptop, such as might occur with a broken cable, the network switch will signal a fault and disconnect the ethernet port. It will reconnect automatically after a few minutes.

6.3 Wireless Laptop Network-GatsbyWPA

- **Gatsby Wireless** !!!! wireless

SSID (802.11g only)	GatsbyWPA
Encryption	WPA2/AES (WPA Enterprise)
Authentication	802.1x using PEAPv0 (EAP-MSCHAPv2)
Outer identity	none (anonymous)
Inner identity	Your Gatsby username and password

7 Gatsby Wireless

This page describes the Unit's own wireless provision which is administered from within this department. It is suitable for Gatsby Staff & Students and for visitors that cannot access the UCL eduroam or UCL guest services. Please see GatsbyLaptop for details of other wireless and wired network services. **You must be issued with a valid Gatsby userid and password before you can use this service**.

7.1 Conditions of Use

- All users, irrespective of affiliation, are subject to the GatsbyRegulations general rules and regulations. The UCL Policy on Connecting Equipment to the College Network is most relevant.
- You are only permitted to connect to designated networks and are not permitted to interfere with the workstation or other infrastructure connections.
- Your laptop must be fully patched and up-to-date and, if Windows based, must have a current virus scanner. See GatsbyRecommends.
- Only Internet Protocol (IP) traffic is permitted on these networks and you must use the IP address provided by DHCP.
- There is no need to register MAC addresses.
- The network has limited access to Gatsby's main network. You must not do anything to interfere with normal operations.

7.2 Basic Settings

The server certificate is fully signed and verfied by **GTE CyberTrustGlobal Root**. Please do not accept untrusted certificates (although you may have to install the root certificate in some rare circumstances).

7.3 Software Requirements

If your computer can connect to the UCL eduroam service then you should be able to connect to `GatsbyWPA` as you will have the necessary 802.1x supplicant.

Mac OS X

- This should work out-of-the-box
- Just select GatsbyWPA and 802.1x automatic when prompted
- Check for conflicting profiles (just delete them)

To Gatsby Internal	ssh, http, https, ipp
To External	all bar SMTP (25)

Windows While Windows should work out-of-the-box, 'Windows XP' has been found to be unreliable. Using a third-party WPA supplicant will be better and is more flexible;

- xsupplicantis highly recommended and is open source.
- SecureW2 (not very reliable)

It has been checked that 'Vista' and 'Windows 7' orks out-of-the-box without any problems.

Linux You will need some WPA supplicant software - most distributions have this already.

The location of the config file may be distribution dependent but it is normally `wpa_supplicant.conf`. There may be a GUI utility which configures this file appropriately.

```
network={
  ssid="GatsbyWPA"
  key\_mgmt=WPA-EAP
  eap=PEAP
  identity="username"
  password="xxxxxx"
}
```

7.4 Permitted Protocols

- You must use IPv4 and DHCP

7.5 Printing from the GatsbyWPA Network

You need to configure your OS to point to the printer server '`caxton.gatsby.ucl.ac.uk`'. The printer '`ps4`' is used as an example here but the other printer names are valid.

- Linux/CUPS: edit `/etc/cups/client.conf` so that is has '`ServerName caxton.gatsby.ucl.ac.uk`'
- Windows: Add network printer, URL `http://caxton.gatsby.ucl.ac.uk:631/printers/ps4`, any Postscript driver should work.
- Mac OS X: IPP printer, name '`caxton.gatsby.ucl.ac.uk`', queue '`printers/ps4`'

If you are having problems, a useful test is to access http://caxton.gatsby.ucl.ac.uk:631/ with your browser. If you can see a page then you should be able to print.

Also see the section on GatsbyPrinterProblems.

7.6 Reporting Problems

- Please report problems promptly and as accurately as possible, try not to only say ”It doesn’t work!”
- Can the issue be reproduced ?
- Does 802.1x authentication work ?
- Do you get an IP address via DHCP ?

A Printer Problems

A.1 FAQ

- The jobs are held up but I am not sure what the problem is.

  Please see the Queue Problems checklist below.

- I send a job to the printer, the queue is empty but nothing has emerged from the printer.

  Please go through the !PostScript problems checklist below.

- I ask for duplex but it only comes out single sided.

  See the EPS discussion below or ticket:115.

- Do I need to worry about which printer can handle which documents/features?

  All printers should be able to handle all print jobs with equal efficiency. If this is not the case, report it.

- Some PDFs do not print or come out very slowly on some or all printers.

  Please report these. PDF files are generated by many different applications so variations can arise that trigger bugs - these need to be addressed. In the short term, you can usually use `pdf2ps` or similar tools to convert the troublesome file into something the print server can handle.

- My jobs is not processing properly but is holding up the queue.

  Please `cancel` it using the instructions on the GatsbyPrinting pages.

- The printer jams. What should I do ?

  Attempt to clear the jam if you feel competent to do so. Please do not use excessive force. In either case, you should make a note of how and where it jammed and inform the GatsbySupport.

  Please try to load the paper into the printers carefully, without tearing or otherwise folding, creasing or distorting the sheets. Allow the tray to empty and then fill with an entire ream when possible.

A.2 General Queue Problems

The best place to look when diagnosing printer problems is the printer server’s WWW pages;

- First look at the [http://caxton.gatsby.ucl.ac.uk:631/classes Printer Classes] and check the ’Class State’.
- Next look at the [http://caxton.gatsby.ucl.ac.uk:631/printers Printers] and check the ’Printer State’.
- Click on the link for the relevant printer and examine the jobs.

Any problems relating to printer connectivity issues will be reported there. For the laptop network the instructions are the same except use `http://gate:631/classes` instead etc.

A.3 Consumables

The printer consumables are stored out in the 4th floor reception area. This enables anyone to replace something as soon as it is needed and without delay. If replacing a toner unit or other consumable please inform GatsbySupport via an e-mail. This way we know if anything may need replacing in stores.

Please load the paper into the trays carefully, ensuring there are no folds, tears, creases etc. Try to observe the orientation arrow.

A.4 !PostScript Problems

The first thing to check is that your file is a proper !PostScript file.

```
file filename.ps
```

Then try using `ghostview` or `gv` to view it.

A.5 Document Structure

Does the !PostScript file have the correct "'Document Structure Comments"' (DSC), e.g. `If a PS document is comprised of other PS documents it may have EOF comments distributed through-out, one for each embedded file. These are formal document structure comments which indicate the end of a file (EOF). While comments should obviously be ignored by a printer's PS interpreter, anything else that is looking for that document structure will interpret them as meaning the file ends here. Thus, the CUPS printing system on Linux may see the first 1. dvips has a -K option which will strip out the embedded comments. 1. Use a !PostScript 'distiller', like pstops, which rewrites the document.`

A.6 Encapsulated PostScript

`Is the file` *Encapsulated PostScript* `(EPS) ? EPS files are not complete PS documents and often do not contain a showpage command. They are designed to be embedded in a larger document, e.g. a logo as part of a letterhead. Ghostview '''will''' display these but the '''printer may not print them out'''. The solution is to embed them in a bone fide PS document in the way they are designed to be used. You might get away with adding a showpage command to the last line of the file.`

`An EPS file is a !PostScript file which should have the following properties;`

- `The first line is %!PS-Adobe EPSF-3.0`
- `It contains a BoundingBox comment`
- `It is single page image (in DSC terms, the %%Pages comment must have a value of 0 or 1).`
- `The file should not use any operators which affect the global state.`
- `The file should not, ideally, use showpage.`

`If your !PostScript file appears to follow these rules then it is Encapsulated.`

A.7 Size Issues

Europe uses different paper sizes to that of the US, although many PS files will explicitly request Letter size. The printers are configured to print Letter on A4 but if someone tells the printer that it has a US letter tray, then the printer will always request Letter. You can always correct the PS file if in doubt;

```
pstops -pa4 input.ps output.ps
```

A.7.1 Memory Issues

Does your print job require a lot of memory ? Try reducing the memory requirement.
See also; [http://partners.adobe.com/public/developer/en/ps/5002.EPSF_Spec.pdf EPS Specification (PDF)]