Information for new Linux users at Diam, Faculty EEMCS, Tu Delft, version 1.25

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1 TuDelft and DIAM network Do's and don'ts !!

- **Never** give your account information and/or password to someone else.
- **Never** ever try to connect a private computer or laptop to our department network, e.g. by highjacking an IP or MAC address from another system!!

  If you use an IP-address or MAC (ethernet) address from our department network we consider that as hacking and if we discover this you'll be reported to the security officer of the Tu Delft.

  If you want to use your own computer or laptop on the department the only legal way to do so is by using the wireless or wired networks on **eduroam** or **TUvisitor**.
- **Do not** shutdown your system.

  Updates, upgrades, patches, backups from local partitions and other things are done outside working hours. If your system is down these routines will fail. If you go away for a longer period and want to shutdown your system, then **notify us in advance** so that we can remove it from the list of active systems.
- **Always** log off when you leave your room for more than a few hours. Do not stay logged in for more than about 1 week or you may experience problems (e.g. you may miss warnings about password or account expirations).

  Being logged in for weeks may also cause problems as e.g. log files may grow very large and make you exceed the disk quota threshold. Logging off also allows system management to easily find out if a system is available for maintenance and/or upgrade.
- **Run** programs on your desktop or on a cluster node and **not** on a main server. If you run e.g. simulations on a server these programs will be aborted without notification.
- **Do not** try to install software that requires "sudo" or root access.

  Even system management always installs software without root access to minimize the chances of compromising the system by badly written or malicious software. See for more details the section on Additional Software further in this document.
- **Never** reboot your computer on a Live CD or Live USB stick or similar, especially while it is connected to our trusted network. If you really need this consider using a virtual machine like KVM/Qemu or a container (Docker/Singularity) instead.
- **Do not** use Bit-Torrent or any other p2p programs used for sharing content over the Internet as this is not allowed on our university network for obvious reasons.

2 An Important Note

- All desktop systems, servers and cluster systems are **rebooted approximately once every 4 months**, e.g. to make sure they run the latest system software and drivers. The system will automatically notify you by email whenever this is about to happen. Of course this will terminate all running jobs so be careful not to loose any data if you receive this warning.

3 DIAM Network Overview

3.1 Servers

Our department has 5 Linux desktop servers and each server has about 20-25 satellites (desktop computers) for our users. Files in your login (home) directory are stored on the server and NOT on your local desktop. This means that you can use any desktop system attached to your server to login and still have all your data available. This is useful if your own system is broken or you have to leave your room for some reason.

Run jobs with a lot of I/O on your local harddisk. This is because space on the fileservers is limited compared to the space on your local harddisk and the performance for heavy access (e.g. compiling a large application) is much less than doing the same on your local harddisk.

There is a softlink (e.g. Localdisk) that points to a large area on your local harddisk. If you do not have this and need one : simply ask system management to do so. This link can also be used to store large and less important data that doesn't need to be backed up or to be accessible from other systems.

Note : If you login to another computer than your own system the link to your Localdisk will be non-existent. You can only access the Localdisk directory from your own desktop.

The current Linux fileservers at the location van Mourik Broekmanweg 6 are:

- dutita1 : Numerical Analysis, Scientific Computing, floor 2-3 (Vuik)
- dutita2 : Mathematical Physics, floor 2 (Heemink)
- dutita3 : Statistics, System Theory, Mathematical Physics and Mathematical Finance, floor 2-3 (Jongbloed, Aardal, Oosterlee)
- dutita4 : Differential Equations, System management, floor 2 (v. Horssen)
- dutiaw4 : Mathematical Analysis, floor 1 (v Neerven, de Pagter)
- dutita11 : Extra server for floor 2-3. Only keeps software packages in /opt and located in the TU data-center. This is the only system that may be affected by a TU wide network interruption.

3.2 Backups

We have various backups of all user files on the servers:

1. Twice a day an incremental backup in an archive on a network disk that only stores the files that changed since the previous day.
2. Once a day a snapshot of the homedirs on the same disk as where the original files reside. This uses rsnapshot and has 7 snapshots for the last 7 days, 4 snapshots for the last 4 weeks and 2 snapshots for the last 2 months. They can all be found in /local/Snapshots/ on the server.
3. Once a week on tapes both stored inside and outside this building and kept for 1 month.
4. A quarterly backup on tape stored outside the building and kept for 1 year.
5. A year backup on tape kept forever.
6. Five times a week a complete mirror of all user files (including part of the snapshots) is written to a second (spare) disk on the server : `/mnt/sdb3/home/<group>/<user>`

If you delete something by accident and it is older than one day you can immediately restore it yourself from the snapshots without consulting system management by going to the fileserver and copying it back.
Example (for a user in the dutita1 server group) :

```
rlogin dutita1   (or ssh dutita1)
cd /local/backuphome/nw/myusername/mydir  # Contains latest snapshot from the day before
cp myfile /home/nw/myusername/mydir/
```

Other snapshots can be found by ordinary users as well, e.g. this is for a snapshot of 6 days ago :

```
rlogin dutita1   (or ssh dutita1)
cd /local/Snapshots/daily.5/localhost/mnt/sda3/home/nw/myusername/mydir
cp myfile /home/nw/myusername/mydir/
```

The same for a snapshot of 3 weeks ago :

```
rlogin dutita1   (or ssh dutita1)
cd /local/Snapshots/weekly.2/localhost/mnt/sda3/home/nw/myusername/mydir
cp myfile /home/nw/myusername/mydir/
```

Restoring backups from incrementals must be done by system management but is also quite easy. In contrast: restoring data from tape can take many hours. This can only be done if you have lost a considerable amount of data that can't be restored easily by yourself. But in most cases the snapshots should be convenient, provided there aren't any harddisk crashes.

4 Disk quota

The disk quota (storage space) on the server is about 10-12 GByte per user and is mainly limited by the size of our backup tapes. **NEVER** exceed your disk quota as this ruins `config` files in your homedirectory and results in a myriad of strange problems, such as lost or corrupted emails, a desktop that suddenly looks very different, empty files or even a complete lockup of your account!

To check your disk quota manually you can type the command `"quota -v"`. Generally the system will display a message such as "You are in block grace time" whenever you are about to exceed your disk quota. This message is displayed in a window every-time you login to the system. Yet another reason to log off every time you leave the building at the end of the day!

Filelight : A very nice way to find out graphically how much space is used by which files is the **filelight** program. Start it from the commandline and choose the option **Scan -> Scan Homedirectory**.
Avoid using the **Scan Root** directory option as this will scan the whole file-system, including all network disks so this will take very long and has no useful information for an ordinary enduser.

Tip 1 : Use your homedir wisely: do not store your holiday pictures, James Bond movies or music in your homedir but use the Localdisk for these purposes instead or - even better - consider to store this type of data on your private computer. Our backup system is quite sophisticated but also expensive: we don't want to waste our resources in just backing up lots of mp3 files or mpeg4 movies every day!

Tip 2 : Sometimes users create extra IMAP or POP mailboxes in e.g. Thunderbird. But in Thunderbird the default is to synchronize all messages to your homefolder for off-line use (often 20000 messages or more !). This is a good idea for e.g. a laptop, but a **very bad idea** for a system always connected to the Internet, and it may also easily push you over your disk quota. Besides it makes Thunderbird very slow as well.
To turn this off you should remove the flag at :
`Edit -> Account Settings -> Synchronisation and Storage -> Keep messages on this computer`.
Do this for ALL your mail accounts!

Using POP is completely obsolete and is really not a good idea anymore. And you will always download all messages to your homedirectory (much like the synchronization in IMAP).

Tip 3 : Do not forget to empty your trashcans regularly, both for File Managers like Konqueror or Dolphin and e.g. in your Thunderbird mailboxes.

5 Passwords

Your password is valid for about 6 months and works for all desktop systems within the same server group. After 6 months, but before it expires, your password has to be changed on your fileserver. The system begins warning you about 14 days before it expires.
Changing it on your local system is useless as the passwords will be synchronized with the ones on the fileserver every whole hour and so a new one will be overwritten.

If you change your password on the server it will be valid on the desktop system after the next whole hour during office hours, as we synchronize only once per hour.

Example of changing your password on your server (here dutita1) :

```
ssh dutita1
passwd
<Give old password>
<Give new password>
<Give new password>
logout
```

Note : Make sure that you change your password a few days **before** it expires or you will have problems logging in when your password has expired!
In case of emergency when the password has already expired: login to a console using Ctrl-Alt-F2 and change your password temporarily there. Then switch back to the graphics screen using Ctrl-Alt-F7 and login to your desktop. After you have done this, you can change your password on the server (see above).

Tip : Several users receive their email on the same server as where they have their homedirectory. In that case you also have to change the password inside your mail program or else you won't be able to read your email anymore.
If you keep your email on the central TU Delft Exchange mailserver you instead have to change the **netid password** inside your mail program when it expires.

6 Printing

We are not allowed to buy our own printers anymore but have to use the university copiers instead. These are not always as reliable as the old local printers and may be slow sometimes as all traffic first goes to a central SSC-ICT server outside this building. This is mainly to be able to charge each person individually for the amount of print jobs started.
For black and white only printing or in case of TU wide printing problems, there is a small and slow local HP Laserjet printer on floor 2 for emergency cases.

The following printers are currently available on all systems :

pshplaserjet	room West W2.790 floor 2	old black and white HP Laserjet
TUD610289-smb	room West W2.790 floor 2	SSC ICT Xerox copier, only one allowing direct printing
FollowMe-smb-NetId	anywhere	SSC ICT all Xerox copiers

6.1 Followme queues on Xerox

There is currently only one Xerox printer that allows for direct printing (see above).
All other Xerox copiers can only be used if you define a followme queue that is connected to your personal NetId on your desktop system. To define a followme queue you can use this command: `"add_followme_queue"` and answer the questions about your NetId. This command will also add some reasonable defaults for that printer to your /.cups/lpoptions if not already there.

Important : Everytime your NetId password has changed, you also have to redefine the followme queue on your system! If you forget to redefine it, then the followme queue won't work anymore.
Also be careful about strange characters in your netid password: due to the mechanism used by the (Microsoft based) TUD printer servers some characters may cause problems, e.g. the following characters are not allowed in NetId based FollowMe queues: `@ # \ / ! $ " and :`

If you have a problem with printing, first check the printer applet in your taskbar or with the command `"lpstat -t"` to see if there is something wrong with our local queuing system. If there is a paper jam or similar problem on a **local** printer, the queue will be disabled after a couple of minutes to avoid wasting paper by resubmitted print jobs. The printer must then be re-enabled **manually** with e.g. the command `"cupsenable pshplaserjet"` for printer pshplaserjet.
However, you should first remove pending jobs (e.g. with `"lprm -Ppshplaserjet -"` for printer pshplaserjet). This avoids wasting large amounts of paper.

6.2 Printing defaults

If you want to change the default printer you can define the preferred printer in the variable LPDEST and put that in your .profile:

```
export LPDEST=TUD610289-smb  # printer on floor 2 West
```

If you want to change printer options permanently (e.g. Duplex mode, Color/Grayscale or Paperformat) you can do that with `lpoptions`. The command `"lpoptions -l -dTUD610289-smb"` gives you a list of all possible options for the printer (here ps600227). The one with the asterix (*) is the one which is currently default.
If you want to change an option you can use something like this:

```
lpoptions -dTUD610289-smb -l           # to show all possible options
lpoptions -dTUD610289-smb -o PageSize=A4 -o Duplex=DuplexNoTumble
lpoptions -dTUD610289-smb -l           # to check if it was changed
```

But please note that you will change the option permanently if you do so. If you want to remove all (undesired) defaults then often the easiest way is to completely remove the file `".cups/lpoptions"`:

```
rm ~/.cups/lpoptions
```

If you want to print something from the commandline but still want a powerful GUI to make adjustments (e.g. papersize, color/grayscale etc.) you can use the command **gtklp**:
`gtklp filename`

Tip : If a printer sticks to print e.g. singlesided, prints 4 pages on one page or always uses black and white no matter whatever you choose in the printer menu then the easiest solution is often to remove or edit the file `".cups/lpoptions"`.

6.3 Cancel jobs on the TuDelft copier/printers

For the central copier/printers the situation is somewhat different from a local printer: your system sends the job to the central TUDelft printer server and from that time the only way to control the print job is from the printer website `http://webprint.tudelft.nl` or using your campuscard on one of the copiers and search through the menus.
So, removing printjobs with the printer applet or “lprm” command from above won’t work for these remote printers.

7 Email

Since 2007 Mail is received by a central university server (a Microsoft Exchange system). You can either decide to leave your mail on that central server and use `IMAP` to read it or use `http://e-service.tudelft.nl.` to forward all your emails to your final emailaddress on e.g. your DIAM server : `<user>@<server>.twi.tudelft.nl.` or anywhere else (e.g. a gmail.com account).

Changing your forward address can be done by yourself by going to: https://e-service.tudelft.nl/ `->` Login `->` Profile/Profiel.
However, if you want to forward to more than one address this is not possible using the MS-Exchange system. In that case you may forward to your Linux server and from there use procmail to redirect it to multiple addresses (e.g. both a local copy and a gmail address).

Both methods (reading your emails on the MS Imap server or forward your email to our local Imap server) have their advantages and disadvantages.
Largest advantage for the MS server is that it can be accessed from all around the world, but this is also it’s largest disadvantage as it makes that system more vulnerable for intrusion by criminal hackers and other nasty people.
In contrast the Imap service on our DIAM servers can only be used from a limited amount of domains in the Netherlands (e.g. Xs4all, Ziggo, Planet.nl, Surfnet, Sara, Math Dep. Leiden and a few more), mainly for security reasons. This implies that in all other cases you’ll have to use a VPN connection to be able to read your email on a DIAM server.

7.1 Mail programs

Most people now use `Thunderbird` as a mailclient. It has the disadvantage that for local email folders it cannot use the efficient and robust `maildir` format that stores every mail as a single file in a directory. For Local Folders it can only use the clumsy `mailbox` format, where all emails are stored in a huge single file (500 GB or even (much) more).

But, as we now use IMAP access for all email (both on the central mailserver and the DIAM mailservers) we simply avoid using Local Folders and so this won't make much difference as with IMAP Thunderbird leaves the task of the real message handling to the IMAP program on the remote servers.
However, be careful to always switch "synchronization for all mailboxes off ! (see also the section about Disk Quota). If you don't do this all your remote mail will be copied to your local system and that may easily blow you over your diskquota threshold.

Tip : Try nevertheless to avoid having more than 3000-4000 messages in your inbox! If you have more than this, it may take a considerable length of time to scan all the message titles and so you may have performance problems if the serverload is high or the connection slow.
Also move large amounts of older messages to a separate folder, e.g. a new archive for every new year or even month (possibly by using a softlink in Local Folders that point somewhere to your Localdisk).

7.2 Procmail

Email to `<name>@<server>.twi.tudelft.nl` will be delivered in your local homedirectory on the server using `procmail`, a very useful mail program that handles your email immediately when it is received and not - as with most mail programs - when you open your mailbox.

This `procmail` can be used to filter all your email, forward or copy it to other places and also to give automatic out-of-office replies. If you want to know more about this: check your `.procmailrc` file for examples, use the manual pages or just ask!
If you have your email on the central TU server this doesn't work, but MS-Exchange has similar features, although they have to be accessed using a GUI or webserver.

7.3 Using IMAPS on the TUDelft mailserver

To setup a TU Delft IMAP account with any mail reader (Thunderbird, Kmail, Evolution) follow these steps:

- Create a new incoming mail account with an IMAP profile
- As loginname use your netid with suffix "@tudelft.nl"
  Example: `ppaaltjens@tudelft.nl`
- Provide your password and let it be stored if you prefer
- Consider using a master password if you store your passwords for security
- Provide the IMAP hostname: `imap.tudelft.nl`
- Set security to "SSL/TLS" . The port will be automatically set to 993
- Send yourself an email and see if it works :-)

7.4 Mail forwarding on DIAM servers

You may also forward the local department mail (DIAM) to your TUDelft address to have everything in a single mailbox (on the central TU server). Most convenient for this is again `.procmailrc`. In that case your department email box will be always empty and the only effective box will be your TUDelft mailbox.

Don't use `.forward` to redirect your emails to another address as it is old and obsolete and will simply send everything to your remote address instead of filtering Spam and/or other things that shouldn't be forwarded. It may even occasionally create nasty mail loops, e.g. : you forward to B, B sends a warning back to you, you forward this warning again to B ad infinitum.
Another problem of using `.forward` is that you also forward malicious emails containing viruses. They won't harm our Linux systems, but if they are detected on e.g. Gmail it may put our server on a blacklist as Gmail cannot see that we are "innocent" and only forwarding. And if we are on a blacklist no emails can be send anymore from that system.
The best way to forward your DIAM emails is really by using a rule in your `.procmailrc` . There are several forwarding examples in your personal `.procmailrc`.

8 DIAM Webpage

We have a simple webserver on the department that can give semi-public access to webpages stored on our fileservers, e.g. for students or for collaborating organizations like fellow universities.
If you need to make a webpage: go to `/home/<group>/Public/users` and create a directory there with your own username. In this directory you can store your HTML files or whatever you want to make semi-public.

Changes since April 2018: because we are under constant attack from hackers all around the world we decided to limit access to our little webservers. From now on the following limitations apply:

- The system trying to access the webpage has to be in one of the following country domains: **nl, de, uk, be, se, no, gr, fr, cz, th, pl,hr, it, at, ch, dk, es, fi, ie, is, pt, sk, us, jp, ca, au, nz**
- Alternatively the system trying to access the webpage has to be in one of the following functional domains: **edu, gov, net, org, com**
- The system trying to access the webpage also requires a properly registered IP-address. This implies that it should have an associated DNS name (e.g. "server.debian.org") and both a lookup for name− >ipaddress and for ipaddress− >name should exist and yield exactly the same answers.
- PHP is not supported anymore.

All users in a group are allowed to create web directories on their server, but are of course not allowed to modify or delete data which is owned by any other user.

Example to create a personal homepage with your own username :

```
mkdir -p /home/$GROUP/Public/users/$USER
```

This directory can be accessed from the outside world using the following URL :

`http://ta.twi.tudelft.nl/<mygroup>/users/<myusername>`

It may be convenient to create a softlink in your homedir that points to your webpage, so that you don't have to remember where it is located. Example :

```
ln -s /home/$GROUP/Public/users/$USER ~/Mywebpage
```

If you need a more professional webserver you can use a commercial hosting center, try the "www" directory on the H: drive (but which also isn't very powerful) or ask for advise at the TU Delft service point.

9 Sharing files : Dropbox, OwnCloud, Webdata

9.1 DropBox

Many people nowadays install and use DropBox to share files with others or to be able to access files from elsewhere. However, especially when the dropbox synchronization directory is inside your homedirectory on the fileserver this may put a huge burden on that fileserver: DropBox synchronizes very often and this setup may degrade the performance of our fileservers considerably.
So, if you really insist to use DropBox, then make sure that the DropBox directory is somewhere on your Localdisk and not on the Fileserver disk, e.g. as follows:

```
mkdir -p ~/Localdisk/Dropbox
ln -s ~/Localdisk/Dropbox ~
dropbox &
```

Please note that DropBox is NOT installed on the systems by default, so if you want to use it you'll first have to download and install the client by yourself.

Another point of concern is security : by using DropBox you have a permanent connection between our department and a completely untrusted system outside. This can lead to compromises as soon as a new bug is discovered inside the DropBox protocol (which already happened several times in the past).

9.2 OwnCloud with SurfDrive

A good alternative to DropBox is OwnCloud (has to be installed on your desktop system), an Open Source file share solution in contrast with the blackbox provided by DropBox.
SurfNet (the network provider for Dutch Educuational institutions) has a service similar to DropBox but using the OwnCloud protocol that they call "SurfDrive".
To use it first create a directory OwnCloud on your Localdisk to avoid putting a huge burden on the server (same as with DropBox), make a softlink and then start owncloud:

```
mkdir -p ~/Localdisk/ownCloud
ln -s ~/Localdisk/ownCloud ~
owncloud &
```

Then go to `https://surfdrive.surf.nl/files` , choose the "Delft University of Technology" and provide your netid and password. The rest should be clear.
Note you can also use it from a webbrowser (like DropBox) : `https://surfdrive.surf.nl/files` In that case however there won't be automatic synchronization between your local and remote files.

The largest advantage of SurfDrive / OwnCloud is that your data is stored on trusted servers in the Netherlands (at SurfNet) and not on arbitrary servers owned by some vague commercial companies in the USA.

9.3 Webdata

Another alternative for DropBox - provided by the central ICT department of the TU Delft - is your Webdata directory, accessible using your netid. On the TU Delft MS-Windows systems this is known as the **H: drive**. The Webdata folder can be accessed from anywhere in the world, from either MS-Windows, Apple, Linux or whatever (much like DropBox).
To read your Webdata on Linux you can use one of the following methods:

- Go in an browser to `https://webdata.tudelft.nl`, login using netid/passwd, go to your homedirectory (Staff-Homes `-> <first character of your surname> -> <netid>`) and download things from there.
- Use a WebDav network folder from e.g. the Konqueror filemanager.
- Use sshfs to mount it permanently on your Linux box, just as you would do with e.g. a USB memory stick or Dropbox. The following commands will do this :

  ```
  mkdir -p $HOME/mnt/hdrive   # creates a mountpoint: you can use any name you prefer
  sshfs -o workaround=rename  -o reconnect -o transform_symlinks   \
        -o follow_symlinks yournetid@sftp.tudelft.nl:/staff-homes  \
        $HOME/mnt/hdrive      # This starts the connection to the TUDelft servers
  ```

  If this is too complicated: this is now simplified by putting the commands in a script: the command `mnthdrive` should be enough now.

  Then type your netid password and check for the content in the mount point, e.g.: `ls $HOME/mnt/hdrive`. Of course a filemanager inside `$HOME/mnt/hdrive` works just as well.

  With the `reconnect` option the system will even ask for the password in case the connection was lost (e.g. because you were idle for a long time) without having to reconnect manually.

  Your real homedir is located in a subdirectory with the first character of your family name and has the name of your netid: e.g. for "L. Torvalds" it would be "`cd t/ltorvalds`". This path could of course also be added to the sshfs command above if you prefer (`staff-homes/t/ltorvalds`).

  Note that it is rather slow (2-5 MB/s), but it can be used from all around the world and also provides many backups, so you can use it as an alternative backup facility instead of e.g. a USB stick or of course to replace DropBox.

  To terminate the connection you can give these commands:
  `umnthdrive` or `fusermount -u $HOME/mnt/hdrive` .

  If it fails this is most often caused by an old registration in `$HOME/.ssh/known_hosts`. Move or remove `$HOME/.ssh/known_hosts` and see if it fixes the problem.

10 Running Microsoft Windows programs

On all Linux systems it is possible to use KVM (Open Source and very fast PC emulation) as a local application and then install a MS-Windows version (or any other Operating system) in there.
Note: to see Collegerama you don't need MS-Windows anymore. The dreadful Microsoft Silverlight plugin was finally dropped and replaced with the HTML 5 standard, that works fine inside e.g. Firefox or Chrome, although for some videocodecs you'll have to use a commercial browser like Google-Chrome, as an Open Source browser is not allowed to provide such patented codecs witout paying the full fees.
Best would be if Collegerama would simply only provide us with free video codecs, like e.g. Ogg-Vorbis , but it may take a while before they do that.

10.1 Citrix on https://weblogin.tudelft.nl

For many MS-Windows applications a much simpler method than having MS Windows locally installed is to use Citrix as provided by the central ICT department of the TU Delft:
From any browser it is possible to start a complete remote Windows 7 session by using Citrix (choose TU Delft desktop). or use e.g. the latest MS-Office, Matlab, Maple and many other programs. This is without having to install any software locally and so makes it unnecessary to run either KVM or VirtualBox on Linux only to be able to use some MS-Windows programs.
How to proceed :

1. Go to `https://weblogin.tudelft.nl` and login with netid/passwd
2. Ignore the "Download" button but click on "Already installed" (right)
3. If you go to "Office" you can start many applications as if they were running on your desktop (e.g. MS-Powerpoint, MS-Word, MS-Excel, Maple, Matlab).
4. If you want a full-blown Windows 7 session you can click on "TU Delft desktop".
5. Either option downloads a file "**launch.ica**" that has to be opened with a program "**/opt/bin/wfica**". If you enter this name and click on "Remember", you'll never have to do this again.
6. It may take some time to startup but it works reasonably fast and reliable most of the time.

11 Special software like OpenFOAM, Cuda, Fenics, Numba

To use some software packages you have to override some of the standard libraries or programs on your system as they may conflict with similar ones in these packages. This implies you cannot have them permanently in your searchpath or you may have sometimes strange problems, e.g. with MPI.
So, before you can use these packages you'll have to temporarily extend your environment by typing a simple command. The following table shows which packages are only available after giving such command :

Package name	Command	Short description
Cuda (default)	addcuda	Nvidia GPU developmentkit GPUs
Cuda 8.0	addcuda8	Nvidia GPU developmentkit GPUs 2017 (v8.0)
Cuda Python	addpycuda	Python bindings for Cuda
OpenFOAM (default)	addopenfoam	Popular CFD package
OpenFOAM 4.x	addopenfoam4x	Popular CFD package version 2017 4.0.0)
Paralution	addparalution	Numerical solvers for PDEs (GPU, OpenMP)
MPI Python	addmpi4py	Python bindings for MPI
Python games	addpygame	To run interactive game-like Pyhon programs

Since 2018 I prefer to install large packages like above in a so-called "container" using a nice piece of software called "**Singularity**". A container is a single, large file (much like an ISO image) that contains all the software required - with the correct version number - in a completely separate file-system, so you don't have to install or modify anything locally anymore.

At the moment the following packages are available using **Singularity**:

Package name	Command	Short description
Cuda 9	singularity-cuda9	Nvidia GPU developmentkit GPUs 2018 (v9.x)
Cuda 10	singularity-cuda10	Nvidia GPU developmentkit GPUs 2019 (v10.x)
OpenFOAM 6.x	singularity-openfoam6	Popular CFD package version 2018 6.x)
OpenFOAM 1806	singularity-openfoamv1806	Popular CFD package version 2018 v1806)
Fenics	singularity-fenics	Finite Element package for PDEs with Mesh generator
Numba	singularity-numba	Python accelerator for GPUs, with Anaconda and support for Jupyter notebooks
Tensorflow CPU	singularity-tensorflow-cpu	Popular Machine Learning tool, with Jupyter notebooks
Tensorflow GPU	singularity-tensorflow-gpu	Popular Machine Learning tool, with Jupyter notebooks

if you have made or downloaded your own Docker or Singularity image you can run it yourself as well using this:
`singularity run <imagename>` or `singularity shell <imagename>`
Docker itself is not supported on our systems as it has too many security issues, especially on a large network of systems like ours, but most Docker images run fine using Singularity.

12 Using Latex

Our Debian Linux systems have **TexLive** installed and not the more simple **TeTex** distribution that was used on good old Slackware that we used until 2013. There shouldn't be many differences, although in general **TexLive** is more modern and has some newer packages (e.g. tikz, beamer).
However not all **TexLive** packages are installed: the current install on Debian is just a subset, good enough for most articles, reports and sheets.
If you are a real TeX "guru" and insist on the full distro you can install the complete TeXLive somewhere on your local system and override the searchpath to the system **TexLive**. If you really are a "guru" you'll know how to do that :-)

Note : **Ppower4**, which was often used to make nice presentations with fancy desktop effects doesn't work with the TexLive distribution. You now have to use the **Beamer** package instead, which works fine as well.

13 Additional software

The system already has a large amount of software installed on the fileserver in /opt64 and /opt and that software can be used directly from your desktop. Examples are Inkscape, Acroread, Skype, GoogleEarth, Maple, Maxima, Matlab and many others. This software can be found in the separate "**DIAM Localmenu**" section which sits in the K-menu in the taskbar below.
If you want to compile and/or install your own software this is no problem, as long as you do it in one of your own directories (either on the local harddisk or in your homedirectory).
Software that requires root access for installation is not supported. Note that even we as administrators most often do not install software while being `root` (or Administrator), as this is far to dangerous with anonymous software that was simply downloaded somewhere from the net.
Compiling and installing software from the net as an ordinary user is often done in this way:

```
cd /tmp
tar -xvf package-x.y.z.tar.gz
cd package-x.y.z
./configure --prefix=/where/ever/myprograms
make
make install
```

You only have to make sure that `/where/ever/myprograms/bin` is in your searchpath or that you make a softlink to the `bin` directory in your homedirectory as this one is already in the searchpath for every user.
Example :

```
mkdir -p ~/bin
ln -s /where/ever/myprograms/bin/package ~/bin/
```

Note that `~` is simply an abbreviation for your homedirectory.

14 Remote access

All the DIAM fileservers can be accessed from outside using `ssh` and `imap2 over TLS` from most locations in the Netherlands. But if you need access from another place in the world you'll have to use a VPN connection or login to the TU delft "bastionhost" linux-bastion.tudelft.nl first.
This policy makes us less vulnerable for brute force SSH attacks. Nevertheless, we still get thousands of these attacks every day, so be especially careful from what system you start this remote login using ssh.
From any remote Linux system you can use the commandline tool `ssh -CY` to login to our fileservers and then even run graphics programs from there on your remote screen (e.g. Thunderbird) provided the connection is not too slow.
To go to your own desktop you can first login to your fileserver and from there use another login to go to your desktop machine:

```
remotesystem % ssh -CY myname@myfileserver
<Give your pwd>
myfileserver % ssh -CY myname@mydesktopsystem
<Give your pwd>
```

To use the bastionhost of the TU Delft central ICT department if you can't access the DIAM server directly :

```
remotesystem % ssh -CY <yournetid>@srv227.tudelft.net  # or
remotesystem % ssh -CY <yournetid>@linux-bastion.tudelft.nl
<Give your netid pwd>
bastionhost % ssh -CY <myname>@myfileserver
<Give your diam pwd>
myfileserver %
...
```

If you prefer a graphics SSH client use `mindterm`, a very good Java client that runs on all platforms, including MS-Windows and Mac. You can find it on https://www.cryptzone.com/products/appgate/mindterm.

To read your email on our DIAM servers you may also use an IMAP connection using your local mailclient such as Thunderbird (provided you are in the Netherlands).

Note Using a remote Microsoft Windows system to gain access to our system (e.g. using Putty or similar) is NOT always a good idea.
Why ? Millions of MS-Windows systems around the world are infected with botnets, backdoors, keyloggers and other nasty stuff. Only in the Netherlands there are probably $>$ 1 million MS-Windows systems semi-permanently controlled by criminals using botnets.
If you use such a system your username and password can be intercepted and exposed to criminals who might use this to gain access to our Linux systems. In fact this already happened at least twice in the past, once with disastrous consequences (dutita3, around 2011).
You'd better reboot a Microsoft Windows system on e.g. a Live Linux USB stick and use that to access our systems and thus avoid our servers becoming compromised.

Remember: if a server gets compromised because of a **single careless person**, it may make that system unavailable to **all other users** for days or even weeks ....

15 Computational clusters

Although your desktop may be reasonably powerful for more simple computations, doing heavy computations on your desktop makes your working environment sluggish and less responsive. Also, you can run only one program at the time and your system may even have not enough memory to run your problem at all.
For **larger** computations we have about 20 fast dedicated computers with a lot of memory, that can be used by everyone. You can run Matlab programs or your own C (or Fortran) code. You can do this either on one single system or by using many of them in parallel. If you login using `ssh -CY <node>` you can even see the graphics on your desktop system.

A few notes about the clusters :

- We currently have 2 clusters :
  - dutita8 with about 8 nodes and used mainly by floor 2

– dutita9 with about 10 nodes and used mainly by floor 3 (3 GPU nodes, K20, Titan-X and P100)

- If you want to use the clusters, you'll need a separate account that is independent from your DIAM account and has an independent expiry date.
- **DO NOT** run any programs on the cluster servers: these systems are only a "gateway" to the real computation nodes. Additionally, they are much slower than the other nodes as far as computing is concerned (only file I/O may be faster on the cluster server).
- Login to a node from your desktop using the following commands:

```
desktop % ssh -CY  <server>
server  % ssh -CY  <node-nr>
```

  This can be simplified so that you don't need to type a passwd for the second stage every time : just type `mksshkeys` to generate a public key for all nodes if the system still asks you for a password. After this, login to a node should go automatically without prompting for a password.

- The network disk is visible on all nodes and is the best place for small programs, scripts and data files, as they can be then directly accessed from all nodes without copying them. A network disk is much slower compared to a local disk, so if you are going to generate a lot of data or have large datafiles that have to be accessed many times during a run it is better to store the data on the local harddisk of each node.

  The pseudo directory `/part2` or `/mnt/sda2` is an entry point to the localdisk on each node and is writable for all users. There is at least 500-1000 GBytes per node and they have no disk quota, so you can use as much as you want. To copy data from or to the clusternode you can do the following (but there are many others ways to do it as well) :

  Example :

```
ssh -CY nw-node7
cd /part2
mkdir username
cd username
rsync -avz dutinwa:/part2/myname/mydata .
```

  Important Reminder: Please remove data that you don't use anymore, so the disks won't be filled over time with a lot of useless waste!

- **Always** run large programs in the background! Running a program inside a terminal on your desktop is a very bad idea: if you have to log off from your desktop the program(s) on the node(s) will be happily killed as well!

  To run a C/Fortran program or Shell script in the background use this command:

```
./myprogram </dev/null 1>/mywork/dir/output.log 2>/mywork/dir/error.log &
```

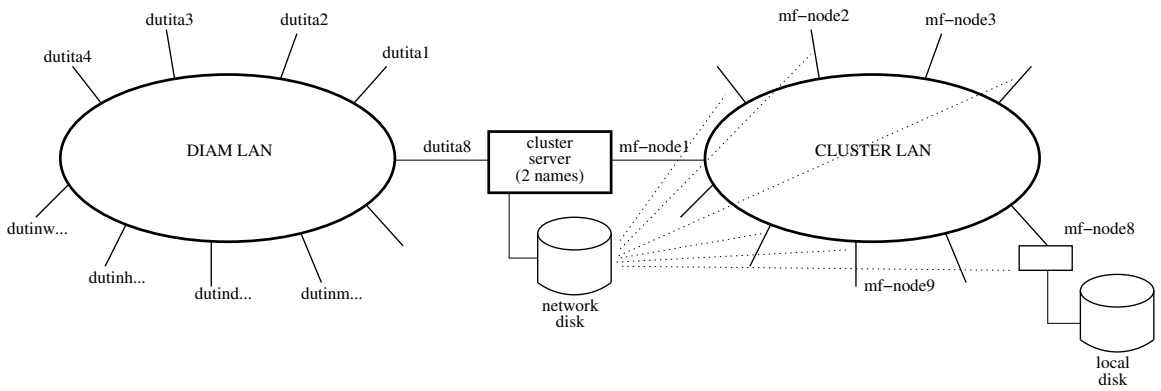

Figure 1: Schematic overview of a computational cluster (dutita8)

or even better, to avoid the program being killed when you quit the parent shell, which may e.g. happen if you have your graphics forwarded to a remote display using 'ssh -Y' :

```
at now
cd work/dir
./myprogram </dev/null 1>/mywork/dir/output.log 2>/mywork/dir/error.log
Ctrl-D
```

After this you can log off and simply inspect the output and error logfile(s) now and then. To do this interactively you may use e.g. :

```
tail -f /mywork/dir/output.log
```

This will show all output of your program just as if it runs in the foreground but without taking the risk of killing your program by closing the terminal window or session by accident.

Running Matlab programs in the background works in a similar, although different way (also note that the Matlab inputfile should be given without the path and the ".m" extension and should be in the working directory):

```
cd /working/directory
 matlab -nodesktop -nodisplay -logfile /mywork/dir/output.log -r matlabinputfile \
 < /dev/null >&/dev/null &
```

or, using the '`at`' or '`batch`' command avoiding problems with graphics forwarding (especially important if you are using Matlab as it always tries to open a graphics connection, e.g. to show the startup Matlab logo):

```
at now
cd ~/working/dir
matlab -nodesktop -nodisplay -logfile /mywork/dir/output.log -r matlabinputfile \
 < /dev/null >&/dev/null
Ctrl-D
```

In contrast with the '`at`' command the '`batch`' command will only start a job when any previous job has finished, i.e. when the load of the system has sunk below a certain threshold (approx. 80 %). In this way you can start many jobs at once and still make sure that they'll all be run in a sequential order and not all at the same time.

- Executing commands on many nodes at the same time:

  There are several tools that enable you to run the same command on all nodes.

  E.g. to get some specs about the available nodes :

```
clustermem               # shows amount of memory installed in each node
clustertypes             # shows type and number of CPUs per node
```

  Find out the load :

```
clusterload              # shows the load of all available clusternodes
```

  To issue an arbitrary command on all nodes use '`clustercmd`'. Example:

```
clustercmd df /mnt/sda2  # shows disk usage of the local diskspace assigned to users
clustercmd w             # show who is using the nodes and what their workload is
```

- Note that some systems are reserved for only a few users and cannot be used without permission by other people (e.g. nw-node10 - nw-node12).

16 Trouble shooting

1. **Question** : Thunderbird and Firefox do not start anymore after accidently switching off or resetting my system without properly logging off. They both complain about "already being in use".

   Solution : Remove the lock and .parentlock files in the /.mozilla/firefox/¡profile¿.default and /.thunderbird/¡profile¿.default directories. E.g. like this :

```
cd ~/.mozilla/firefox/
rm -v *.default/lock  *.default/.parentlock
cd .thunderbird/
rm -v *.default/lock  *.default/.parentlock
```

17 A few Useful Linux Commands

`rlogin` *server*	remote login to *server* (only on local network)
`cd` *directory*	change working directory to *directory*
`cp` *myfile directory*	copy *myfile* to *directory*
`rsync` *-av source host:target*	synchronize local directories (read the manual : man rsync)
`rsync` *-av host:source target*	synchronize remote directories (read the manual : man rsync)
`ssh -CY` *myname@{server,desktop}*	Remote login to your account on the DIAM server/your desktop
`passwd`	Change password (only useful on the fileserver)
`logout`	Log out of a terminal
`mkdir` *dirname*	Creates directory called *dirname*
`lpr -P`*printer file*	Prints *file* on printer *printer*
`lpstat -t`	Show status of the printer queues
`cupsenable` *printer*	reenable a printer when it is disabled (eg because of paperjam)
`ls`	Lists files in current directory (or another if you provide the name)
`ls -la`	Lists all files in current directory with size, date, owner etc.
`mv` *source-file destinationfile*	Moves *sourcefile* to *destinationfile*
`grep` *text file(s)*	Search for a piece of text in one or more files
`quota -v`	Show how much diskspace you are using on the fileserver and what the maximum is
`df -h`	Shows the total and remaining amount of a space on all partitions
`du -shc *`	Shows size for each entry in the current directory. Useful to find large files/dirs
`find . -name '*thesis*'`	Finds all files in the current dir with a name containing 'thesis'
`man` *command*	Shows extensive information about a Unix command
`rm` *file*	Removes *file*
`rmdir` *dirname*	Removes a directory *dirname*

18 This document

The latest version of this document is always available from http://dutita4/LinuxInfo/, accessible from all systems inside our DIAM network.

Note If you have any suggestions or find any errors/typos in the current version: please send your reaction to C.W.J.Lemmens@tudelft.nl