

Options for working remotely on machines at the department of computer science

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This document describes how you can remotely work on machines at the department of computer science in order to compile and run code for exercise sessions / projects.

The remote set-up consists of three parts

1. Making sure your departmental account is set up in the PC-rooms.
2. Setting up remote access via SSH.
3. (Optional) Installing and setting up the IDE VS Code on your personal machine, so that you can use this to easily work remotely on departmental machines.

1 Setting up your departmental account

Assuming you are properly registered for a course at the department of computer science, you should have an account on the departmental machines. This means that you can log in with your student number and Toledo password in the PC-rooms. If you are unable to log in, please contact the systems group at helpdesk@cs.kuleuven.be.

2 Setting up remote access via SSH

If you want to work on the departmental machines from outside the department, you can use SSH. The following tutorial will guide you through the steps to establish a SSH connection to the departmental computers ¹.

2.1 Part 1 (only first time)

The following steps will be slightly different depending on the operating system on your personal machine. Windows 10 has introduced support for OpenSSH, which should work out of the box. Older versions of Windows will require extra tools, as you can see below.

1. Generate a public-private ssh key pair on <https://www.cs.kuleuven.be/restricted/computerklas/keys.php>. (**You might have to wait one day until your key is activated on the departmental servers.**)

Linux

2. Download the files `id_rsa`, `id_rsa.pub`, `id_dsa` and `id_dsa.pub` and save them in the folder `~/.ssh`.
3. Use `chmod 700 id_rsa` and `chmod 700 id_dsa` to change the access rights of these files.

¹This tutorial is based, in part, on the information found on <http://dietercastel.com/2013/03/02/ssh-to-computer-science/>, <https://system.cs.kuleuven.be/cs/system/wegwijs/computerklas/internet/index-E.shtml> and <https://system.cs.kuleuven.be/cs/system/wegwijs/computerklas/machines/index-E.shtml>

Mac

2. Install xquartz from <https://www.xquartz.org/>
3. Download the files `id_rsa`, `id_rsa.pub`, `id_dsa` and `id_dsa.pub` and save them in the folder `~/.ssh`. **Make sure that the files do not have .txt as extension!**
4. Use `chmod 700 id_rsa` and `chmod 700 id_dsa` to change the access rights of these files.

Windows

2. Download the files `id_rsa`, `id_rsa.pub`, `id_dsa` and `id_dsa.pub` and save them in the folder `.ssh` in your home folder (most likely `C:\Users\). If the folder .ssh does not yet exist then create it. Make sure that the files do not have .txt as extension!`
3. Download MobaXterm (<https://mobaxterm.mobatek.net/>) and install it.
4. Open MobaXterm.
5. Click on 'Session' (top left).
6. Click on 'SSH'.
7. Remote host: `machine.cs.kotnet.kuleuven.be` with `machine` the name of a PC in the departmental PC rooms.
8. Username: your student number.
9. In network settings, check "Connect through SSH gateway". Servername: `st.cs.kuleuven.be`, Username: your r-number and key file the `id_rsa` file you downloaded before.

2.2 Part 2 (every time you log in)

Note: You might have to wait one day until your key is activated on the departmental servers.

1. Find an available PC. For Linux, Mac and newer Windows computers execute the following command in the terminal/ Windows Powershell:
`ssh -N -L 10080:mysql.cs.kotnet.kuleuven.be:80 r0000000@st.cs.kuleuven.be`
with `r0000000` your student number, enter your keyphrase and open `http://localhost:10080/` in your browser.

Linux

2. Open the terminal on your own machine.
3. Connect to your PC of choice:
`ssh -X -J r0000000@st.cs.kuleuven.be r0000000@machine.cs.kotnet.kuleuven.be` with `r0000000` your student number and `machine` the name of a machine in the departmental PC rooms.
4. Enter your ssh key phrase (twice).
5. Now you are connected to a machine in the departmental PC rooms.

Mac

2. Start xquartz.
3. Connect to your PC of choice:
`ssh -X -J r0000000@st.cs.kuleuven.be r0000000@machine.cs.kotnet.kuleuven.be` with `r0000000` your student number and `machine` the name of a machine in the departmental PC rooms.
4. Enter your ssh key phrase (twice).
5. Now you are connected to a machine in the departmental PC rooms.

Windows

1. Open MobaXterm.
2. Click on the connection you created before.
3. Enter your keyphrase (twice).
4. You should now be connected to a departmental PC.

2.3 Copying files between machines

Linux/Mac

- Open a terminal on your local machine. Copy a file from your machine to the PC-rooms using `scp -o 'ProxyJump r0000000@st.cs.kuleuven.be' myfile r0000000@machine.cs.kotnet.kuleuven.be,` with `r0000000` your student number and `machine` the name of a machine in the departmental PC rooms Copy a file from the PC-rooms to your machine using `scp -o 'ProxyJump r0000000@st.cs.kuleuven.be' r0000000@machine.cs.kotnet.kuleuven.be:myfile ./.` In both cases, `myfile` is being copied between the current directory of the local terminal and your home directory on the remote machine.

Windows

- MoxaXterm has a built-in drag and drop system for copying files.

3 Tips and tricks for the terminal set up


Some useful commands for working in a remote terminal environment:

- `$ cd path/to/directory`: navigates to the specified path.
- `$ cd ..`: navigates up one directory level
- `$ cd ~`: navigates to the home directory.
- `$ ls`: lists the files in the current directory.
- `$ pwd`: prints the path of the directory you are currently working in.
- `$ mv path/to/existing_file path/to/new_location`: moves file to new location.
- `$ cp path/to/existing_file path/to/new_location`: copies file to new location.
- `$ mkdir dir`: makes a new directory with the name `dir`.
- `$ cat path/to/file`: outputs the content of file to the standard output.
- `$ top`: shows a real-time view of the running processes.
- `$ clear`: clears the standard output.
- `$ exit`: closes the terminal.
- `↑` (up arrow on key board): scrolls through the commands you've entered previously.
- `Tab`: autocompletes command or filename.
- `Ctrl-c`: interrupts the execution of a program.

There are a number of different command line based tools you can use for editing files on the PC-room machines. If you are unfamiliar with working in a command line environment, we recommend `nano`, which can be started by typing `nano <filename>`, with `<filename>` the name of the file you wish to edit.

4 VS Code set-up

VS Code is a free lightweight cross-platform IDE. We will use it in this course because it allows for easy remote development, i.e., you can work from your own machine while compiling and running code on the departmental PC-rooms. You can also copy files between your local machine and the PC-rooms using the IDE.

- VS Code can be downloaded and installed from <https://code.visualstudio.com/>.
- Once you have installed VS Code, open the extensions panel by clicking on the  button on the left of your screen.
- Use the search-bar to find and install the following plugins:
 - Remote - SSH
 - Live Share

The following plugins are not required, but will likely enhance your experience with the IDE:

- Bracket Pair Colorizer
 - Code Spell Checker
 - Packages specifically for the programming languages you wish to use.
- If you are a Windows 10 user, you should check whether your OpenSSH installation has been updated to version 8. You can do this by running the command `ssh -V` in Powershell. If you still have version 7, you need to patch your OpenSSH installation: <https://github.com/microsoft/vscode-remote-release/issues/18#issuecomment-507258777>. Note that it is most likely that the correct file to download in the first step is OpenSSH-Win64.zip unless you are using a very old machine. Only do this if you encounter an issue connecting as described in the video. You will also need to remove the passphrase from your local copy of your private key. Assuming your key is in the `.ssh` folder in your home folder, and it is called `id_rsa` you can do this as follows:
 - Open a Powershell window.
 - Run the command `ssh-keygen -p -f .ssh\id_rsa`.
 - Enter your passphrase for the key as instructed.
 - Hit enter twice when prompted for a new key (without typing in a new key).

Please note that this copy of your key is now only secured by the security on your own laptop. This means that you should have a password on your Microsoft account and if you suspect someone may have had access to your key, you should generate a new one. You can check that everything with your OpenSSH installation is working as expected by running `ssh -J r0000000@st.cs.kuleuven.be r0000000@machine.cs.kotnet.kuleuven.be` in Powershell with r0000000 your student number and machine the name of a machine in the departmental PC rooms.

- Now watch the video at <https://people.cs.kuleuven.be/~emil.loevbak/vscssh.mp4> to configure the Remote - SSH plugin.
- Below you can find a list of common mistakes when performing this setup. If you encounter an issue you cannot resolve, please let us know at emil.loevbak@kuleuven.be or pieter.a.peltans@kuleuven.be.

5 Common issues

These are common issues when connecting with the VS Code setup:

- On Windows/Mac, your key files in the `.ssh` folder may have the `.txt` extension. Double check this. When checking this, you should make sure that file extensions are visible.
- Double check that you see the following files when running `ls .ssh` in a terminal or Powershell: `id_rsa`, `id_rsa.pub` and `config`. If these do not exist, then you have forgotten a step in the process.
- On Mac/Linux, double check that you have set the correct permissions on your key files.
- If VS Code is giving issues, double check that you can log in using a Powershell or terminal using `ssh -J r0000000 @st.cs.kuleuven.be r0000000@machine.cs.kotnet.kuleuven.be`.
- Some connection issues with VS Code can be caused by not having enough quota on the departmental machines. You can fix this by logging in with a terminal using `ssh -J r0000000 @st.cs.kuleuven.be r0000000@machine.cs.kotnet.kuleuven.be`. You can see what folders take a large amount of space using `du -hd 1`. You can remove a folder with `rm -r <folder>`. Common culprits are the `.cache` and `.mozilla` folders. Do not remove folders or files if you do not know what they are!
- Having bad temporary files from a previous connection (attempt) with VS Code can cause issues. You can fix this by removing the `.vscode` and `.vscode-server` folders in your home directory in the PC-rooms, after logging in with a terminal as explained above.
- The first time you connect with VS Code, the connection may fail. Usually attempting to reconnect will resolve this issue.