External Server Guide

Banco de Portugal's Microdata Research Laboratory (BPLIM)

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Contents

1 Access to the External Server

1.1 Upon Access Approval

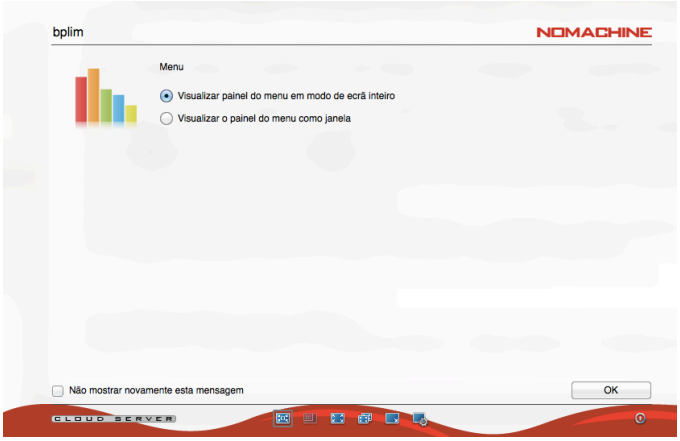
Once access is approved, you can connect to the external server using the **NoMachine** client. See Download, install and configure NoMachine client for detailed instructions.

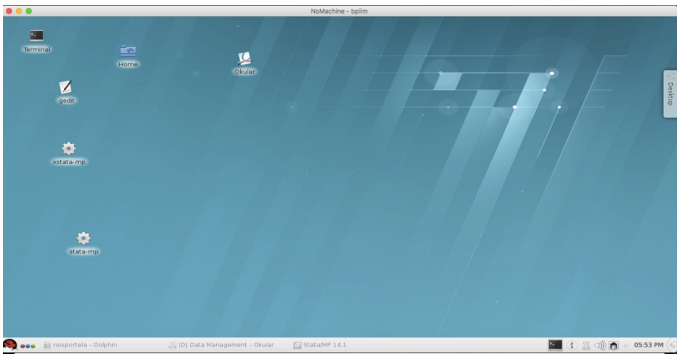
1.2 Password Policy

- The first password provided must be changed at your first login.
- Passwords expire after **60 days**. When this happens, the login window will prompt you for a new password.
- Passwords must comply with the rules described in Password requirements.

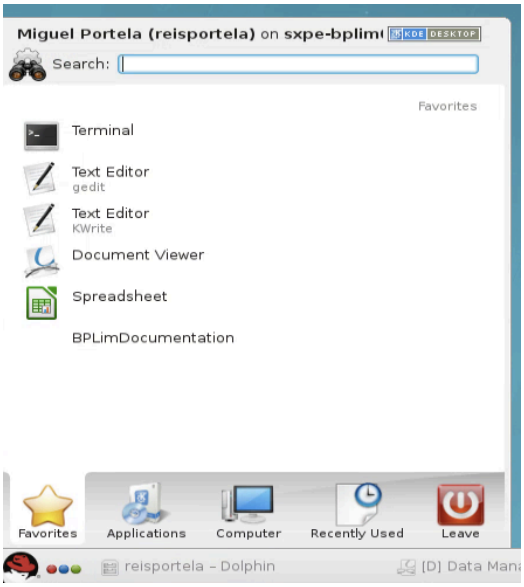
1.3 First Steps

1. When you start **NoMachine**, you will see the following three screens:





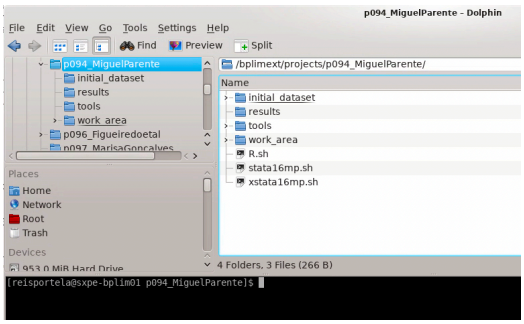
2. Select the "**Kickoff Application Launcher**" menu:



3. Then:

    1. Click on **Applications**.
    2. Select **BPLIM** and click on your project (e.g., `PXXX_name`).
       You will then see a graphical environment (the **Dolphin** file manager[1]):

[1] Dolphin is an intuitive and easy-to-use file manager. You can use it, for example, to browse the directory, to create or delete files/directories (by using the right mouse button). For more information about Dolphin, please visit: https://userbase.kde.org/Dolphin .



You can display the command line (`Terminal`) alongside Dolphin by pressing **F4**.

4. Files with the `.sh` extension are scripts used to launch applications or enter an interactive environment.
   For example, `stata_container.sh` starts the graphical version of Stata.
   You can run these scripts either by double-clicking them in Dolphin[2] or by typing in the Terminal:

   ```
   ./stata_container.sh
   ```

5. Within your project folder, you will have access to the following directories:

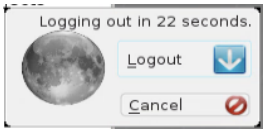
Directory	Purpose	Access
`initial_dataset`	Data sources provided by BPLIM	Read-only
`initial_dataset/modified`	Modified data provided by BPLIM	Read-only
`results`	Output files generated by researchers	Read–write
`tools`	Project-specific analysis tools	Read-only
`work_area`	Temporary working directory	Read–write
`/bplimext/doc/Manuals`	Manuals and auxiliary files	Read-only

- Your **work_area** folder also contains templates for both Stata and R(`R.sh`). By default, these template files are read-only.

6. To reset and disconnect the remote desktop session, log out as shown below. After logging out, close the NoMachine window.[3]

[2] In case 'xstata17mp.sh' does not launch Stata please see 'Statistical software'.
[3] Click on the cross button at the upper right corner to close.

Confirm before exiting by clicking **Logout**:[4]



- If you do not log out, your session will remain open until your next login. This may be useful to keep programs running, but note:
  - Leaving sessions open consumes server resources.
  - The recommended method for running programs overnight is **batch mode** (see discussion below).
  - If the server is rebooted for maintenance, your session will be closed and unsaved work will be lost. We strongly recommend saving your statistical programs at regular intervals.

2 Important Guidelines

2.1 Keep your home area tidy

- **Do not save files in your home area** (`/home/USER_LOGIN`).
  If you exceed its size limit, you will not be able to log in.
- Check the size of your project regularly. Open a Terminal and follow these steps:

[4]Note that before exiting the server, you need to make sure that all active programs have been closed (unless they have been launched in *batch* mode). Running programs in *batch* mode is justified for procedures that require high computational resources, intense calculation and/or long processing time.

1. Move to the project folder:

   ```
   cd /bplimext/projects/PXXX_name/
   ```

2. List the total project size:

   ```
   du -h
   ```

3. Check folder sizes and list those $\geq$ 1 GB:

   ```
   du --max-depth=1 -h | sort -h | grep G
   ```

4. Move to the `work_area` folder:

   ```
   cd work_area
   ```

5. Repeat the size check in this folder:

   ```
   du --max-depth=1 -h | sort -h | grep G
   ```

6. Identify duplicate or temporary files and remove them:

   ```
   rm FILE_TO_DELETE
   ```

7. Compress large files or folders you are not currently using:
   - Compress a folder:

     ```
     tar -zcvf YOUR_FOLDER.tar.gz YOUR_FOLDER
     ```

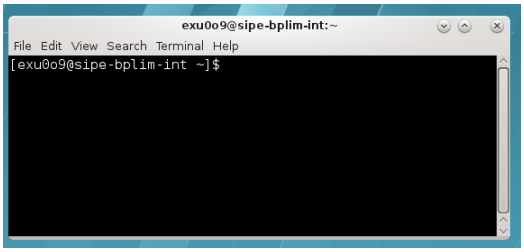
   - Compress an individual file:

     ```
     gzip YOUR_FILE
     ```

2.2 Using the Terminal

The Linux Terminal is a command-line interpreter. You can use the shell for many tasks, such as searching files and contents, organizing your workspace, and—most importantly—running programs in **batch mode**.

1. Access the Terminal from:
   Red Hat → Applications → System → Terminal



2. See Shell Commands for a list of frequently used commands.

3. If you use a non-English keyboard, the actual key mapping may differ from what you see on the screen. This mainly affects symbols.

   Example: on a Portuguese keyboard, `+` is on the `?` key, and `*` is on `SHIFT + ?`. This depends on your operating system.

4. Linux is **case-sensitive**. For example, `LS` and `ls` are different commands.

5. Use the **arrow keys** to scroll through previously entered commands.

6. Use the **Tab** key for automatic command-line completion.

7. Example: list elements within a folder in a human-readable format (`h`), long list (`l`), reverse order (`r`), sorted by modification time (`t`), including almost all files (`A`):

   ```
   ls -lArth
   ```

3 Statistical Software

The installation of additional commands or packages must be requested from the BPLIM team at **bplim@bportugal.pt**. Researchers are not allowed to install new commands or packages on the server independently.

3.1 Stata

Stata versions available on the server: **15 through 19.5 (Stata Now)**. The way you run Stata depends on your project configuration.

3.1.1 Running Stata inside a container

For projects configured with a container, Stata must be run within that environment.
In this case, you will find a launcher script named **`stata_container.sh`** in your project folder.

You can start Stata in any of the following ways:

- **Using the file manager** (Dolphin): double-click the `stata_container.sh` file to launch Stata.
- **Using the Terminal**:

  1. Open a Terminal in the project folder.
  2. Run:

  ```
  ./stata_container.sh
  ```

- **Manually opening the container**:

  ```
  cd /bplimext/projects/PXXX_name
  singularity shell tools/_container/CONTAINER_ID.sif
  ```

Then start Stata inside the container:

```
xstata-mp
```

If your project does **not** currently use a container and you would like to upgrade to the latest version of Stata, please contact the **BPLIM Team**.

3.1.2 Running Stata natively (installed locally)

For accessing the native Stata installations (versions 15 to 18), follow the instructions below.

Stata can be run in **interactive graphical** or **non-graphical** modes.[5]

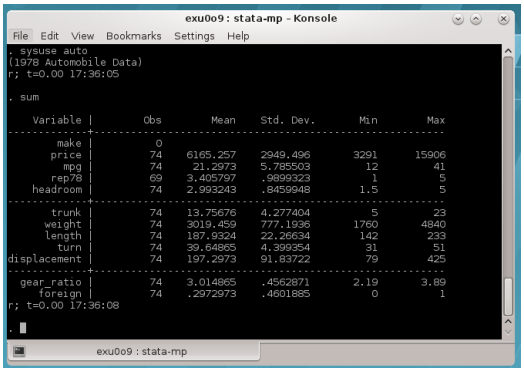
3.1.2.1 Interactive non-graphical mode

1. Move to the desired folder, for example:

   ```
   cd /bplimext/projects/PXXX_name/
   ```

2. Launch Stata by typing:

   ```
   stata16-mp
   ```

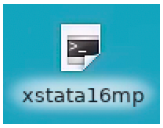


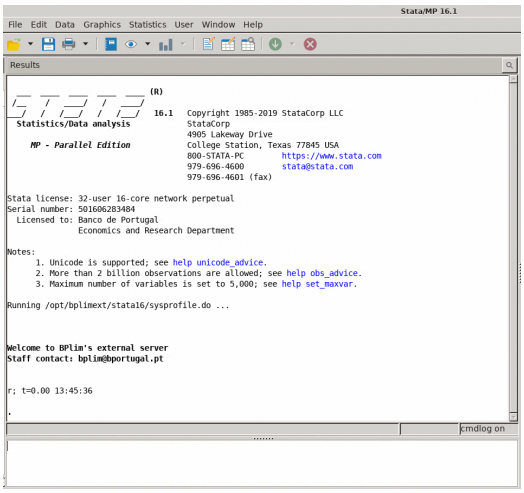
To make launching easier, you can add Stata to your PATH. For example, for Stata 16:

```
vi ~/.bash_profile
# Add the following line
PATH=$PATH:$HOME/.local/bin:$HOME/bin:/opt/bplimext/stata16
export PATH
```

[5]The version of Stata on the server has the same features as the Stata on Windows or Mac. By default when the Stata starts in this way the "working directory" active becomes your folder "work_area".

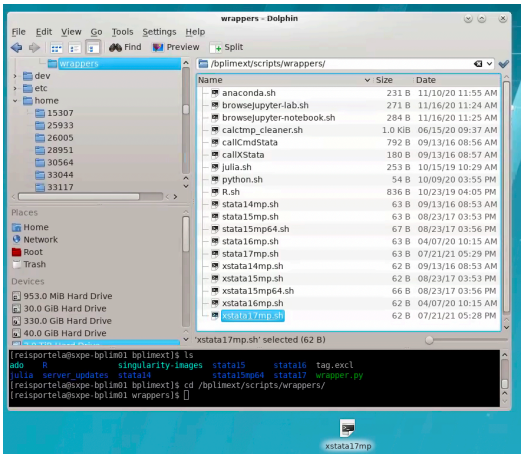
3.1.2.2 Interactive graphical mode Click on the desktop icons such as `xstata16mp.sh` (Stata 16) depending on the version you want.





- You can use the 'Do-file Editor' in Stata to create your own "do-files" and "ado-files", or use another such as **KWrite** (or **gedit**).
- Open KWrite via: **Red Hat** → **Applications** → **Utilities** → **KWrite**
- Or from the Terminal: `kwrite`

If the Stata icon is not on your desktop, use **Dolphin**, navigate to `/bplimext/scripts/wrappers/`, and drag the file **xstata16-mp** to the desktop.



NOTE: Use the shortcuts provided in your project folder to start Stata.

3.1.2.3 Ado-files Ado-files are text files containing Stata programs. It is advisable to create and save your ado-files so results can be replicated later when running them on BPLIM datasets.

Stata looks for ado-files in several locations, typically organized as:

- **SITE** – system-wide ado-files
- **PLUS** – user-installed ado-files
- **PERSONAL** – user-created ado-files
- **OLDPLACE** – legacy location for ado-files

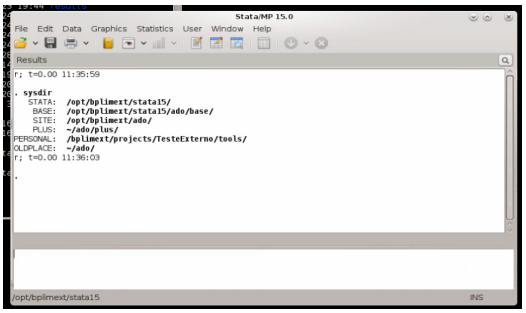
Ado-files created for your project can be found in the current directory (`.`). Specific ado-files requested from BPLIM will be placed in `/bplimext/projects/PXXX_name/tools`. To ensure Stata recognizes this directory, run inside Stata:

```
sysdir set PERSONAL "/bplimext/projects/PXXX_name/tools"
```

You may also edit your `profile.do` file, located in your project root (`/bplimext/projects/PXXX_name/`), to include commands that should run at every Stata startup. For example:

```
sysdir set PERSONAL "/bplimext/projects/PXXX_name/tools"
```

The `sysdir` command within Stata will list all directories currently in use:



3.1.2.4 Temporary files: To manage Stata's temporary files:

1. Check the current temporary folder:

```
tempfile junk
display "``junk'"
```

2. In your project's work_area, create a folder named `.TMP`.
3. Edit your `.bashrc` in your home directory (`cd ~`) with `kwrite` or 'vi and add:

```
export STATATMP="/bplimext/projects/YOUR_PROJECT_ID/work_area/.TMP"
```

4. Apply the changes:

```
source .bashrc
```

5. Log out from your Red Hat session (via the Red Hat menu) and reconnect using NoMachine.
6. Start Stata and confirm that the `tempfile` folder is pointing to `.TMP`.

3.2 'batch' mode: an example using Stata

1. Open a **shell** in Linux and navigate to the directory containing the do-file you want to run (e.g., `prog1.do`):

```
cd /bplimext/projects/PXXX_name/work_area/
```

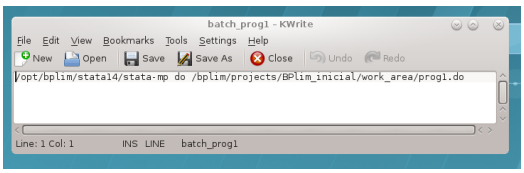
2. You may find it easier to use **Dolphin** (the File Manager) to browse your folder structure. In Dolphin, press **F4** to open an integrated Terminal. This allows quick navigation between folders and the ability to run shell commands in the same window.
3. Create a plain text file (ASCII) named, for example, `batch_prog1`.
4. Inside this file, write the execution command you would normally type in the shell. For example:

```
stata-mp do /bplimext/projects/PXXX_name/work_area/prog1.do
```

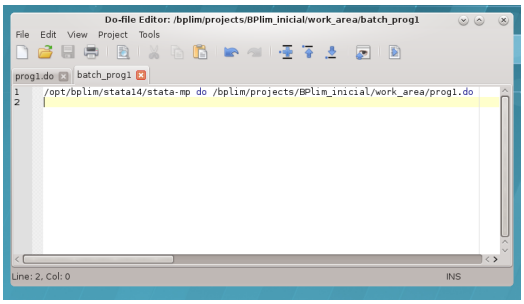
5. To create the batch file, you can use any text editor. For instance, with the command-line editor `vi`:

```
vi batch\_prog1
```

6. The batch file can also be created using graphical editors such as **KWrite** or the Stata **Do-file Editor**:



or



7. You may add the extension `.txt` to the batch file name. Sometimes the Stata Do-file Editor does not recognize files without an extension (e.g., `batch`), but it does recognize `batch.txt`.
8. Once the batch file is created, run the `.do` file in batch mode by typing in the Terminal:

```
at now -f batch\_prog1
```

9. To explore more options for`at`, type`man at`‘. For example:

```
at now + 5 hours -f batch\_prog1
```

‘ or

```
at now + 4 minutes -f batch\_prog1
```

This runs the Stata program 5 hours or 4 minutes from now, respectively. (`man` displays the Linux help manual.)

10. Type `top` in the Terminal to confirm the program is running.
11. Inside `top`, press `i` to hide irrelevant processes and reduce the output shown.
12. To terminate a running process in top:

- Press `k` (for kill).
- Enter the process number (PID, shown in the first column).
- Then type `9` to force termination.

13. To exit `top`, press `q`.

3.2.1 Useful features of the `at` command

- `atq` — lists programs in the batch queue (`=` indicates the program is running, `a` indicates it is queued along with its scheduled execution time).
- `atrm <job_number>` — removes a program from the batch queue.
- Monitor progress by checking the log file with `tail`:

```
tail --f logcrc_may21.log
```

This continuously updates the last lines of the log without overwriting it.

3.2.2 Running programs in the background with `screen`

- `screen` is useful if you want to run Stata interactively and ensure the session is preserved even if your network connection drops. You can disconnect from NoMachine and later recover the session by typing:

  ```
  screen --r
  ```

- Multiple `screen` sessions can run simultaneously. After reconnecting with NoMachine, list the running sessions:

  ```
  screen -d
  ```

Then recover a specific session by typing:

```
screen -r <pid>
```

(replace with the actual process ID).

3.3 R

3.3.1 Running R inside a container (recommended)

R can run either natively or inside a container. For projects configured with a container, R should be started within that environment. In this case, you will find a launcher script named `r_container.sh` in the project folder. You can start R in the following ways:

- **Using the file manager** (Dolphin): double-click the `r_container.sh` file to launch RStudio inside the container.
- **Using the Terminal**:

  1. Open a Terminal in the project folder.

  2. Run:

  ```
  ./r_container.sh
  ```

- **Manually opening the container**:

  ```
  cd /bplimext/projects/PXXX_name
  singularity shell tools/_container/CONTAINER_ID.sif
  ```

Once inside the container, then start RStudio

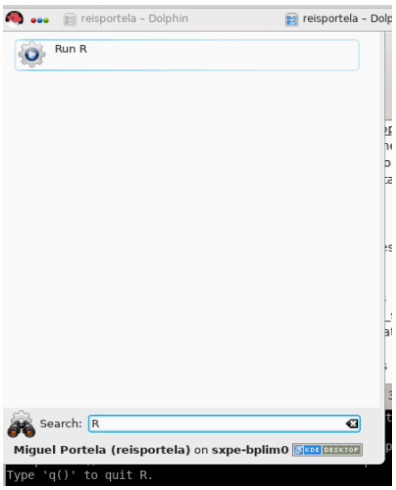
```
rstudio
```

3.3.2 Running R natively (installed locally)

R can be accessed in interactive graphical or non-graphical modes.

- **Interactive non-graphical mode**:

  Click the **Red Hat** symbol and type `R` in the search box.



- **Using the Terminal**:

  ```
  R
  ```

- **Interactive graphical mode**:

Click the **Red Hat** symbol and type `rstudio` in the search box.

Using RStudio through the Terminal. Type in the Terminal:

```
rstudio
```

If you experience issues opening or saving files in RStudio, run the wrapper script instead:

```
/bplimext/scripts/wrappers/R.sh
```

IMPORTANT: Do **not** save your workspace image in your home folder when prompted (`Save workspace image? [y/n/c]`).
If you need to keep the workspace, save it inside your project folder under `work_area`.

RStudio Font Settings: Please ensure you are **not** using the Courier font type.
Go to **Tools** → **Global Options** → **Appearance** and select a different font.

3.4 Python

You will find a launcher script named **`python_container.sh`** in the project root. You can start the Python container by double-clicking this script in **Dolphin**.

Alternatively, start the container from the **Terminal**:

```
./python_container.sh
```

You can also start the container manually:

```
cd /bplimext/projects/PXXX_name
singularity shell tools/_container/CONTAINER_ID.sif
```

Once inside the container, you can use Python directly or launch a Jupyter Notebook:

```
jupyter notebook
```

A Jupyter Notebook will open in **Firefox**. Click New and select the **Python** kernel.

3.5 Julia

If you plan to use Julia, request a project container with **Julia** enabled. The image (`.sif`) will be placed under your project at `tools/_container/`.

You will also find a launcher script named **`julia_container.sh`** in the project root. You can start Julia by double-clicking this script in **Dolphin**.

Alternatively, start Julia from the **Terminal**:

```
cd /bplimext/projects/PXXX_name
./julia_container.sh
```

You can also start the container manually:

```
cd /bplimext/projects/PXXX_name
singularity shell tools/_container/CONTAINER_ID.sif
```

Once inside the container, you can launch the Julia REPL or Jupyter:

```
# Julia REPL
julia

# or Jupyter Notebook
jupyter notebook
```

A Jupyter Notebook will open in **Firefox**. Click New and select the **Julia** kernel.

Alternatively, you can use **VS Code** to run Julia. Open VS Code from the terminal (in your project folder):

```
code
```

3.6 Updates to Commands and Packages

Requests for additional commands or packages, as well as updates to existing ones, must be submitted to the **BPLIM Team**.

3.7 Build a Container to Fine-Tune Your Statistical Packages

The server uses **Apptainer (formerly Singularity)** containers. To request one, please send the BPLIM Team the **definition file**. We will build the image and place it in your project's `work_area`. Detailed information about Apptainer/Singularity containers is available at https://sylabs.io/.[6] Additional notes are provided in the Appendix.

4 Allowed Outputs

Stata results can be exported to disk in the following formats:

1. **ASCII files** — e.g., log files
2. **Graphs** — export as `.png`
   > *Do not use the* `save` *option within a graph command. Instead, use a separate command:*
   > `stata > graph export xyz.png >`
3. **CSV** — Comma-Separated Values, for use with MS Excel or similar
4. **RTF** — Rich Text Format, for use with word processors
5. **XLS / XLSX** — Excel files containing output tables
6. **TEX** — LaTeX format for integration into TeX documents

5 Removing Outputs

Output files (e.g., log files, images) must be requested from the **BPLIM Team** at **bplim@bportugal.pt**.
Researchers are not allowed to place or remove files on the server independently.

Place in the **`results`** folder all the outputs you wish to have extracted from the server.[7]

1. Send an email with the subject line:

   PXXX_name: request for result extraction

   to:

   bplim@bportugal.pt

2. After validation, the requested results will be sent to you by email.

[6] Singularity is now called Apptainer. You can find further information here: https://apptainer.org.
[7] You may only remove text files that do not contain data or results that allow identification. For all the graphs you request as an output you must provide the corresponding Table to replicate it. You may only export graphs in .PNG format (no vector graph is allowed).

6 User's Home Folder

1. Do **not** save files in your home folder:
   `/home/USER_ID/`
2. Regularly empty your **Trash** folder.
   If your disk usage exceeds the quota, you will not be able to log in.
   To clean the Trash via Terminal, type:

```
rm -rf ~/.local/share/Trash/*
```

7 Scientific support

Researchers will be provided with the necessary scientific and computational support (*i.e.*, advises on programming, computational resources, micro econometrics, and econometrics of panel data for research undertaken with the selected microdata).

8 Project Archival Policy

Projects that remain inactive for more than **two (2) years** will be archived.
Archived projects will no longer be directly accessible but can be reactivated upon request to the **BPLIM Team**.

9 Appendix

9.1 Basic Shell Commands on Linux

- `top`: List processes currently running on the server
  - Press `i` to hide background processes.
  - Press `h` to display the **help menu** for available options.
- `pwd`: Show the current working directory
- `cd`: Change directory

  ```
  cd /bplimext/projects/PXXX_name/work_area/
  ```

- `cd ~` moves to your home folder
- `cp`: Copy file(s) to a given path

```
cp prog1.do /bplimext/projects/PXXX_name/results
```

- `mv`: Move file(s) or rename file(s)

  ```
  mv prog1.do /bplimext/projects/PXXX_name/results
  ```

- `rm`: Delete a file

```
rm /bplimext/projects/PXXX_name/results/prog1.do
```

- `mkdir`: Create a directory

```
mkdir programs
```

- `rmdir`: Delete an empty directory

```
rmdir programs
```

- `screen`: Start a session manager that allows running programs in the background and resuming them later

```
screen top
```

- `man`: Show the manual page for a given command

```
man ls
```

- `du -h`: Display disk usage of files and directories in human-readable format

```
du /bplimext/projects/PXXX_name/work_area/
```

- `df -h`: Show disk space utilization in human-readable format
- `vi`: View or edit ASCII text files (e.g., `.do` files, logs)
- `ghostscript`: Preview files with `.eps` or `.pdf` extensions

```
ghostscript /bplimext/projects/PXXX_name/results/file_name.pdf
```

- `okular`: View PDF files
- `find`: Search for files
  - Basic structure: `find /path options pattern`

```
find . -name "*.do"
```

- Save search results to a file:

```
find . -name "\*.do" > find_results.txt
```

- Search for a string within filenames:

```
find . -name "\*.do" | grep "analysis"
```

Identify `.do` files containing the word `graph export`:

```
find . -name "\*.do" -exec grep "graph export" '{}' \; -print
```

- `passwd`: Change your password
- **Exit a program**: Press `CTRL + C` to terminate the current process in the shell

9.2 Using the `vi` File Editor

1. Open a file in `vi` from the shell, for example:

   ```
   vi batch1.txt
   ```

2. Common shortcut keys in `vi`

   a. `i`: insert text

   b. `ESC`: exit insert mode

   c. `x`: delete the character under the cursor

   d. `dd`: delete the current line

   e. `10 dd`: delete 10 lines

   f. `yy`: copy (yank) the current line

   g. `p`: paste the copied (yanked) text

   h. `SHIFT + G`: go to the last line

   i. `gg`: go to the first line

   j. `ESC + :q!`: quit without saving changes

   k. `ESC + :w!`: write (save) and overwrite the file

   l. `ESC + :q`: quit if no changes have been made

   For a more complete guide, see: https://www.cs.colostate.edu/helpdocs/vi.html

3. Easier alternative: use the `gedit` text editor for a graphical interface:

```
gedit batch1.txt
```

9.3 Password requirements

Rule	Value	Notes
Maximum Password Lifetime	**60 days**	*After 60 days the / password will / expire* | and has to be changed | in the next login. | The password can be | changed at any moment | using: **(1)**,"Red Hat icon | Applications | |Settings | System | Settings – Account | Details", click | "Change Password"; | or, **(2)**, in the | 'Shell' type 'passwd' |
Minimum Number of Character Classes	4	You should include at least 4 classes of characters in the password. For example, small letters, capital letters, numbers and punctuation marks. There are a total of five classes: 1. Capital letters : A-Z 2. Small letters: a-z 3. Numbers: 1-9 4. Punctuation marks: <space> ! % & ( ) * + . , { } [ ] ~ " # $ ' - / \ ^ _ ‘ | 5. Characters above 127 (0x7F): marked characters (ã, á, ä, à, etc.); symbols (@, £, §, º, ª, «, », etc.)

		Number of characters: by using the same character 3 or more times may imply the use of an additional class (it is highly recommended that you do not use consecutively the same character more than 2 times)
Minimum Length of Password	8	The minimum size of the password is 8 characters (it may be higher in case you repeat characters)
Password History	7	One cannot use a password defined in the previous set of 7 passwords
Maximum Consecutive Failures	6	If the user fails 6 consecutive times the password the account will be locked for the time defined in “Lockout Time”
Fail Interval	60 sec.	Time interval for attempts to enter a password to be considered consecutive. If more than 60 seconds have elapsed since the last attempt, consecutive attempts are no longer considered, ie the number of failures, according to the requirement ”Maximum Consecutive Failures” becomes one.
Lockout Time	600 sec.	Time (10 minutes) during which the account will be locked if the maximum number of failed attempts is reached.

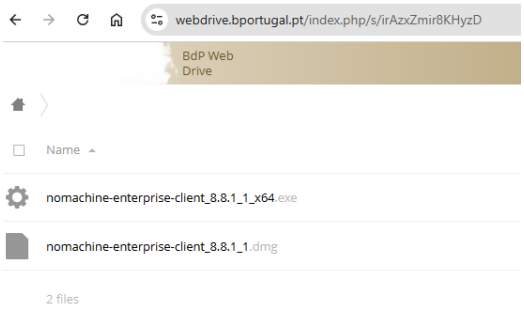
9.4 Download, install and configure NoMachine client

Step 1: Go to the following link and use the credentials provided by BPLIM to access the site:

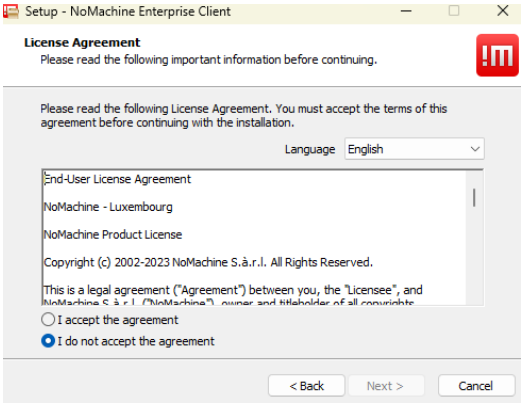
https://www.bportugal.pt/webdrive/index.php/s/irAzxZmir8KHyzD/authenticate

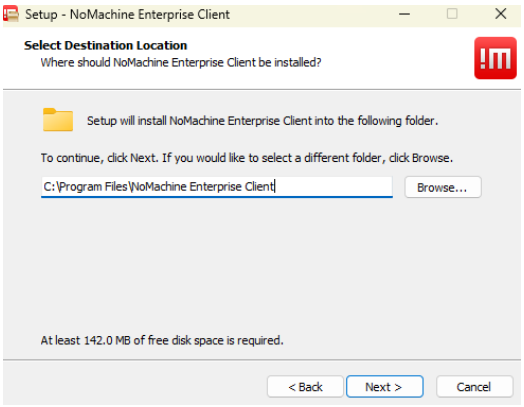
Note: sometimes the internet provider, *e.g.*, a University, may block access to this particular website. Please check with your provider in case you get an error while trying to use the link.

Step 2: Download the file with an extension compatible with your OS (Operating System).

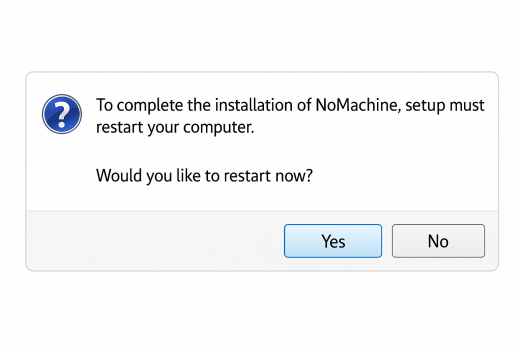


Step 3: Install 'NoMachine'.



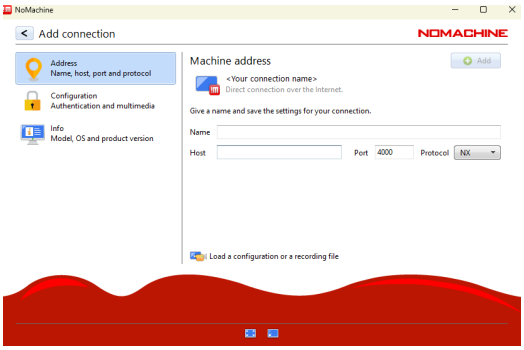


Step 4: Reboot your computer

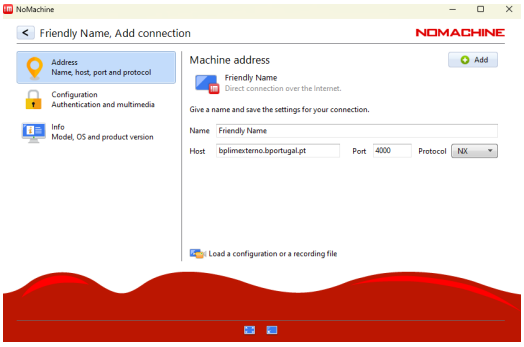


Step 5: NoMachine client access configuration.

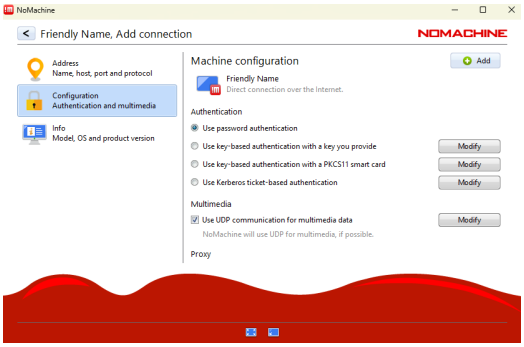
Step 5.1: Start 'NoMachine' and create a new connection.



Step 5.2: Define the 'Host' as bplimexterno.bportugal.pt, 'Port' 4000, 'Protocol' NX and set a 'Friendly Name' for 'Name'.



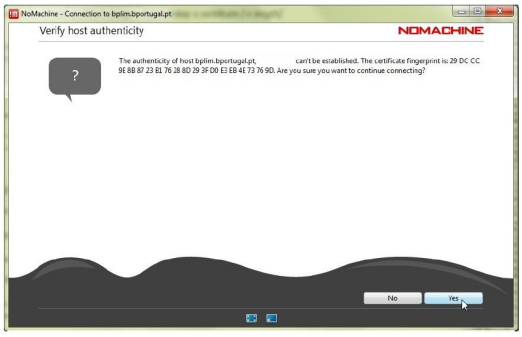
Step 5.3: Use password authentication, with or without proxy, depending on the instructions of the network administrator/user 's computer support. Click 'Add' to create the connection.



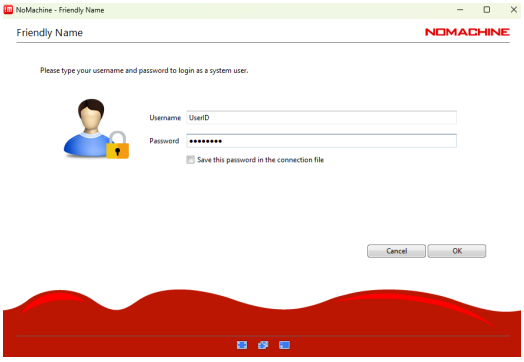
Step 5.4: Once the entry for `bplimexterno.bportugal.pt` has been created, connect:

Step 5.5: Before the first effective connection, it may be necessary to accept the certificate from bplimexterno.bportugal.pt. You should verify that the "fingerprint" (verification code) is:

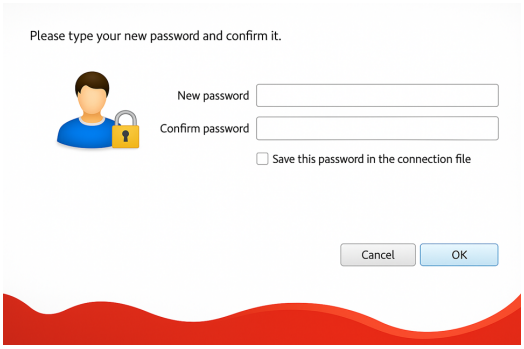
SHA256 ED 1B D9 E2 C2 F8 C6 08 1A 53 5F 97 DA 71 77 D9 D2 EE 7A 5F 9C 35 87 B3 19 F4 7E A1 CB 2C 68 0B



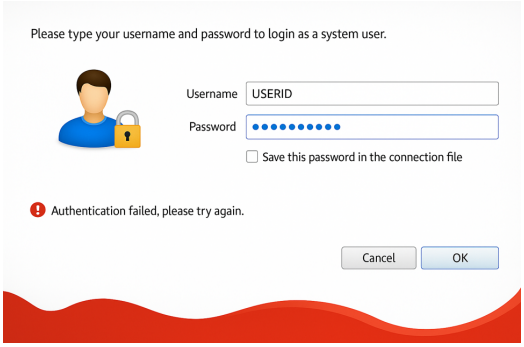
Step 5.6: Connect with the UserID (**case sensitive**) and password provided by Banco de Portugal:



Step 5.7: After the first successful login, it is necessary to change the password, which must comply with the Password Policy defined above.

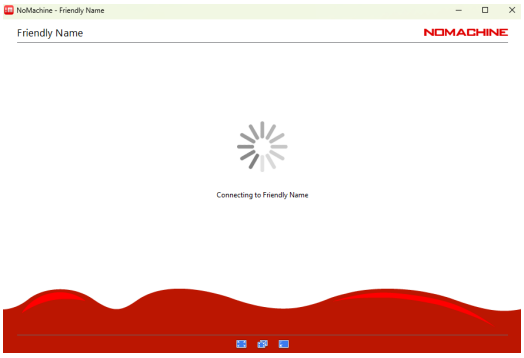


If the new password does not comply with the Password Policy, the original password provided by the Banco de Portugal will be re-requested. You get the message "Authentication failed, please try again." See Appendix 3 for details.

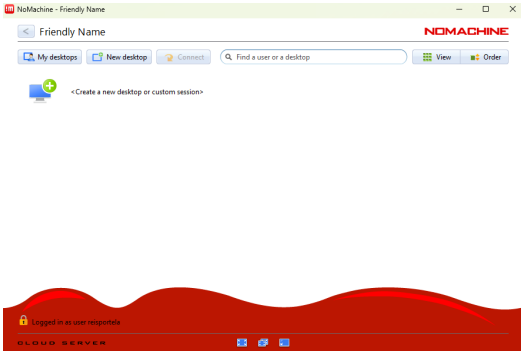


The NoMachine client does not tell you why the new password was not accepted – it is the responsibility of the user to verify that the new password is in compliance.

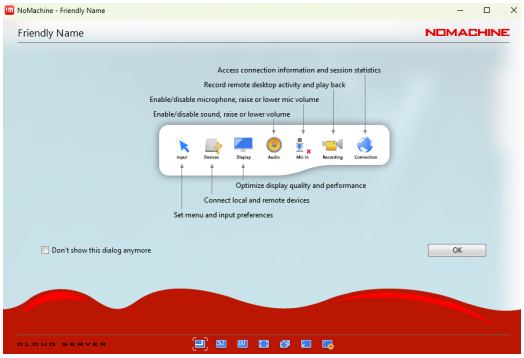
Step 5.8: Upon login success, the following screens should appear.

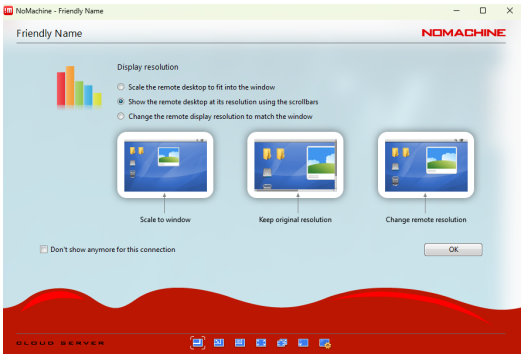


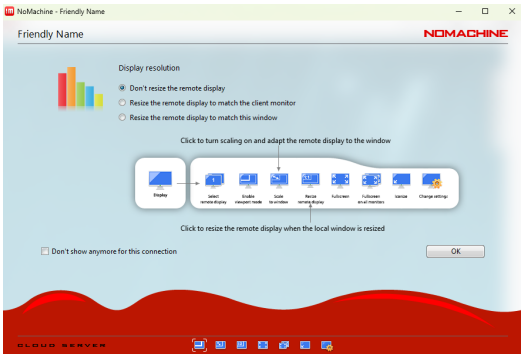
Create a new desktop.



Step 5.9: In the following screen define the settings of your monitor.

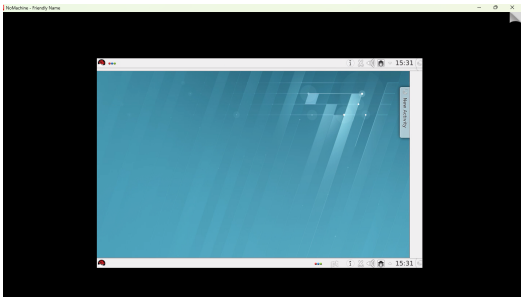




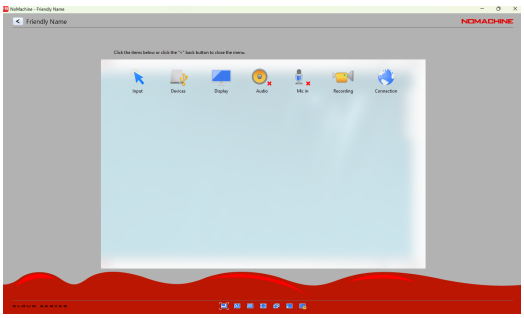


Step 5.10: Upon login success, the following screens should appear.

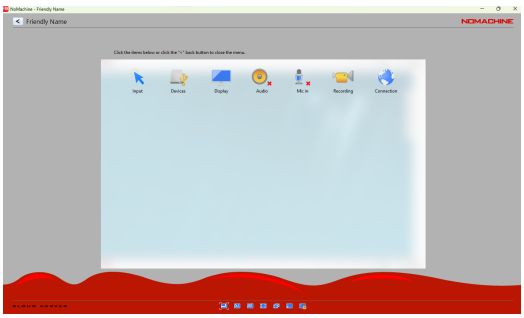
Once logged in and with access to a KDE session, click on the upper right corner of the KDE desktop, as shown below, to access the menu and then expand the screen as exemplified for greater ease of use.



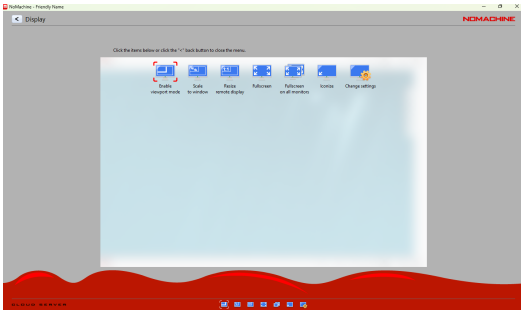
Step 5.11: You should see the following screen.



Step 5.12: Click 'Display'.

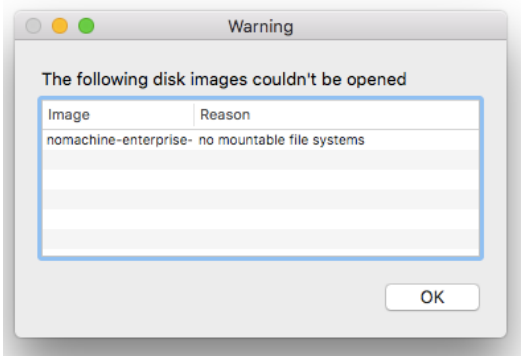


Step 5.13: Choose the option that best fits your monitor.



9.5 Frequently Asked Questions

1. **Mac users cannot install NoMachine and receive the error below:**

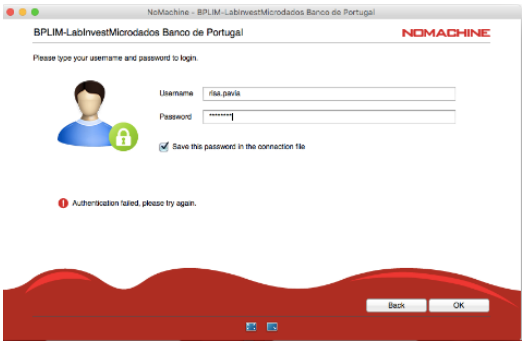


- Ensure your **macOS** is up to date.

- As a temporary solution, download the **NoMachine Enterprise Client** from the official website and run the installation file.

  https://www.nomachine.com/pt-pt/product&p=NoMachine%20Enterprise%20Client

2. **NoMachine authentication failure**



- This may happen due to a mismatched keyboard layout.
  For example, if you use a **Portuguese keyboard** but the system assumes a **US keyboard**, a password containing `ç` may be rejected as "wrong password."
  Verify your keyboard layout or change your password after the first login using:

  ```
  passwd
  ```

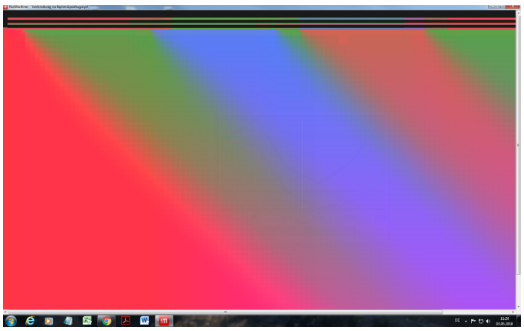
- If login fails with the error:
  "Could not connect to the server. Error is 138: Connection is timed out"
  check whether your network firewall is blocking the connection.
  Some university networks block external connections to BPLIM's server.
  Test from another location (e.g., your home network).

3. **User pressed 'Lock' instead of 'Log out' and cannot unlock**

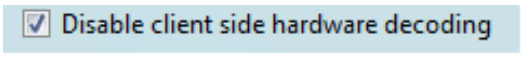
- Check that the keyboard layout is correct (e.g., PT or UK).

- Close the NoMachine session and start a new one. Before the final **Login** step, right-click and choose **Logout**, then double-click to reconnect.

4. **"Cannot see the screen in NoMachine"**



- **Option A**: Move your mouse to the top-right corner of NoMachine.
  A folded-sheet icon will appear. Left-click → **Display** → **Change settings** → enable **Disable client-side hardware decoding**.



- **Option B**: Close the NoMachine connection and start a new one. Before the final **Login** step, right-click and choose **Logout**, then double-click to reconnect.

5. **"Error: Parameter 'agentm_display' has bad value"**

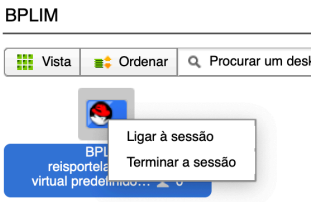
- This usually means your home folder is full (`/home/USER_LOGIN`).
  Do not save files in your home folder.

- Ask the BPLIM Team to free up space in your home directory.

6. **Session is frozen**

- From the first NoMachine screen, double-click the following icon:

- Then right-click the icon below and choose **Terminar sessão**:



7. **Visualizing LaTeX tables**

If you want to preview a table exported to LaTeX as a PDF, create a simple file named `main.tex`:

```
\documentclass{article}
\begin{document}
  \input{your_table.tex}
\end{document}
```

Replace your_table.tex with the name of your table file. Compile it in the Terminal with:

```
pdflatex main.tex
```

This generates `main.pdf`, which you can view with:

```
okular main.pdf
```

9.6 Version Control

The server runs GitLab.
If you need Git for your projects, please request access from the **BPLIM Team** (bplim@bportugal.pt).

From Wikipedia:

> *"Git is a distributed version-control system for tracking changes in any set of files, originally designed for coordinating work among programmers cooperating on source code during software development. Its goals include speed, data integrity, and support for distributed, non-linear workflows."*

9.6.1 First Steps

1. **Generate an SSH key**
   Open a **Terminal** in your home folder:

```
cd ~
```

Then type:

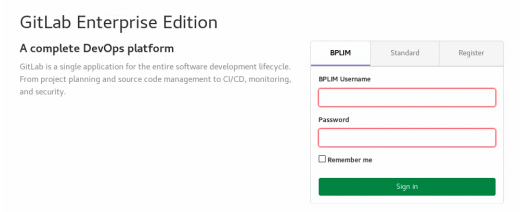
```
ssh-keygen -t rsa -C "BPLIM git"
cat ~/.ssh/id_rsa.pub
```

2. **Copy your SSH key**

Highlight the generated key in the terminal, right-click, and choose Copy to copy it to your clipboard.

3. **Access GitLab**

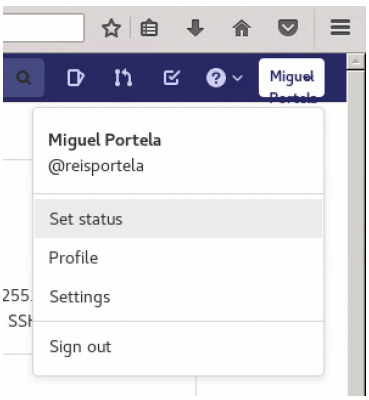
Open **Firefox** (Red Hat → Search → Firefox) and navigate to: https://vxpp-bplimgit.bplim.local/



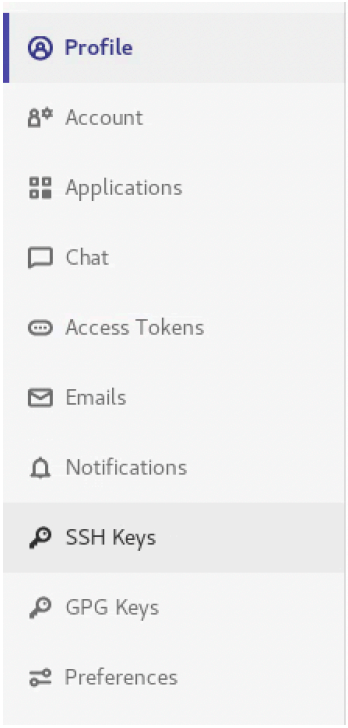
Log in with your external server credentials.

4. **Add your SSH key in GitLab**

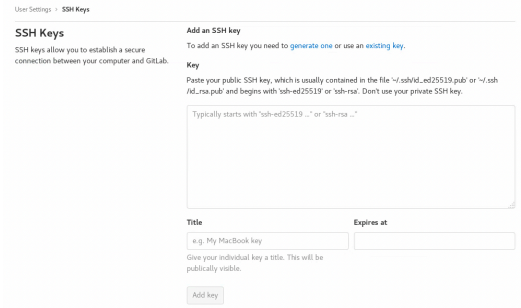
- Navigate to your profile (**Settings** in the top-right corner).



- In the left sidebar, click **SSH Keys**.



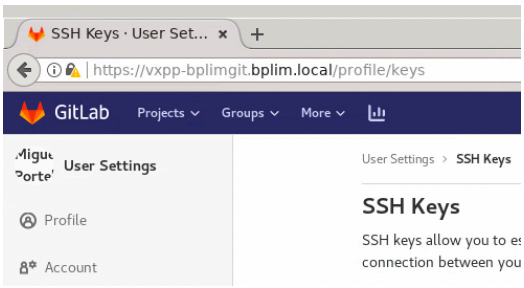
- Paste the contents of the clipboard in the text box on the top right corner under **Key**.

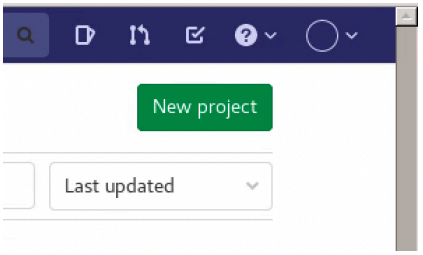


- Give a title, e.g., "BPLIM git", and click in **Add key**.

5. **Create a new project**

Go to **Projects** → **New project**, e.g., `scripts_P999` (replace `P999` with your project ID).





Configure Git by editing/creating the `.gitconfig` file in your home folder. You can use KWrite (Red Hat → Search → KWrite). Example:

```
[cola]
        spellcheck = false
[user]
        name = Investigador A
        email = investa@sxpe-bplim01.bplim.local
[gui]
        editor = kwrite
```

6. **Clone the project**

In the Terminal, move to your `work_area` and clone the repository:

```
cd /bplimext/projects/your_project_ID/work_area/
git clone git@vxpp-bplimgit.bplim.local:investa/scripts_P999.git
```

7. **Add** the file `.gitignore` available in folder `tools` of your project:

```
cd scripts_P999
cp /bplimext/projects/your_project_ID/tools/
gitignore .
```

8. **First commit & push**

```
git add *
git commit -a -m "First"
git push
```

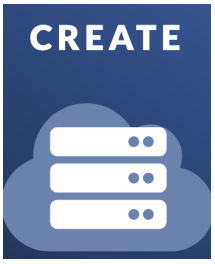
9. **Best practice**

Place all your scripts and code files in the `scripts_P999` folder. This ensures a structured and efficient workflow with version control.

9.7 Containers

9.7.1 Build Your Container

- You can create a container definition using the template files available in our GitHub repository.
- Test your script and build the container using SylabsCloud (you can log in with your GitHub account).
- Click **CREATE**:



- In the next step, upload your `.def` file or copy/paste its contents into the text box:

- Sylabs will validate your script. Once successful, the **Build** button will be enabled. Click it to proceed.
- Monitor the build process at the bottom of the screen and check for any error messages.
- Once the container builds successfully, send the **definition file with your changes** to the BPLIM Team.

9.7.2 Use the container in BPLIM's server

1. Open a **Terminal**.
2. Move to your project's container folder:

```
cd /bplimext/projects/PXXX_name/tools/containers
```

3. Start the container

```
singularity shell YOURPROJECTID.sif
```

4. The Terminal prompt will change to show: `Singularity`
5. Start RStudio by typing `rstudio` (small caps)

```
Singularity> rstudio
```

6. Once inside RStudio, you will have access to the original folder structure of your project.

9.8 Jupyter Lab

Explore Jupyter lab:

> *"JupyterLab is a web-based interactive development environment for Jupyter notebooks, code, and data.*
> *It is flexible, allowing you to configure and arrange the interface to support diverse workflows in data science, scientific computing, and machine learning.*
> *JupyterLab is also extensible and modular, enabling plugins that add new components or integrate with existing ones."*

9.8.1 Starting JupyterLab

Run the following command in the Terminal:

```
jupyter lab --browser=firefox
```

9.8.2 Sample session