

Access to the Laboratory Computer

There are two ways to analyse the data collected during the lab course: 1. Perform the analysis directly on the computer *columba* at the university (by prior arrangement). 2. Log in to this computer remotely from another system (e.g. from home) and perform the analysis there.

External Login

Data analysis can also be carried out remotely, either from the computer pool of the Physics Institute or from a private computer with an internet connection. Several access methods are available, each with its own advantages and disadvantages.



We currently recommend accessing the system directly via *SSH* with *X11 forwarding* or via *Waypipe*, as well as access via the *Remote Desktop Protocol*.

Requirements

Credentials are provided by the supervisors or communicated during the introduction:

```
User:      alpha
Password:  will be provided
```

alpha is used here as an example and must be replaced by the corresponding group name.



To access the analysis computer from outside the university network, you must first connect to the university network via VPN. Instructions can be found on the [ZIM website](#).

Linux / Unix

Since all astrophysics computers run Linux, logging in from another Linux/Unix system is straightforward. In most cases, a simple [SSH](#) login is sufficient to perform the complete data analysis remotely.

Graphical output (e.g. FITS viewers or editors) is also supported, although performance depends on the connection speed. Within the university network this is usually not an issue, but from home the performance may be limited.

Login via terminal:

```
ssh -Y alpha@columba.astro.physik.uni-potsdam.de
```

You will be prompted for your password. The parameter **-Y** (capital Y) enables forwarding of graphical output. **alpha** is once again used here as an example and must be replaced with the relevant group name.

Once you have logged in successfully, you can navigate the computer's directory tree via the terminal window and launch other programmes. You can also carry out data reduction and analysis in this way. Many guides covering the basic commands for navigation and working with files are available online (e.g. those from [PhoenixNAP](#)).

Waypipe

On a modern Linux system that runs Wayland (which replaces the old X11 server architecture), native Wayland programmes can be streamed directly from the **columba** data reduction computer to a local client system that also runs Wayland. This is achieved using the *Waypipe* programme, which must first be installed on most systems. Once installed, a Wayland programme can be launched as follows:

```
waypipe ssh alpha@columba.astro.physik.uni-potsdam.de Wayland_programme
```

Xpra

Alternatively, you can use [Xpra](#), which also uses *SSH* but allows more stable work with graphical applications, especially on slower connections.

In most cases, *Xpra* must first be installed via the package repositories. You then log in to **columba** via *SSH* as described above. Next, use the following command to start

```
xpra start :10 --start=konsole
```

the desired programme. In this case, the KDE terminal programme *Konsole*.

In the next step, you can then connect to the programme running on **columba** from your local computer:

```
xpra attach ssh:alpha@columba.astro.physik.uni-potsdam.de:10
```

In our case, the *Konsole* window should open. You can then use this window to launch other programmes. **alpha** is once again used here as an example and must be replaced with the relevant group name.

You can detach from a running session without terminating it:

```
xpra detach
```

Reconnect with:

```
xpra attach ssh:alpha@columba.astro.physik.uni-potsdam.de
```

Terminate the session with:

```
xpra exit
```

macOS

macOS comes with a built-in SSH client that can be accessed via Terminal.

Terminal access (SSH)

The Terminal can easily be opened via a Spotlight search (Cmd + Space) by entering the search term "Terminal" (see also [Apple documentation](#)). An SSH connection can then be established in the same way as on Linux:

```
ssh alpha@columba.astro.physik.uni-potsdam.de
```

Graphical interface via X11 (XQuartz)

macOS does not natively support X11. In order to forward graphical applications via SSH (X11 forwarding), you must first install **XQuartz**, which is a free X11 implementation for macOS. **XQuartz** can be downloaded from the official website (xquartz.org). After installation and restarting the system, X11 forwarding can be used as follows:

```
ssh -Y alpha@columba.astro.physik.uni-potsdam.de
```

Windows

Since Windows does not use the X-Window system, graphical output from Linux systems cannot be displayed directly. Therefore, an additional X server (X11 server) must be installed.

Recommended tools are:

MobaXterm

MobaXterm is an SSH client that includes a built-in X11 server.

- [MobaXterm](#)

To improve connection stability, it is recommended to enable the **SSH keepalive** option and restart the program.

PuTTY and Xming

Required software

- [PuTTY](#) (SSH client)
- [Xming](#) (X server)

Xming should be installed and ideally started automatically with the system. PuTTY requires only minimal configuration:

- Enter `columba.astro.physik.uni-potsdam.de` as hostname in the *Session* menu
- Enable X11 forwarding under *Connection* → *SSH* → *X11*
- In case of problems with the graphical output, set `localhost:0` as the display location

Operating System Independent

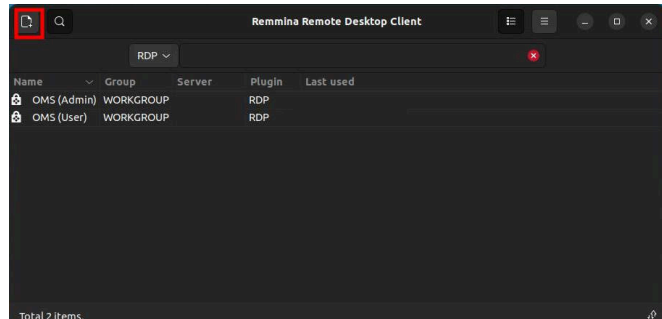
Remote Desktop Protocol

In addition to the above methods, you can log in to columba using the Remote Desktop Protocol (RDP). This protocol, developed by Microsoft, is highly efficient and enables the entire desktop to be displayed without any significant loss of speed. There is a free Linux implementation, so we can use this with columba too. However, as RDP is not considered the most secure method, you must first establish an SSH tunnel to Columba before connecting to the RDP server.

Linux

On Linux, [Remmina](#) is the recommended option:

- Start the program and create a new connection
- Enter a name for the configuration
- Server: `127.0.0.1:3389`
- Enter username and password
- Enable Use client resolution

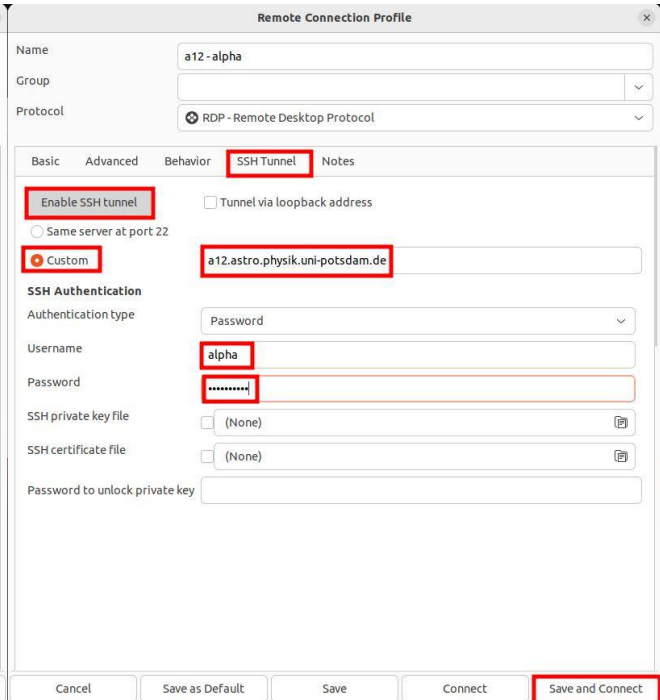
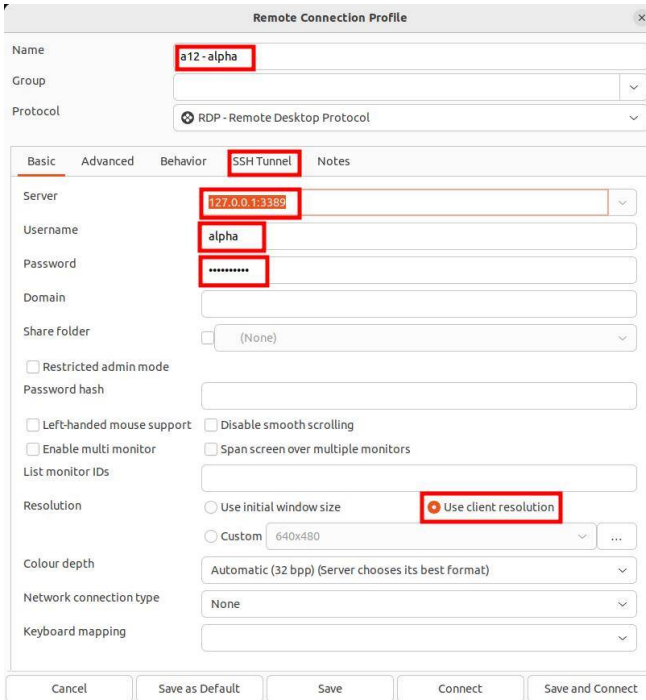


Under SSH Tunnel:

- Enable SSH tunnel
- Server: `columba.astro.physik.uni-potsdam.de`
- Enter username and password

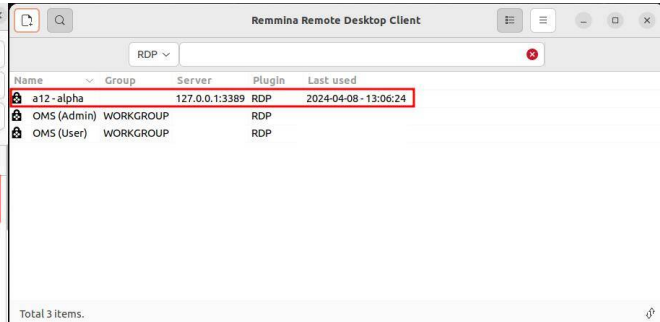
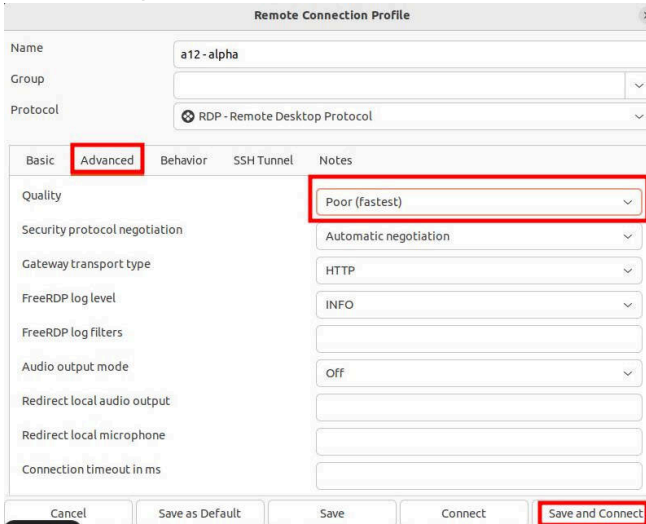
Start the connection via **Save** and **Connect**.

If you are satisfied with the connection speed, the **Advanced** tab allows you to improve the quality of your connection.



Basic setup

SSH tunnel



Additional options

Windows 11

Firstly, an SSH tunnel must be created using PowerShell, as the Windows RDP client does not support this:

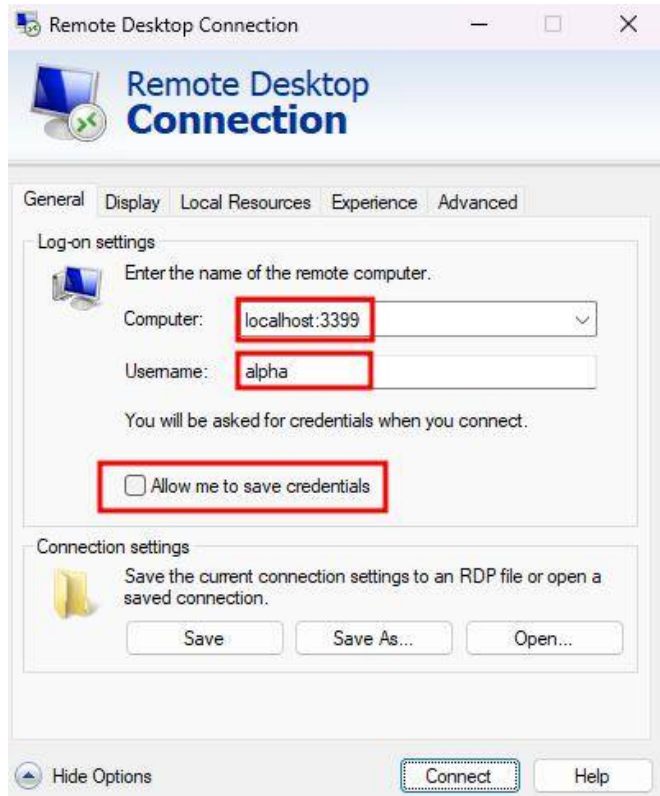
```
ssh -L 3399:127.0.0.1:3389
alpha@columba.astro.physik.uni-
potsdam.de
```

You can then connect using an RDP client. The following settings must be configured:

- Computer: localhost:3399
- User name: e.g. alpha
- Allow me to save credentials (optional, it may be necessary to click on

Show Options first)

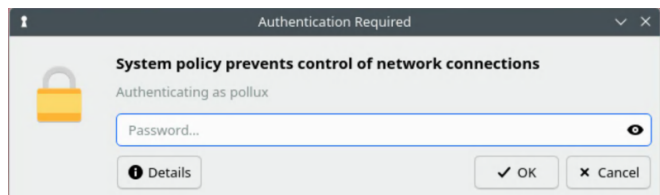
Click Connect to establish the connection. You will then be prompted to enter your password.



RDP Windows Client

After logging in

After logging in, a window appears requesting further authentication for network services (see below). You can safely ignore this and close it.

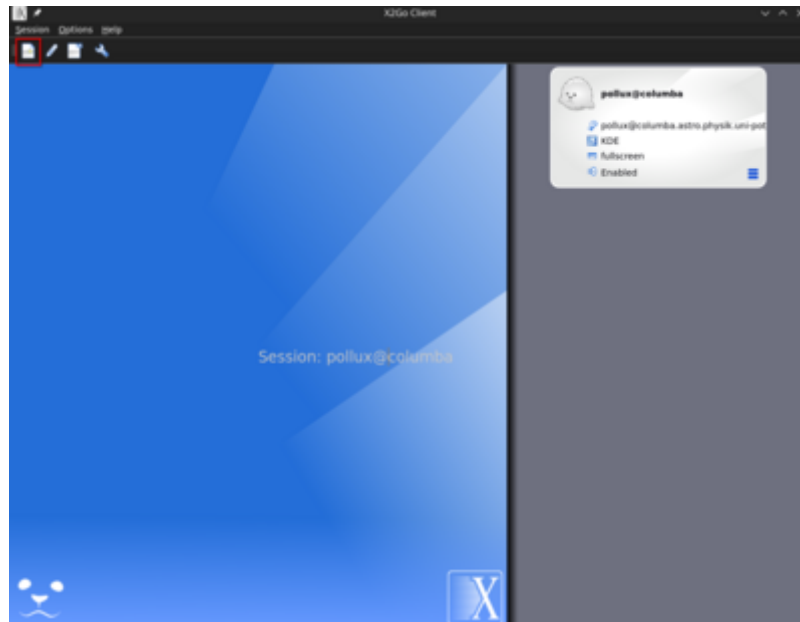


Authentication window that appears after logging in

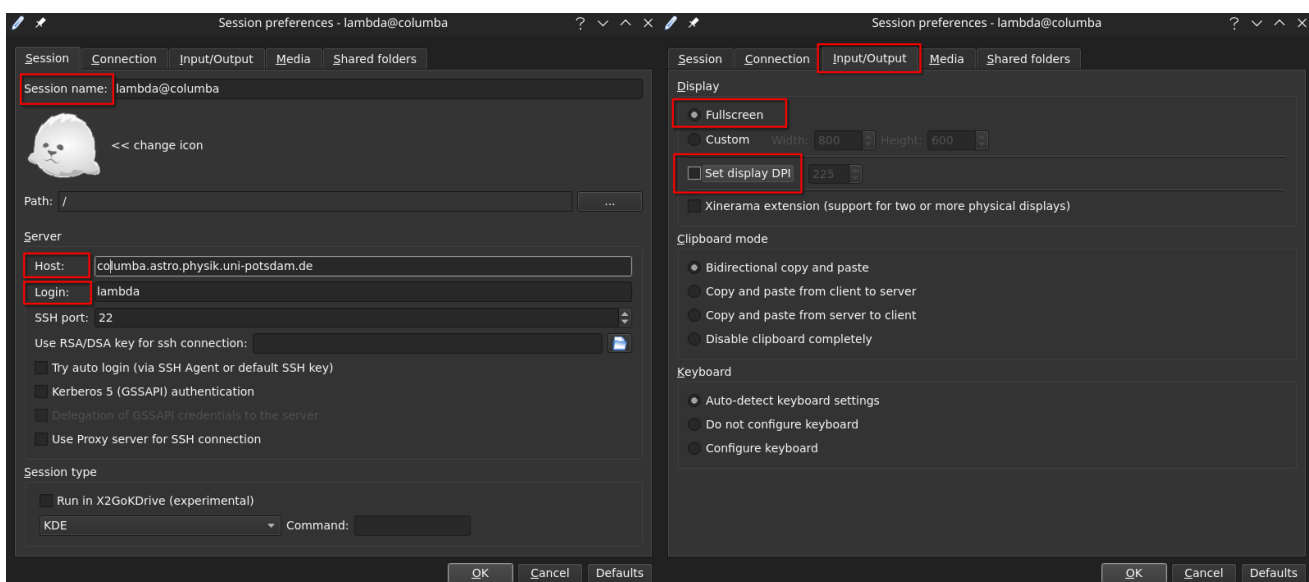
Methods that are currently not supported

X2Go

An X2Go server is installed on the laboratory computer **columba**, allowing efficient remote work with graphical applications. The X2Go client is available for all major operating systems, including Windows, Linux and macOS.



After installing the client, create a new session via *Session* → *New session*



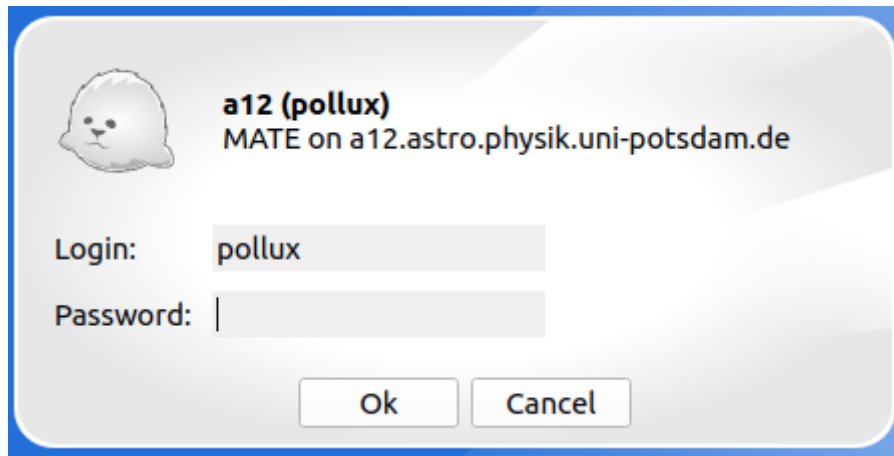
Configure the following parameters:

- **Session name:** arbitrary
- **Host:** columba.astro.physik.uni-potsdam.de
- **Login:** e.g. alpha

In the Input/Output tab:

- Enable **Fullscreen**
- Disable **Set display DPI**

After clicking OK, start the session by double-clicking the entry. You will then be prompted to enter your password:



Attention Wayland users: If the client crashes, try starting it via:

```
env QT_QPA_PLATFORM=xcb x2goclient
```

Terminus

Terminus Terminus is a modern SSH client with a graphical user interface. A free basic version is available for many operating systems.



Although the programme is said to be good, we haven't tested it ourselves yet, so we cannot offer direct support.

External Login from the Physics Computer Pool

The computers in the Physics computer pool (room 2.28.1.101) can also be used to access the laboratory computer via SSH. Due to the high network speed, efficient work is possible without prior reservation.

Accounts can be requested from Mr H. Todt (room 2.28.2.004).

Working Directly on the Data Reduction Computer

The laboratory computer (columba) is available for on-site data analysis (room 2.28.2.009) and can be booked via email.

File Transfer via SFTP

Regardless of the operating system, it is possible to log in via SFTP (SSH File Transfer Protocol) solely for the purpose of exchanging data. This requires an SFTP programme. These are available for

virtually every operating system, whether console-based or with a graphical user interface. Users accustomed to a graphical user interface can use [WinSCP](#), for example, as a free SFTP client.

The login details for the SFTP client are identical to those for SSH access:

```
Server:   columba.astro.physik.uni-potsdam.de
Protocol: SFTP
User:     alpha
Password: as provided
```

Similarly, **alpha** is used here merely as an example and must be replaced with the relevant group name.

Note: SFTP is intended for file transfer only. It does not allow execution of programs.

Linux Cheat Sheets

- [Basic commands](#)

[Laboratory Courses - Overview](#)

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