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Gesellschaft für wissenschaftliche Datenverarbeitung mbH Göttingen

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SSH Tips and Tricks

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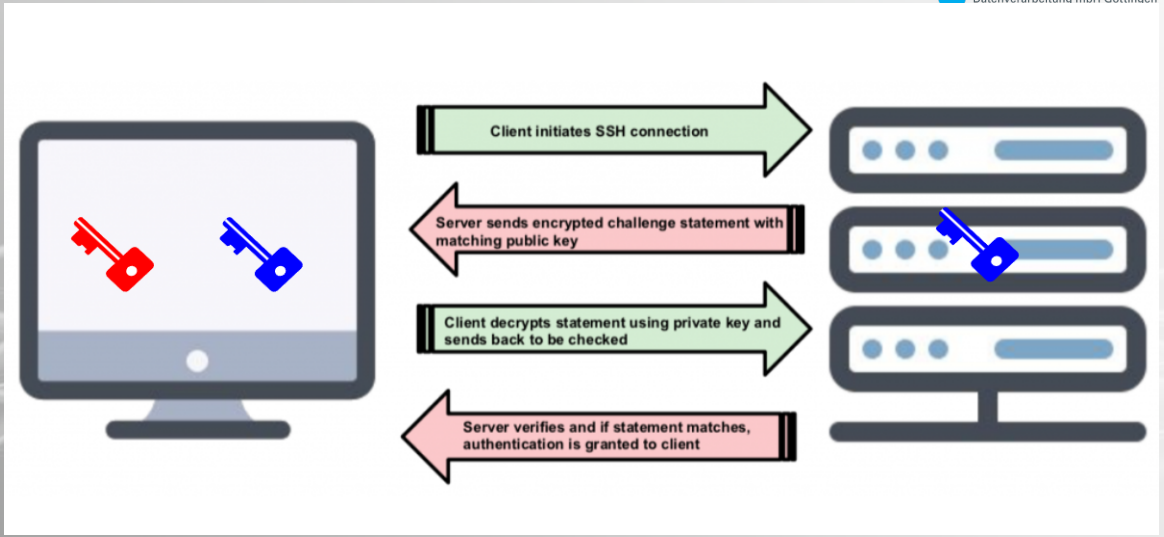
Introduction

- SSH (Secure Shell) is a cryptographic network protocol for secure data communication, widely used for remote server login and command execution.
- Purpose: Provides a secure channel over an unsecured network.
- ssh client: OpenSSH, MobaXterm, PuTTY

SSH Key-Based Authentication 1



SSH Key-Based Authentication 2

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1. Generate SSH Key Pair:
   `ssh-keygen -t ed25519 -f ~/.ssh/KEYNAME`
   or
   `ssh-keygen -t rsa -b 4096 -f ~/.ssh/KEYNAME`
   Then Follow the prompts to save the keys (default location: **~/.ssh/KEYNAME** for private key and **~/.ssh/KEYNAME.pub** for public key).
2. Add Public Key to the remote server:
   - `ssh-copy-id user@remote_host`
   - via Academic Cloud for HPC.

Remote login

- The basic syntax to log into a remote host is: `ssh remote_host`
- If you want to specify a username: `ssh -l user remote_host` or `ssh user@remote_host`
- If sshd is running on a non-standard port, you may also specify that on the command line: `ssh -p 2222 user@remote_host`

SSH AGENT

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- SSH keys are protected with a passphrase when created.
- SSH agent is a program that holds your decrypted private keys in memory.
- Allows SSH keys usage for authentication without entering passphrases repeatedly.
- To add a private key to the SSH agent:
  `ssh-add ~/.ssh/KEYNAME`
- List keys added to the SSH agent:
  `ssh-add -l`

Redirecting commands input and output

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- Execution of a single command on a remote system, e.g. grep command:
  `ssh user remote_host "ls /bin | grep -i rm"`
- Same output running the grep command on the local machine:
  `ssh user remote_host "ls /bin" | grep -i rm`
- Redirect the output of a command executed on remotely to a local file:
  `ssh user remote_host command > local_file.txt`

Keeping a persistent terminal open remotely

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Managing multiple terminal sessions efficiently within SSH connections:

- tmux (Terminal Multiplexer):
  1. Start a new tmux session:
     `tmux new -s session_name`
  2. Detach from tmux session:
     `Ctrl + b, d`
  3. Reattach:
     `tmux attach -t session_name`
- GNU screen
  1. `screen -S session_name`
  2. `Ctrl + a, d`
  3. `screen -r session_name`

Client configuration 1

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Remembering or typing out connection details can be a pain. e.g:

1. ssh remote_host1
2. ssh -l friend remote_host2
3. ssh -p 2222 remote_host3

Solution: `~/.ssh/config`

Client configuration 2

It might not exist by default, thus `chmod 600 ~/.ssh/config`

```
1   Host experiments
2       HostName remote_host1
3
4   Host uni
5       HostName remote_host2
6       User friend
7
8   Host personal
9       HostName remote_host3
0       Port 2222
```

The name in front of "Host" can be anything

Client configuration 3

Execution:

1. ssh experiments
2. ssh uni
3. ssh personal

Use "*" to apply a certain configuration option to every host, and to exclude specific hosts from the default configuration use "!":

```
1                    :
2
3               Host *
4                   ForwardAgent yes
5
6               Host !remote\_host1 !remote\_host2
7                   IdentityFile ~/.ssh/id_key
```

File transfer 1: scp

Copy file:

- Remote to local:
  ```
  scp user@remote_host:/path/to/source/file /path/to/destination/file
  ```
- Local to remote:
  ```
  scp /path/to/source/file user@remote_host:/path/to/destination/file
  ```
- Between two hosts:
  ```
  scp user@remote_host1:/path/to/source/file user@remote_host2:/path/to/destination/
  ```

To see if the operation is properly executed, use the **-v** flag, and **-r** for directories.

File transfer 2: rsync over SSH

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rsync can be faster than SCP. To copy file:

- Remote to local:
  ```
  rsync -a user@remote_host:/path/to/source/file /path/to/destination/file
  ```
- Local to remote:
  ```
  rsync -a /path/to/source/file user@remote_host:/path/to/destination/file
  ```
- Between two hosts:
  ```
  rsync -a user@remote_host1:/path/to/source/file user@remote_host2:/path/to/destina
  ```

File transfer 3: SFTP (Secure File Transfer Protocol)

Same authentication methods available in SSH. Use SFTP When:

- Needing interactive file transfer capabilities.
- Requiring advanced file management operations remotely.

File transfer 4: SFTP

- Copy file from remote to local:
  1. sftp user@remote_host
  2. get /path/to/source/file /path/to/destination/file
- Copy file from local to remote:
  1. sftp user@remote_host
  2. put /path/to/source/file /path/to/destination/file

Remote mount filesystem (SSHFS)

The sshfs utility is a FUSE (“Filesystem in Userspace”) program that allows you to mount a directory from a remote system locally, assuming you have ssh access to the remote system. The command format is:

`sshfs user@remote_host:path/to/dir ./local_mountpoint` *options* There are lots of options, but the one that is almost always worth using is **-C**, which enables compression on the ssh link.

e.g:

- Mounting
  1. `mkdir local_dir`
  2. `sshfs user@remote_host:path/to/dir local_dir -C`
- Unmounting

  Simply using *umount* won’t work

  `fusermount -u local_dir`

Troubleshooting SSH Issues

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- Permission Denied Error. Often incorrect file permissions or SSH key setup:
  - Ensure correct file permissions:
    `chmod 600 ~/.ssh/KEYNAME`
  - Verify the SSH key is added to the SSH agent:
    `ssh-add -l`
  - Double-check the username and SSH key used for authentication
- Network issues: Test network connection with **ping**
- Verbose Output: Use **-v** (or **-vv**, **-vvv**) option with SSH command for verbose output

References

- Getting started on the HPC clusters at GWDG
- How To Use Linux Screen
- SSH Tips and Tricks, by Ferry Boender
- Using the SSH Config File
- How To Use SSHFS to Mount Remote File Systems Over SSH
- ssh-agent and ssh-add
- SSH tips, tricks & protocol tutorial
- Why Authentication Using SSH Public Key is Better than Using Password and How Do They Work?