Homework 5: SSH Configuration

Môn học: Hệ điều hành Linux và Ứng dụng
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1: Disable Root SSH Access

1.1 Edit SSH configuration file

```
sudo nano /etc/ssh/sshd_config
```

Change or add the line:

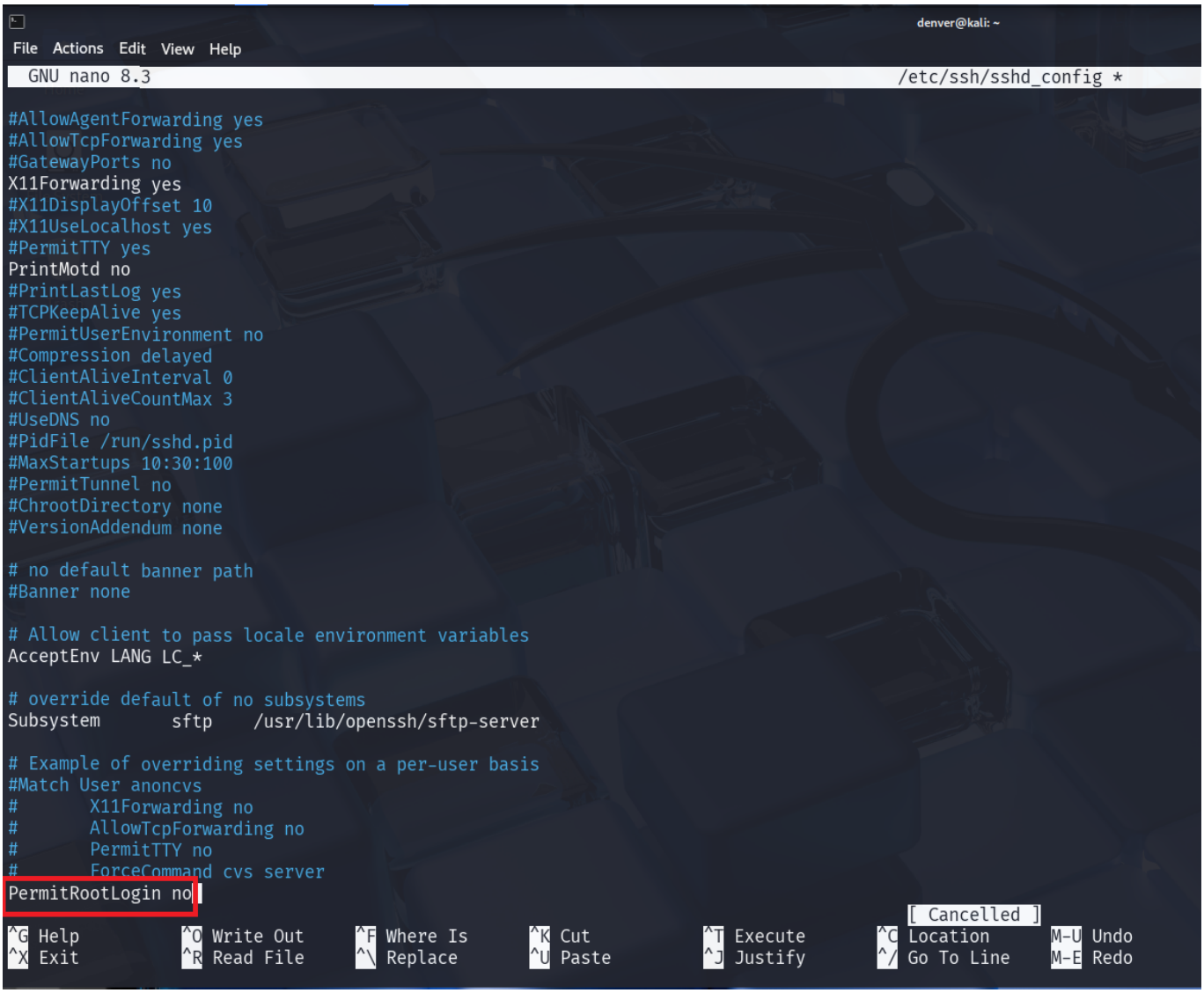
```
PermitRootLogin no
```

Explanation:

- This command opens the SSH daemon configuration file. Setting `PermitRootLogin no` disables direct SSH login using the root account, reducing the attack surface and improving security.

Screenshot:

Edited `sshd_config` with `PermitRootLogin no` set.



1.2 Restart SSH service

```
sudo systemctl restart sshd
```

Explanation:

- Applies the changes made to the SSH config. Without restarting, modifications won't take effect.

Screenshot:

Restart ssh service.

```
┌──(denver㉿kali)-[~]
└─$ sudo nano /etc/ssh/sshd_config
[sudo] password for denver:

┌──(denver㉿kali)-[~]
└─$ sudo systemctl restart sshd

┌──(denver㉿kali)-[~]
└─$
```

1.3 Result:

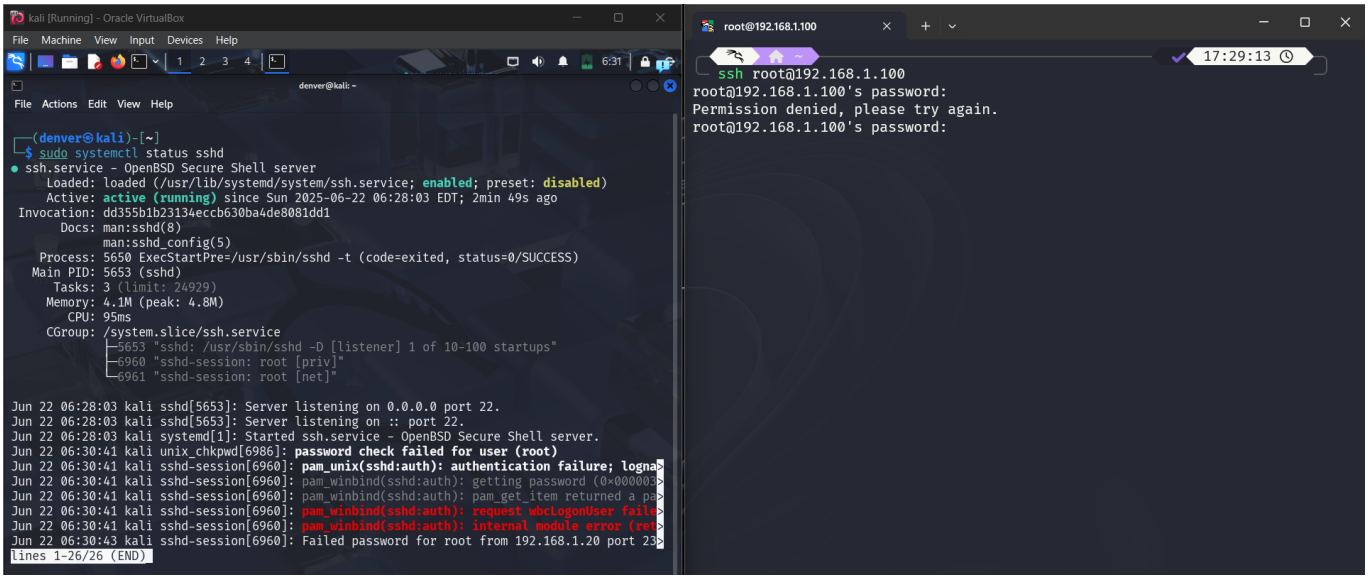
After applying the change, attempts to login via `ssh root@192.168.1.100` should be rejected with a message such as `Permission denied`. This confirms root SSH access is successfully disabled.

Output of `systemctl status sshd` showing SSH service is running.

```
┌──(denver㉿kali)-[~]
└─$ sudo systemctl status sshd
● ssh.service - OpenBSD Secure Shell server
     Loaded: loaded (/usr/lib/systemd/system/ssh.service; enabled; preset: disabled)
     Active: active (running) since Sun 2025-06-22 06:28:03 EDT; 1min 27s ago
 Invocation: dd355b1b23134eccb630ba4de8081dd1
       Docs: man:sshd(8)
             man:sshd_config(5)
    Process: 5650 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)
   Main PID: 5653 (sshd)
      Tasks: 1 (limit: 24929)
     Memory: 1.4M (peak: 2M)
        CPU: 51ms
     CGroup: /system.slice/ssh.service
             └─5653 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Jun 22 06:28:03 kali systemd[1]: Starting ssh.service - OpenBSD Secure Shell server...
Jun 22 06:28:03 kali sshd[5653]: Server listening on 0.0.0.0 port 22.
Jun 22 06:28:03 kali sshd[5653]: Server listening on :: port 22.
Jun 22 06:28:03 kali systemd[1]: Started ssh.service - OpenBSD Secure Shell server.
```

Login via `ssh root@192.168.1.100` was rejected and we can see log from SSH service



2: Create SFTP-Only User (No Shell)

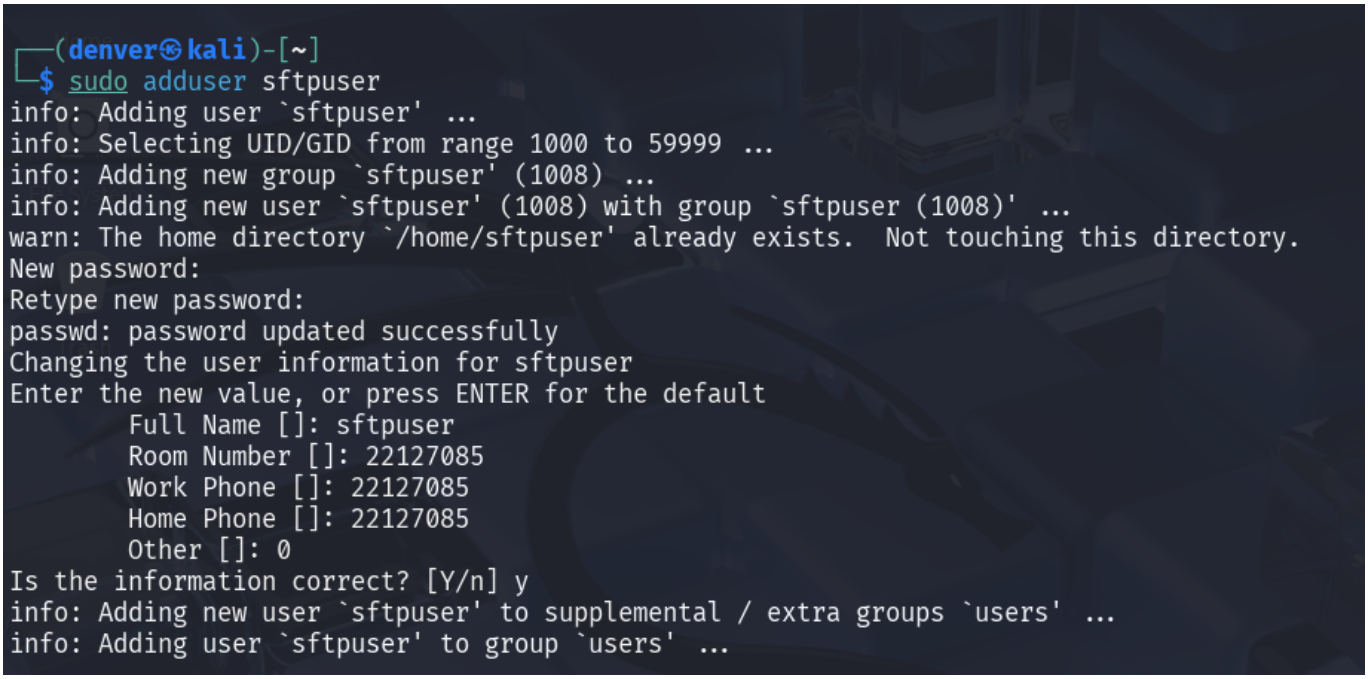
2.1 Create user and set password

```
sudo adduser sftpuser
```

Explanation:

- `adduser` creates a new account. This account will be used for SFTP only, no shell access.

Screenshot:



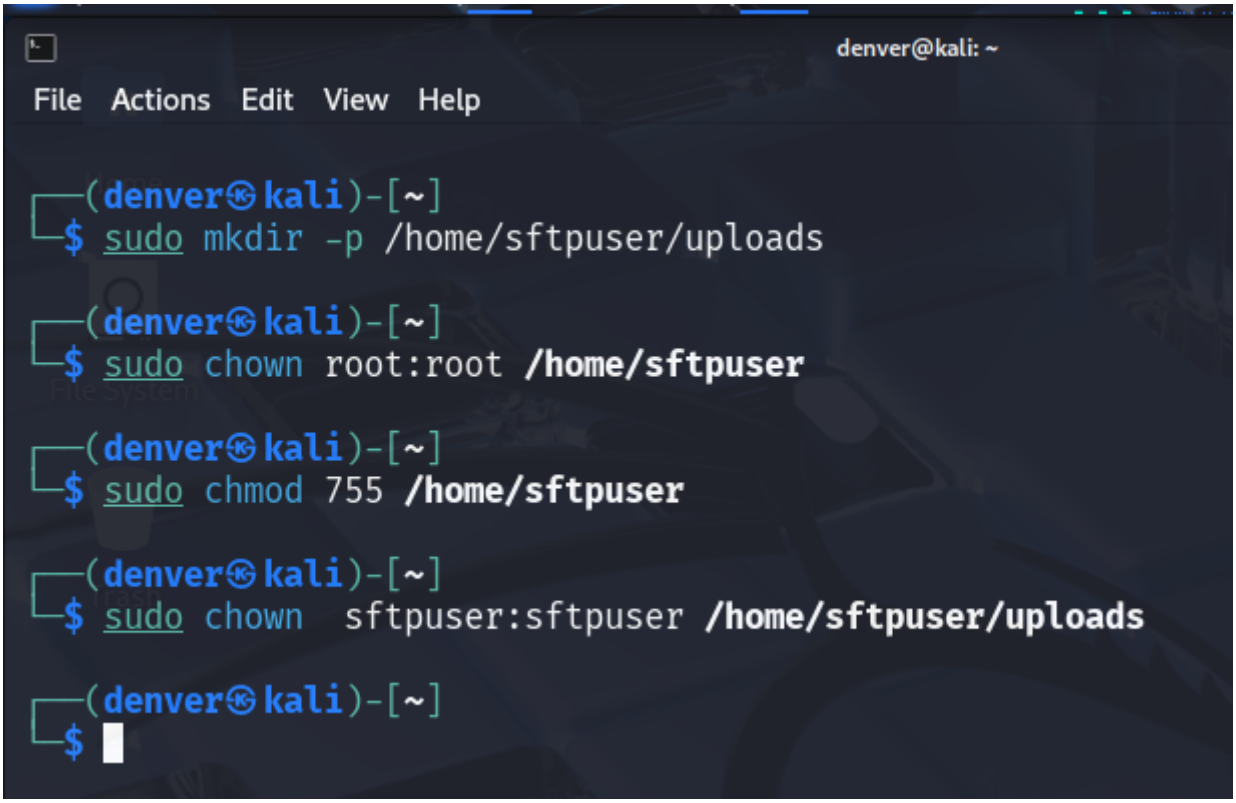
2.2 Setup chroot directory

```
sudo mkdir -p /home/sftpuser/uploads
sudo chown root:root /home/sftpuser
sudo chmod 755 /home/sftpuser
sudo chown sftpuser:sftpuser /home/sftpuser/uploads
```

Explanation:

`mkdir -p` ensures upload folder exists. `chown root:root` and `chmod 755` are required for SSH chroot jails. User must only have ownership inside the uploads folder.

Screenshot:



2.3 Update SSH configuration

```
sudo nano /etc/ssh/sshd_config
```

Add to bottom:

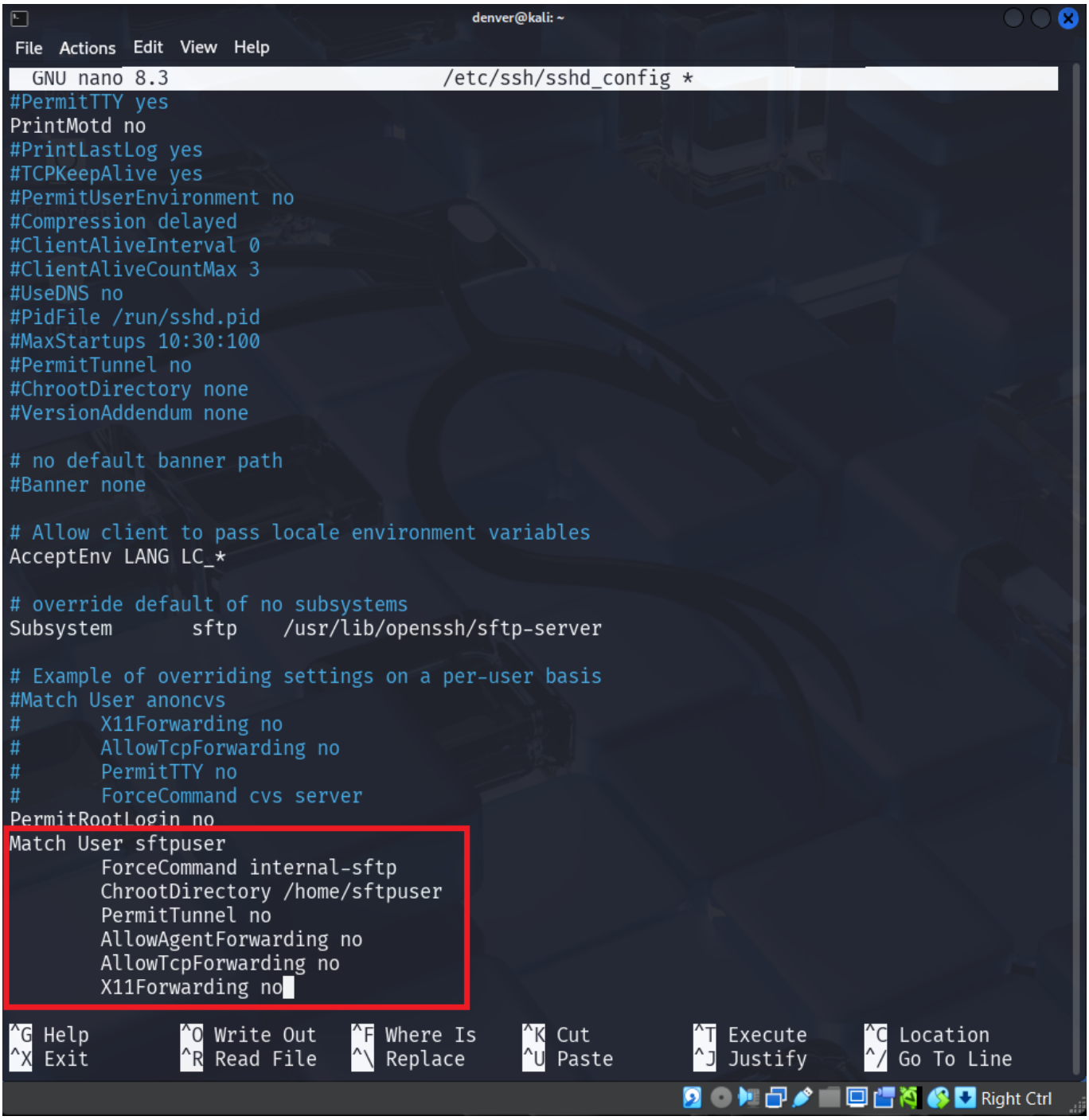
```
Match User sftpuser
    ForceCommand internal-sftp
    ChrootDirectory /home/sftpuser
    PermitTunnel no
    AllowAgentForwarding no
    AllowTcpForwarding no
    X11Forwarding no
```

Explanation:

This restricts `sftpuser` to SFTP only. `ChrootDirectory` confines the user, preventing access to other system areas:

- `Match User sftpuser`: a conditional block: only the following lines will apply to `sftpuser`.
- `ForceCommand internal-sftp`: Prevents user from executing arbitrary commands — limits to file transfer only.
- `ChrootDirectory /home/sftpuser`: Enhances security by sandboxing the user into a limited environment.
- `PermitTunnel no`: Disables port tunneling features for `sftpuser`.
- `AllowAgentForwarding no`: Security hardening — avoids abuse of forwarded authentication.
- `AllowTcpForwarding no`: Blocks `sftpuser` from using SSH to access or route other network traffic.
- `X11Forwarding no`: Disables X11 forwarding (GUI over SSH).

Screenshot:



2.4 Restart SSH

```
sudo systemctl restart sshd
```

2.5 Result:

When logging in using `sftp sftpuser@192.168.1.100`, the user should be able to upload and download files. If attempting to SSH with `ssh sftpuser@192.168.1.100`, the session will immediately close or be denied, proving shell access is blocked.

Screenshot:

```
~                                                                    17:55:32
sftp sftpuser@192.168.1.100
sftpuser@192.168.1.100's password:
Connected to 192.168.1.100.
sftp> pwd
Remote working directory: /
sftp> ls
uploads
sftp> cd uploads/
sftp> pwd
Remote working directory: /uploads
sftp> exit

~                                                          28s   17:56:25
ssh sftpuser@192.168.1.100
sftpuser@192.168.1.100's password:
This service allows sftp connections only.
Connection to 192.168.1.100 closed.

~                                                   1 ✗    4s   17:56:39
```

3: Configure SSH Key-Based Authentication

3.1 Create new user

```
sudo adduser studentuser
```

Screenshot:

```
┌──(denver㉿kali)-[~]
└─$ sudo adduser studentuser
info: Adding user `studentuser' ...
info: Selecting UID/GID from range 1000 to 59999 ...
info: Adding new group `studentuser' (1009) ...
info: Adding new user `studentuser' (1009) with group `studentuser (1009)' ...
info: Creating home directory `/home/studentuser' ...
info: Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for studentuser
Enter the new value, or press ENTER for the default
        Full Name []: studentuser
        Room Number []: 22127085
        Work Phone []: 22127085
        Home Phone []: 22127085
        Other []: 1
Is the information correct? [Y/n] y
info: Adding new user `studentuser' to supplemental / extra groups `users' ...
info: Adding user `studentuser' to group `users' ...

┌──(denver㉿kali)-[~]
└─$
```

3.2 On client: generate SSH key (if not already)

```
ssh-keygen
```

Explanation:

Generates a public/private RSA key pair in `~/.ssh/id_rsa` and `id_rsa.pub`. These are used for secure login without passwords.

3.3 Copy public key to server

```
ssh-copy-id studentuser@192.168.1.100
```

Explanation:

Places the public key in the authorized list. Only users with matching private key can log in.

Screenshot:

```
18:07:13
ssh-keygen
Generating public/private ed25519 key pair.
Enter file in which to save the key (/home/denver/.ssh/id_ed25519):
Enter passphrase for "/home/denver/.ssh/id_ed25519" (empty for no passphrase
):
Enter same passphrase again:
Your identification has been saved in /home/denver/.ssh/id_ed25519
Your public key has been saved in /home/denver/.ssh/id_ed25519.pub
The key fingerprint is:
SHA256:PIWqMZVH0JuXCCQxxxzWH6MUeZQalEZpDVDrH7qdt2Y denver@LAPTOP-0DQEKJM4
The key's randomart image is:
+--[ED25519 256]--+
|    +=BXBO..      |
|     =+o@o*       |
|      o=+X.+      |
|     . =*.+       |
|    o . S..       |
|     +   + .      |
|    .   . .       |
|         o .E     |
|        . o+..    |
+----[SHA256]-----+

3s 18:07:20
ssh-copy-id studentuser@192.168.1.100
/usr/bin/ssh-copy-id: INFO: Source of key(s) to be installed: "/home/denver/
.ssh/id_ed25519.pub"
/usr/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to fil
ter out any that are already installed
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are pr
ompted now it is to install the new keys
studentuser@192.168.1.100's password:

Number of key(s) added: 1

Now try logging into the machine, with: "ssh 'studentuser@192.168.1.100'"
and check to make sure that only the key(s) you wanted were added.
```

3.4 Disable password authentication (on server)

```
sudo nano /etc/ssh/sshd_config
```

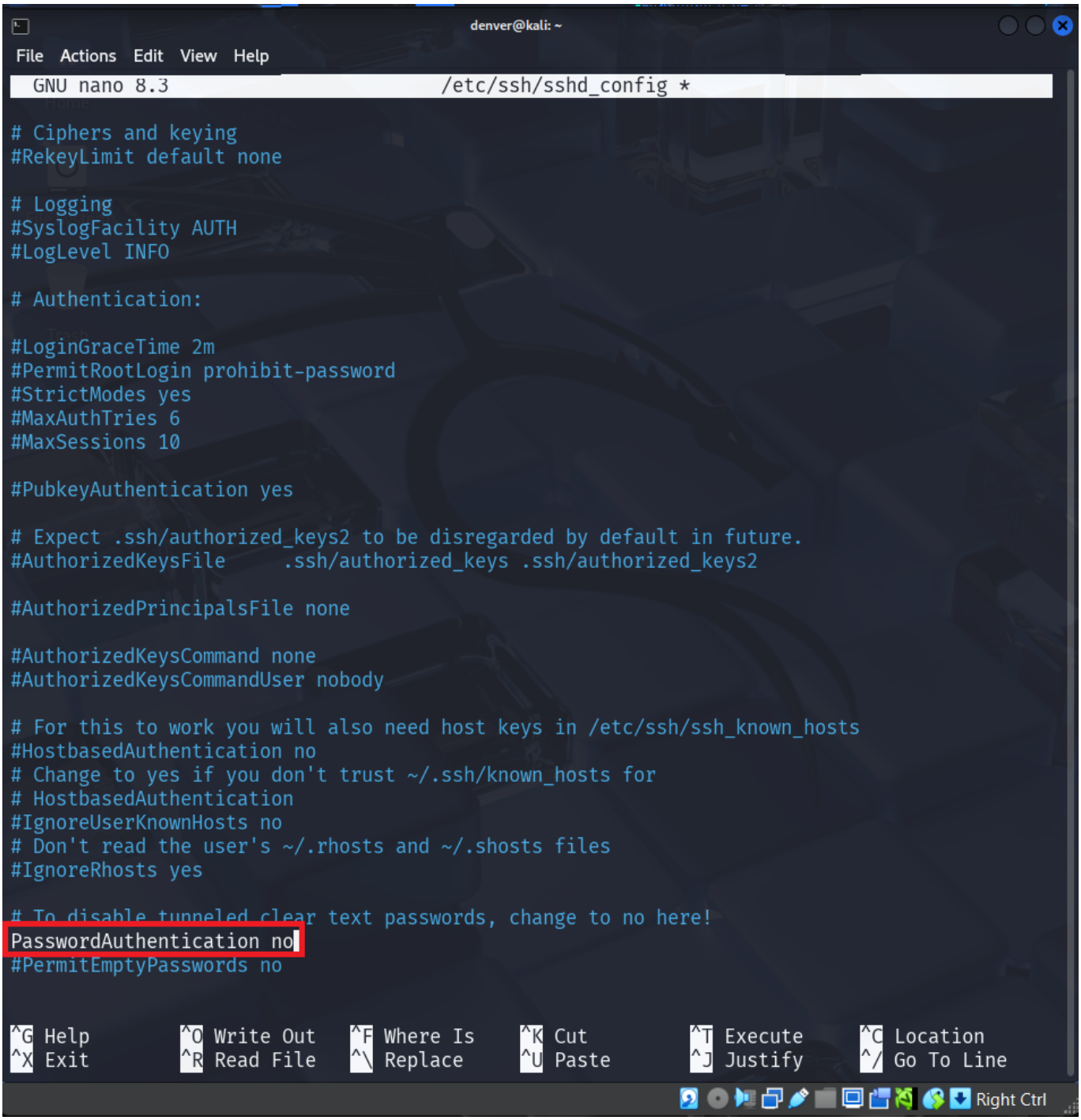
Set:

```
PasswordAuthentication no
```

Then:

```
sudo systemctl restart sshd
```

Screenshot:



3.5 Result:

Logging in with `ssh studentuser@192.168.1.100` will succeed without asking for a password if the correct private key is available. If trying to login without a key or as a different user, access will be denied.

```
~                                                    4s ⌛ 18:07:41 🕒
└─ ssh studentuser@192.168.1.100
Linux kali 6.12.13-amd64 #1 SMP PREEMPT_DYNAMIC Kali 6.12.13-1kali1 (2025-02
-11) x86_64

The programs included with the Kali GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Kali GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
┌──(studentuser㉿kali)-[~]
└─$
```

SSH login for `studentuser` using key-based authentication.

```
~                                                    18:08:43 🕒
└─ ssh denver@192.168.1.100
denver@192.168.1.100: Permission denied (publickey).

~                                                    255 ✗ 18:10:48 🕒
```

Login attempt using wrong user or without key failing.