

Project Title

Secure File Transfer and Automation with `scp` and SSH Key Authentication

Objective

To develop hands-on expertise in secure file transfer using `scp`, including recursive transfers, remote-to-remote copying, and automating secure communication using SSH key-based authentication.





Skills Learned

- Secure file transfer over SSH using `scp`
- Bidirectional file transfer: Local ↔ Remote
- Recursive directory copying between servers
- SSH key generation and usage for password-less login
- Automation of remote file operations securely
- Basic networking and remote server access protocols

Tools Used

- **Operating System:** Kali Linux (or any Linux-based distro)
- **Primary Utility:** `scp` (Secure Copy Protocol)
- **Authentication:** SSH key pairs (`ssh-keygen`, `ssh-copy-id`)
- **Servers:** Remote Linux SSH-enabled machines (can use VMs or cloud)

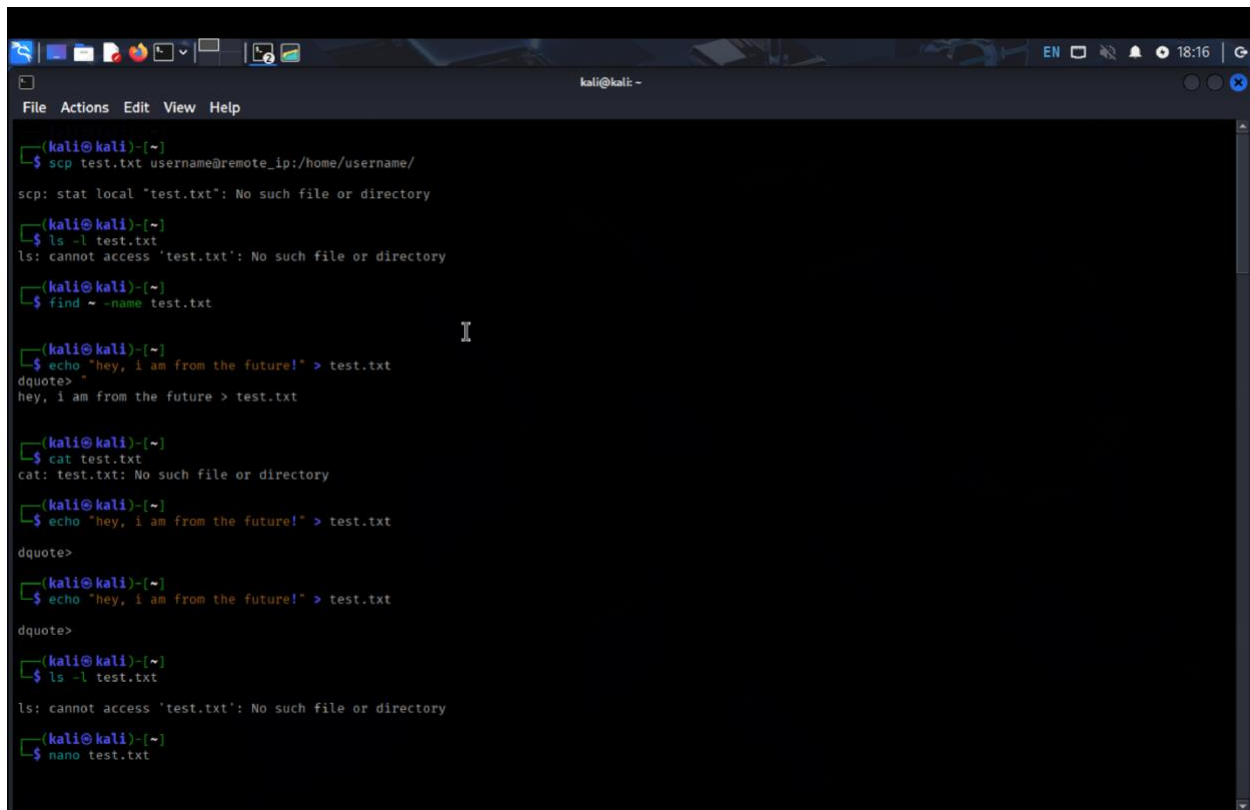
Tasks Performed

Level	Description
 Basic	Copied a local file (<code>test.txt</code>) to a remote server using <code>scp test.txt user@remote-ip:/destination/path</code> .
 Intermediate	Retrieved a file from a remote server back to local using <code>scp user@remote-ip:/file/path ./</code> .
 Advanced	Used <code>scp -r</code> to recursively copy a full directory between two remote servers, acting as a bridge via local.
 Advanced	Set up SSH key-based authentication using <code>ssh-keygen</code> and <code>ssh-copy-id</code> , then used <code>scp</code> without password prompts for automation.

Why This Matters (Real-World Impact)

For cybersecurity professionals, secure and efficient file movement is essential—whether transferring malware samples for analysis, pushing scripts to remote machines, or backing up configurations from network devices. Mastering `scp` and SSH keys ensures secure, encrypted file

transfers without exposing credentials, enabling **scalable automation** in both blue and red team environments.



```
(kali@kali)-[~]
$ scp test.txt username@remote_ip:/home/username/
scp: stat local "test.txt": No such file or directory

(kali@kali)-[~]
$ ls -l test.txt
ls: cannot access 'test.txt': No such file or directory

(kali@kali)-[~]
$ find ~ -name test.txt

(kali@kali)-[~]
$ echo "hey, i am from the future!" > test.txt
dquote>
hey, i am from the future > test.txt

(kali@kali)-[~]
$ cat test.txt
cat: test.txt: No such file or directory

(kali@kali)-[~]
$ echo "hey, i am from the future!" > test.txt
dquote>

(kali@kali)-[~]
$ echo "hey, i am from the future!" > test.txt
dquote>

(kali@kali)-[~]
$ ls -l test.txt
ls: cannot access 'test.txt': No such file or directory

(kali@kali)-[~]
$ nano test.txt
```

```
kali@kali: ~  
File Actions Edit View Help  
  
(kali@kali)~  
$ nano test.txt  
  
(kali@kali)~  
$ cat test.txt  
hey, I am from the future!  
  
(kali@kali)~  
$ scp test.txt username@remote_ip:/home/username/  
  
ssh: Could not resolve hostname remote_ip: Name or service not known  
scp: Connection closed  
  
(kali@kali)~  
$ ip a  
  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
    inet 127.0.0.1/8 scope host lo  
        valid_lft forever preferred_lft forever  
    inet6 ::1/128 scope host noprefixroute  
        valid_lft forever preferred_lft forever  
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000  
    link/ether ea:f0:2f:00:11:3a brd ff:ff:ff:ff:ff:ff  
    inet 192.168.64.3/24 brd 192.168.64.255 scope global dynamic noprefixroute eth0  
        valid_lft 3523sec preferred_lft 3523sec  
    inet6 fd66:97e3:2e1a:17e1:f98b:b366:20e:a053/64 scope global temporary dynamic  
        valid_lft 595726sec preferred_lft 76860sec  
    inet6 fd66:97e3:2e1a:17e1:e8f0:2fff:fe00:113a/64 scope global dynamic mngtmpaddr noprefixroute  
        valid_lft 2591936sec preferred_lft 604736sec  
    inet6 fe80::e8f0:2fff:fe00:113a/64 scope link noprefixroute  
        valid_lft forever preferred_lft forever  
  
(kali@kali)~  
$ scp test.txt kali@192.168.64.5:/home/kali/  
  
ssh: connect to host 192.168.64.5 port 22: No route to host  
scp: Connection closed  
  
(kali@kali)~  
$ scp test.txt kali@192.168.64.3:/home/kali/  
  
ssh: connect to host 192.168.64.3 port 22: Connection refused
```

```
kali@kali: ~  
File Actions Edit View Help  
[kali@kali]~$ scp test.txt kali@192.168.64.3:/home/kali/  
ssh: connect to host 192.168.64.3 port 22: Connection refused  
scp: Connection closed  
[kali@kali]~$ sudo systemctl start ssh  
[sudo] password for kali:  
[kali@kali]~$ sudo systemctl status ssh  
● ssh.service - OpenBSD Secure Shell server  
   Loaded: loaded (/usr/lib/systemd/system/ssh.service; disabled; preset: disabled)  
   Active: active (running) since Mon 2025-06-02 16:31:51 PDT; 6s ago  
 Invocation: 6ed5c7336f4c478dac18c26f992b1cb2  
    Docs: man:sshd(8)  
          man:sshd_config(5)  
 Process: 81035 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)  
 Main PID: 81037 (sshd)  
   Tasks: 1 (limit: 4490)  
  Memory: 2.2M (peak: 2.9M)  
     CPU: 24ms  
 CGroup: /system.slice/ssh.service  
         └─81037 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"  
  
Jun 02 16:31:51 kali systemd[1]: Starting ssh.service - OpenBSD Secure Shell server...  
Jun 02 16:31:51 kali sshd[81037]: Server listening on 0.0.0.0 port 22.  
Jun 02 16:31:51 kali sshd[81037]: Server listening on :: port 22.  
Jun 02 16:31:51 kali systemd[1]: Started ssh.service - OpenBSD Secure Shell server.  
[kali@kali]~$ scp test.txt kali@192.168.64.3:/home/kali/  
The authenticity of host '192.168.64.3 (192.168.64.3)' can't be established.  
ED25519 key fingerprint is SHA256:kXKpvi6WvUW+3YFe+Nm52wNLSxQr85ZpVq9IR2JxfiE.  
This key is not known by any other names.  
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes  
Warning: Permanently added '192.168.64.3' (ED25519) to the list of known hosts.  
kali@192.168.64.3's password:  
test.txt  
100% 27 26.9KB/s 00:00
```

```
kali@kali: ~  
File Actions Edit View Help  
  
(kali@kali)~  
$ scp test.txt kali@192.168.64.3:/home/kali/  
  
The authenticity of host '192.168.64.3 (192.168.64.3)' can't be established.  
ED25519 key fingerprint is SHA256:kXKpvi0WvUW+3YFe+Nm52wNLSxQr85ZpVq9IRZJxfiE.  
This key is not known by any other names.  
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes  
Warning: Permanently added '192.168.64.3' (ED25519) to the list of known hosts.  
kali@192.168.64.3's password:   
test.txt 100% 27 26.9KB/s 00:00  
  
(kali@kali)~  
$  
  
(kali@kali)~  
$ ssh-keygen -t rsa -b 4096  
Generating public/private rsa key pair.  
Enter file in which to save the key (/home/kali/.ssh/id_rsa):  
Enter passphrase for "/home/kali/.ssh/id_rsa" (empty for no passphrase):  
Enter same passphrase again:  
Your identification has been saved in /home/kali/.ssh/id_rsa  
Your public key has been saved in /home/kali/.ssh/id_rsa.pub  
The key fingerprint is:  
SHA256:2RaMmbUXtviuuW2yVj2odd2T0LU093As7/jbvkMKYCc kali@kali  
The key's randomart image is:  
+--[RSA 4096]--+  
| . o . |  
| + + o o o = |  
| + = o o o = |  
| E = . o o |  
| S * . o . + o |  
| . o + = + + |  
| + o o o . |  
| + + . o |  
| . = . + + |  
+--[SHA256]--+  
  
(kali@kali)~  
$ ip a  
  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000  
link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
```

```
kali@kali: ~  
File Actions Edit View Help  
| . = . + * |  
+-----[SHA256]-----+  
  
(kali@kali)~  
$ ip a  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
    inet 127.0.0.1/8 scope host lo  
        valid_lft forever preferred_lft forever  
    inet6 ::1/128 scope host noprefixroute  
        valid_lft forever preferred_lft forever  
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000  
    link/ether ea:f0:2f:00:11:3a brd ff:ff:ff:ff:ff:ff  
    inet 192.168.64.3/24 brd 192.168.64.255 scope global dynamic eth0  
        valid_lft 2090sec preferred_lft 2090sec  
    inet6 fd66:97e3:2e1a:17e1:f98b:b366:20e:a053/64 scope global temporary dynamic  
        valid_lft 592493sec preferred_lft 73627sec  
    inet6 fd66:97e3:2e1a:17e1:e8f0:2fff:fe00:113a/64 scope global dynamic mngtmpaddr noprefixroute  
        valid_lft 2591910sec preferred_lft 604710sec  
    inet6 fe80::e8f0:2fff:fe00:113a/64 scope link noprefixroute  
        valid_lft forever preferred_lft forever  
  
(kali@kali)~  
$ whoami  
kali  
  
(kali@kali)~  
$ ssh-copy-id kali@192.168.64.3  
/usr/bin/ssh-copy-id: INFO: Source of key(s) to be installed: "/home/kali/.ssh/id_rsa.pub"  
/usr/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any that are already installed  
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it is to install the new keys  
kali@192.168.64.3's password:  
  
Number of key(s) added: 1  
  
Now try logging into the machine, with: "ssh 'kali@192.168.64.3'"  
and check to make sure that only the key(s) you wanted were added.  
  
(kali@kali)~  
$ ssh kali@192.168.64.3
```

```
kali@kali: ~  
File Actions Edit View Help  
valid_lft 592493sec preferred_lft 73627sec  
inet6 fd66:97e3:2e1a:17e1:e8f0:2fff:fe00:113a/64 scope global dynamic mngtmpaddr noprefixroute  
valid_lft 2591910sec preferred_lft 604710sec  
inet6 fe80::e8f0:2fff:fe00:113a/64 scope link noprefixroute  
valid_lft forever preferred_lft forever  
  
(kali@kali)~  
$ whoami  
kali  
  
(kali@kali)~  
$ ssh-copy-id kali@192.168.64.3  
/usr/bin/ssh-copy-id: INFO: Source of key(s) to be installed: "/home/kali/.ssh/id_rsa.pub"  
/usr/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any that are already installed  
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it is to install the new keys  
kali@192.168.64.3's password:  
Number of key(s) added: 1  
  
Now try logging into the machine, with: "ssh 'kali@192.168.64.3'"  
and check to make sure that only the key(s) you wanted were added.  
  
(kali@kali)~  
$ ssh kali@192.168.64.3  
  
Linux kali 6.12.25-arm64 #1 SMP Kali 6.12.25-1kali1 (2025-04-30) aarch64  
  
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.  
You have new mail.  
(kali@kali)~  
$ scp test.txt kali@192.168.64.3:/home/kali/  
test.txt 100% 27 17.8KB/s  
  
(kali@kali)~  
$
```

