

LAB 6: sftp/ssh/scp Setup for comp232.com

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COMP-232 Programming Languages
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<https://comp232.com>

The following steps allow you to use ssh (Secure Shell) and sftp (Secure FTP) from your laptop to comp232.com (143.198.238.179) without requiring a password using private and public keys. Both ssh and sftp encrypt the data sent and received from your laptop to the comp232.com site.

Open an Ubuntu terminal window and type:

% uname -a

Linux oho 4.4.0-19041-Microsoft #1237-Microsoft Sat Sep 11 14:32:00 PST 2021 x86_64 x86_64 x86_64
GNU/Linux

% id

uid=1000(john) gid=1000(john)
groups=1000(john),4(adm),20(dialout),24(cdrom),25(floppy),27(sudo),29(audio),30(dip),44(video),46(pl
ugdev),117(netdev)

% pwd

/home/john

<<<< For my user id. Your path will be different.

% ls -l .ssh

.ssh: No such file or directory

%mkdir .ssh

% ls -ld .ssh

drwxr-xr-x 1 john john 4096 Sep 22 09:50 .ssh

% chmod 700 .ssh

% ls -ld .ssh

drwx----- 1 john john 4096 Sep 22 09:50 .ssh

← Must be rwx for john user only.

% cd .ssh

Note: <CR> represents the ENTER key, or Carriage Return, on your keyboard to accept the defaults.

% ssh-keygen -t rsa

Generating public/private rsa key pair.

Enter file in which to save the key (/home/john/.ssh/id_rsa): <CR>

Enter passphrase (empty for no passphrase): <CR>

Enter same passphrase again: <CR>

Your identification has been saved in /home/john/.ssh/id_rsa
 Your public key has been saved in /home/john/.ssh/id_rsa.pub
 The key fingerprint is:
 SHA256:tDDuHhB/dQxPGLTZz5/rzdkHeeAwX7UnDSu5MMWIDGs john@oho

The key's randomart image is:

```
+---- [RSA 3072] -----+
|           .+=+...   |
|           .%o...   |
|      . o . E.B. +o |
|      + + +o.=o+.+ |
|      . o S  o Bo=. |
|      o .      . =.o |
|      o          +. |
|      . .          .* |
|      .           .+= |
+----- [SHA256] -----+
```

% ls -l

```
total 4
-rw----- 1 john john 2590 Sep 22 09:52 id_rsa
-rw-r--r-- 1 john john 562 Sep 22 09:52 id_rsa.pub
```

On comp232.com as user john, run:

% uname -a

```
Linux comp232 5.4.0-73-generic #82-Ubuntu SMP Wed Apr 14 17:39:42 UTC 2021 x86_64 x86_64
x86_64 GNU/Linux
```

% id

```
uid=1012(john) gid=1012(john) groups=1012(john)
```

% pwd

```
/home/john
```

% ls -l .ssh

```
.ssh: No such file or directory
```

% mkdir .ssh

← If .ssh doesn't exist already.

% ls -ld .ssh

```
drwxrwxr-x 2 john john 2 Sep 22 16:59 .ssh
```

% chmod 700 .ssh

← If .ssh isn't 700 already.

% ls -ld .ssh

```
drwx----- 2 john john 4096 Sep 22 16:59 .ssh
```

% cd .ssh

% vi authorized_keys

Copy/Paste the public key id_rsa.pub on your laptop for user john into authorized_keys. Make sure the key is one single line without any spaces in key. In vi, you can type "1G" to go to line 1 and then type "\$" to see if the cursor goes to the last character in the authorized_keys file.

```
% ls -l
```

```
total 8
```

```
-rw-rw-r-- 1 john john 562 Sep 22 16:59 authorized_keys
```

```
-rw-r--r-- 1 john john 444 Sep 22 16:49 known_hosts
```

% chmod 400 authorized_keys

```
% ls -l
```

```
total 2
```

```
-r----- 1 john john 562 Sep 22 16:59 authorized_keys ← Must be r only for john.
```

On your laptop as user john, lets test things out. Run:

```
% sftp john@comp232.com ← sftp stands for Secure File Transfer Protocol (SFTP).
```

```
← First time you'll need to confirm connecting to comp232.com
```

```
The authenticity of host 'comp232.com (143.198.238.179)' can't be established.
```

```
ECDSA key fingerprint is SHA256:Nlt2g1v4/qqh5f13d7Gpj3Xelb8RgzbIN6tML0YVJnA.
```

```
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
```

```
Warning: Permanently added 'comp232.com,143.198.238.179' (ECDSA) to the list of known hosts.
```

```
Connected to comp232.com.
```

```
sftp> quit
```

```
% ls -l
```

```
total 4
```

```
-rw----- 1 john john 2590 Sep 22 09:52 id_rsa
```

```
-rw-r--r-- 1 john john 562 Sep 22 09:52 id_rsa.pub
```

```
-rw-r--r-- 1 john john 444 Sep 22 10:01 known_hosts
```

On comp232.com, we see only one file in .ssh:

```
% pwd
```

```
/export/home/john/.ssh
```

```
john@comp232:~/.ssh$ ls -l
```

```
total 8
```

```
-r----- 1 john john 562 Sep 22 16:59 authorized_keys
```

```
-rw-r--r-- 1 john john 444 Sep 22 16:49 known_hosts
```

On Your laptop as user john, we can manually run sftp without a password:

```
% sftp john@comp232.com
```

```
Connecting to comp232.com ...
```

```
sftp> lls -l test.txt
```

```
-rw-rw-r-- 1 john john      12 May 17 23:49 test.txt
```

```
sftp> put test.txt
```

```
Uploading test.txt to /export/home/john/test.txt
```

```
test.txt                                100% 12  0.0KB/s  00:00
```

```
sftp> ls -l test.txt
```

```
-rw-r--r-- 0 110  103      12 May 18 00:00 test.txt
```

```
sftp> quit
```

On your laptop as user john, we can connect to comp232.com using ssh:

```
john@oho:~/ssh$ ssh john@comp232.com
```

```
Welcome to Ubuntu 20.04.2 LTS (GNU/Linux 5.4.0-73-generic x86_64)
```

```
* Documentation: https://help.ubuntu.com
```

```
* Management:   https://landscape.canonical.com
```

```
* Support:      https://ubuntu.com/advantage
```

```
System information as of Wed Sep 22 17:21:43 UTC 2021
```

```
System load: 0.0          Users logged in: 2
```

```
Usage of /: 7.7% of 48.29GB IPv4 address for eth0: 143.198.238.179
```

```
Memory usage: 18%        IPv4 address for eth0: 10.48.0.5
```

```
Swap usage: 0%           IPv4 address for eth1: 10.124.0.2
```

```
Processes: 130
```

```
68 updates can be applied immediately.
```

```
1 of these updates is a standard security update.
```

```
To see these additional updates run: apt list --upgradable
```

```
*** System restart required ***
```

```
Last login: Wed Sep 15 02:04:46 2021 from 23.241.58.212
```

```
john@comp232:~$ uname -a
```

```
Linux comp232 5.4.0-73-generic #82-Ubuntu SMP Wed Apr 14 17:39:42 UTC 2021 x86_64 x86_64 x86_64  
GNU/Linux
```

```
john@comp232:~$
```

To transfer multiple files to comp232.com, you could create a shell script like:

```
% cat test_sftp.sh
#!/bin/sh
sftp john@comp232.com > sftp-temp.txt <<EOF
lcd LAB3
cd /home/john/LAB3
mput *.c
bye
EOF
```

```
% test_sftp.sh
Connecting to comp232.com ...
%
```

```
% cat /tmp/sftp-temp
sftp> lcd /var/log
sftp> cd /home/john/LAB4
sftp> mput c.*
Uploading /home/john/LAB4/*.c
sftp> bye
```

On Your laptop as user john, we can run scp (secure copy) command to perform the same secure transfer:

```
% scp -qr *.c john@comp232.com:/home/john/LAB4
%
```

Or on Your laptop as user john, run scp in a script:

```
% cat test_scp.sh
#!/bin/sh
run_date=""date '+%m/%d/%Y'""
start_time=""date '+%H:%M:%S'""
echo "$run_date^$start_time^$USER^scp -qr /var/log/syslog*
john@COMP232.COM:/export/home/john/sftp_test.dir \c"

scp -qr /var/log/syslog* john@COMP232.COM:/export/home/john/sftp_test.dir

end_time=""^date '+%H:%M:%S'""
echo "$end_time"

% test_scp.sh >> scp_audit_log.txt

% test_scp.sh >> scp_audit_log.txt
```

```
% test_scp.sh >> scp_audit_log.txt
```

```
% cat scp_audit_log.txt
```

```
05/18/2021^00:56:39^john^scp -qr /var/log/syslog* john@COMP232.COM:/home/john/sftp_test.dir ^00:56:39
05/18/2021^00:56:44^john^scp -qr /var/log/syslog* john@COMP232.COM:/home/john/sftp_test.dir ^00:56:44
05/18/2021^00:56:49^john^scp -qr /var/log/syslog* john@COMP232.COM:/home/john/sftp_test.dir ^00:56:50
```

The scp_audit_log.txt file can now be loaded into an Excel spreadsheet for further analysis if needed.

To generate the public key from the private key, you can run:

```
john@oho:~/ssh$ ssh-keygen -y -f id_rsa > id_rsa.public_key.txt
```

```
john@oho:~/ssh$ more id_rsa.public_key.txt
```

```
ssh-rsa
```

```
AAAAB3NzaC1yc2EAAAADAQABAAQBGQDExpF6lIdPs4LiLer4T/yNEbl8MXLFFeS2gU9eGAVj/bpW5Ou97n
3skfV6GXy8eSJQMuExdlInzleBQIG
prl02/XdWTH6/HGzmTANcj3nIAZ2J0eu4vAKhSTS5PhuJV11qgRZtdAv0I+SE8Cpcx3FtKHSYrwmF2+QryOOg
JHHmHB/1f15UPXp/woqD5hzEWADbynBostn
KHKXk8PQSmHWM4/sq/LOWl3uFsExVkfLxCNd4h5iP9N1+ozYXEWI9CUJCZwA6nA7XKJyxKAT5RDEbelJogF
56aLx2FEvM0Da4J61HEQmIkZKt5oaGW3v1RZP
TBVPjDN6l5ldekjhNiFnWiUbZhQ4JpmN/3ZCef6k5W2nYgHEbQ59vT51Ak1TgN5Co5EOvUqCEO7My4c6+I
e2wuBd5TnZoEnl3842snjbFwXth++pZl3bcVh
GktE4B7wwzV6QpbNhJe5PYNGCg4Dv8ykuJiAJnP+CEViHS8wZ6FGWuuYnS7lSdQRWDvPEAc=
```

```
john@oho:~/ssh$ cat id_rsa.pub
```

```
ssh-rsa
```

```
AAAAB3NzaC1yc2EAAAADAQABAAQBGQDExpF6lIdPs4LiLer4T/yNEbl8MXLFFeS2gU9eGAVj/bpW5Ou97n
3skfV6GXy8eSJQMuExdlInzleBQIGprl02/XdWTH6/HGzmTANcj3nIAZ2J0eu4vAKhSTS5PhuJV11qgRZtdAv0I
+SE8Cpcx3FtKHSYrwmF2+QryOOgJHHmHB/1f15UPXp/woqD5hzEWADbynBostnKHKXk8PQSmHWM4/sq
/LOWl3uFsExVkfLxCNd4h5iP9N1+ozYXEWI9CUJCZwA6nA7XKJyxKAT5RDEbelJogF56aLx2FEvM0Da4J61HE
QmIkZKt5oaGW3v1RZPTBVPjDN6l5ldekjhNiFnWiUbZhQ4JpmN/3ZCef6k5W2nYgHEbQ59vT51Ak1TgN5C
o5EOvUqCEO7My4c6+Ie2wuBd5TnZoEnl3842snjbFwXth++pZl3bcVhGktE4B7wwzV6QpbNhJe5PYNGCg4
Dv8ykuJiAJnP+CEViHS8wZ6FGWuuYnS7lSdQRWDvPEAc= john@ohojohn@oho
```

```
john@oho:~/ssh$ diff id_rsa.pub id_rsa.public_key.txt
```

```
% ssh-keygen -y -f id_rsa > id_rsa.public_key
```

```
% ls -l
```

```
total 8
```

```
-rw----- 1 john john 883 May 17 23:37 id_rsa
-rw-r--r-- 1 john john 226 May 17 23:37 id_rsa.pub
-rw-rw-r-- 1 john john 209 May 18 10:30 id_rsa.public_key
-rw-r--r-- 1 john john 409 May 17 23:48 known_hosts
```

% more id_rsa.pub

```
ssh-rsa AAAAB3NzaC1yc2EAAAABIwAAAIEAxYH8LMFZB5XM4FHv+HmLDuJW87fneROuQszTFwrOS/w9
+yXqH8aL+IVDxXzUw3In9UPD5tYGuuBJ/tVqDo24rGSsZXRMqyyMtMffRKYSOn1Ks2Dkgig9uqek7N23
6DiT45yo2WHusMp8DmHDuKHdbyX1zknPkBwohgxFLe+aUk= john@your laptop2-z1
```

% more id_rsa.public_key

```
ssh-rsa AAAAB3NzaC1yc2EAAAABIwAAAIEAxYH8LMFZB5XM4FHv+HmLDuJW87fneROuQszTFwrOS/w9
+yXqH8aL+IVDxXzUw3In9UPD5tYGuuBJ/tVqDo24rGSsZXRMqyyMtMffRKYSOn1Ks2Dkgig9uqek7N23
6DiT45yo2WHusMp8DmHDuKHdbyX1zknPkBwohgxFLe+aUk=
```

Don't share your private key with anyone!!! Doing so will allow access to your account! That said, here's what the id_rsa file looks like:

```
john@oho:~/ssh$ cat id_rsa
```

← Don't share your private key to anyone!!!

```
-----BEGIN OPENSSH PRIVATE KEY-----
```

```
b3BlbnNzaC1rZXktdjEAAAABAG5vbmUAAAABbm9uZQAAAAAAAAABAAABlwAAAAdzc2gtcn
NhAAAAAwEAAQAAAEAAxMSKRepSHT7OC4i3q+E/8jRG5fDFyxXetoFPXhgFY/26VuTrve5
97JH1ehl8vHkiUDLhMXZZ85XgUCBqa5dNv13Vlx+vxks5kwDXI955QGdidHruLwCoUk0u
T4biVddaoEWbXQL9CPkhPAqXMdxSh0mK8Jhdvkk8jjoCRx5hwf9X9eVD16f8KKg+YcxFg
A28pwaLLZyhyI5PD0Eph1jOP7KvyzsJd7hbBMVZHy8QjXeIeYj/TdfqM2FxFiPQICQmcAO
pwO1yicsSgE+UQxG3i4zoBeemi8dhRLzNA2uCetRxEjiJGSreaGhlt79UWT0wVT4wzepeZ
ZXXpi4TYhZ1oIG2YUOCaZjf92Qnn+pOVtp2IBxG0Ofb0+dQJNU4DeQqORDr1KghDuzMuHO
viHtsLgXeU52aBJ5d/ONrJ42xcF7YfvqWZd23FYRpLROAe8MM1ekKWzYSXuT2DRgoOA7/M
pLiYgCZz/ghFYh0vMGehRlrmJ0u5bHUEVg7zxAAAAFgHYGZbl2BmW5AAAAB3NzaC1yc2
EAAAGBAMTEikXqUh0+zgult6vhP/IORuXwxcSv8RLaBT14YBWP9ulbk673ufeyR9XozfLx
5IIAy4TF2WWfOV4FAGamuXTb9d1ZMfr8cbOZMA1yPeeUBnYnR67i8AqFJNLk+G4IXXWqBF
m10C/Qj5ITwKlZhcW0odJivCYXb5CvI46AkceYch/V/XIQ9en/CioPmHMYANvKcGiy2co
cpeTw9BKydYzj+yr8s7CXe4WwTFWR8vEI13iHml/03X6jNhCRyJ0JQkInADqcDtconLEoB
PIEMRt4uM6AXnpovHYUS8zQNrgnrUcRCYiRkq3mhoZbe/VFk9MFU+MM3qXmWV16SOE2IWd
aJRtmFDgmmY3/dkI5/qTlbadiAcRtDn29PnUCTVOA3kKjkQ69SolIQ7szLhzr4h7bC4F3IO
dmgSeXfzjayeNsXBe2H76lmXdtWEaS0TgHvDDNxpCIs2EI7k9g0YKDgO/zKS4mlAmc/4I
RWldLzBnoUZA65idLuWx1BFYO88QBwAAAAMBAAEAAAGAMPjVjTcXfs3dzEMXq4ChQK/AIY
R+ReBNlqr+eOEX0OYGxueS5w4iy8IkXNm9XezUO1DUFISDmeY6CetnKK6gl7SHCbMkXFou
Fkv/CKmxPly72vZFwglbShL/KjnwlsFX9Gv/LzCwAuZ+hRXDcqkC9OzTBaCrQTO+AZ2FVP
cs0SdggICK2IHM4pMmPXeqMqFVayVkmBvjUeZgNteA+bs5hG1K2dWl1c3MQPCK3rOhpNZJ
ExmvBDbsc0WLfmHgsIhKq2BdrZAnoIrfu+kulGEfBbwdM5gJRUBtfm6+S1TgzG3uLhXTus
E4CrGEkkGxTxr1DysbAXTwoPsaD9dYVvbUEAhX7/f966+c43w45UMjdMF/MqnNk9BMfU+j
ezd2HxmHJVAvotHqF8Tbim7kFuWAKCQL5hBqYzw6Yk4gVRrORIFH+t4DyHErLZEtw3eWm
2rIU9ReKPavxuTPxzD9xvJIFMDRvwMqHr7nvTsz+pRZ5Qat1t/DVb9y2H7uAYTFGxAAAA
wQDiMI2DOBe+S+O2DfkQPBRpFs8hmHET+lhWHLCEEqimzi96kav6nCwGpTWihxeUEXL+zP
O6km1umw8cUfP8+5Du6Ci0LbutaMHmg8GvsST5U40nwwwHG0F63tL9idpUktRoz4/YMITm
Swv0dJbx7KAZH52BKdMug4w0HNPKCop1cJdEzLhMvmOMR2IJK4cbAl+BfG2WWfdJBnslym
kW6IuuLSEymQiuRKLn/kdaQtWqPUt1NIOIK9XDY951ZCUB7tUAAADBAPHUbZfvrBailRdR
wU8bIT6oOfar0oyR6FcqmyWrxly5yk/aMaVowBr15BKF5sMimsbT2VK/pwBT7PjuAzOoAl
O3E0Zqu/fPPozD92e0gYs1U8xZMmvRqoRm/ynHeUCLi6vtNCWOzIfVRyz0N2puHm7I24w8
eOLXaOrFkSq5w1jpa+SHYV83t9fI0/HaQEVwYkbH6I+PtVxrwhtLjvxdzvRVBzFp2gkHCh
```

```
OC/YBZODkZ0tt/FmdsTJcFBeYhXrgJmQAAAMEA0EwoZmiAjNbNCvNjX0tJ4J8IXc/qcfo4
3UCyyYXICV61si3lGYgGiol9bes0669DM7bmxVmE7fi6xR9R7c3Q9HqmmX08X+MArRDz6k
MyzOUf7t2Tb05o47APQaZeCZORYJxDFF6ciBFg+6lBk6Y34+4HosvTRvxmb+lh/HBLd+OA
ZxHy7Ywts3ojGvk0kapvkiB8NM271nkSPWzcSQ2OAnY1BPDmMihFw6ns8by8o6gNNcPiec
pQnlmy7oWGHiqfAAAACGpvaG5Ab2hvAQI=
-----END OPENSSH PRIVATE KEY-----
```

```
john@oho:~/ssh$
```