How To Set Up vsftpd for a User's Directory on Ubuntu 18.04

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Introduction

FTP, short for File Transfer Protocol, is a network protocol that was once widely used for moving files between a client and server. It has since been replaced by faster, more secure, and more convenient ways of delivering files. Many casual Internet users expect to download directly from their web browser with `https`, and command-line users are more likely to use secure protocols such as the `scp` or SFTP.

FTP is still used to support legacy applications and workflows with very specific needs. If you have a choice of what protocol to use, consider exploring the more modern options. When you do need FTP, however, vsftpd is an excellent choice. Optimized for security, performance, and stability, vsftpd offers strong protection against many security problems found in other FTP servers and is the default for many Linux distributions.

In this tutorial, you'll configure vsftpd to allow a user to upload files to his or her home directory using FTP with login credentials secured by SSL/TLS.

Prerequisites

To follow along with this tutorial you will need:

- **An Ubuntu 18.04 server, and a non-root user with sudo privileges**: You can learn more about how to set up a user with these privileges in our Initial Server Setup with Ubuntu 18.04 guide.

Step 1 — Installing vsftpd

Let's start by updating our package list and installing the `vsftpd` daemon:

```
$ sudo apt update
$ sudo apt install vsftpd
```

When the installation is complete, let's copy the configuration file so we can start with a blank configuration, saving the original as a backup:

```
$ sudo cp /etc/vsftpd.conf /etc/vsftpd.conf.orig
```

With a backup of the configuration in place, we're ready to configure the firewall.

Step 2 — Opening the Firewall

Let's check the firewall status to see if it's enabled. If it is, we'll ensure that FTP traffic is permitted so firewall rules don't block our tests.

Check the firewall status:

```
$ sudo ufw status
```

In this case, only SSH is allowed through:

```
Output
Status: active

To                         Action      From
--                         ------      ----
OpenSSH                    ALLOW       Anywhere
OpenSSH (v6)               ALLOW       Anywhere (v6)
```

You may have other rules in place or no firewall rules at all. Since only SSH traffic is

Let's open ports `20` and `21` for FTP, port `990` for when we enable TLS, and ports `40000-50000` for the range of passive ports we plan to set in the configuration file:

```
$ sudo ufw allow 20/tcp
$ sudo ufw allow 21/tcp
$ sudo ufw allow 990/tcp
$ sudo ufw allow 40000:50000/tcp
$ sudo ufw status
```

Our firewall rules should now look like this:

```
Output
Status: active

To                         Action      From
--                         ------      ----
OpenSSH                    ALLOW       Anywhere
990/tcp                    ALLOW       Anywhere
20/tcp                     ALLOW       Anywhere
21/tcp                     ALLOW       Anywhere
40000:50000/tcp            ALLOW       Anywhere
OpenSSH (v6)               ALLOW       Anywhere (v6)
20/tcp (v6)                ALLOW       Anywhere (v6)
21/tcp (v6)                ALLOW       Anywhere (v6)
990/tcp (v6)               ALLOW       Anywhere (v6)
40000:50000/tcp (v6)       ALLOW       Anywhere (v6)
```

With `vsftpd` installed and the necessary ports open, let's move on to creating a dedicated FTP user.

Step 3 — Preparing the User Directory

We will create a dedicated FTP user, but you may already have a user in need of FTP access. We'll take care to preserve an existing user's access to their data in the instructions that follow. Even so, we recommend that you start with a new user until you've configured and tested your setup.

First, add a test user:

```
$ sudo adduser sammy
```


prompts.

FTP is generally more secure when users are restricted to a specific directory. `vsftpd` accomplishes this with `chroot` jails. When `chroot` is enabled for local users, they are restricted to their home directory by default. However, because of the way `vsftpd` secures the directory, it must not be writable by the user. This is fine for a new user who should only connect via FTP, but an existing user may need to write to their home folder if they also have shell access.

In this example, rather than removing write privileges from the home directory, let's create an `ftp` directory to serve as the `chroot` and a writable `files` directory to hold the actual files.

Create the `ftp` folder:

```
$ sudo mkdir /home/sammy/ftp
```

Set its ownership:

```
$ sudo chown nobody:nogroup /home/sammy/ftp
```

Remove write permissions:

```
$ sudo chmod a-w /home/sammy/ftp
```

Verify the permissions:

```
$ sudo ls -la /home/sammy/ftp
```

Output

```
total 8
4 dr-xr-xr-x  2 nobody nogroup 4096 Aug 24 21:29 .
4 drwxr-xr-x  3 sammy  sammy   4096 Aug 24 21:29 ..
```

Next, let's create the directory for file uploads and assign ownership to the user:

```
$ sudo chown sammy:sammy /home/sammy/ftp/files
```

```
$ sudo ls -la /home/sammy/ftp
```

Output

```
total 12
dr-xr-xr-x 3 nobody nogroup 4096 Aug 26 14:01 .
drwxr-xr-x 3 sammy  sammy   4096 Aug 26 13:59 ..
drwxr-xr-x 2 sammy  sammy   4096 Aug 26 14:01 files
```

Finally, let's add a `test.txt` file to use when we test:

```
$ echo "vsftpd test file" | sudo tee /home/sammy/ftp/files/test.txt
```

Now that we've secured the `ftp` directory and allowed the user access to the `files` directory, let's modify our configuration.

Step 4 — Configuring FTP Access

We're planning to allow a single user with a local shell account to connect with FTP. The two key settings for this are already set in `vsftpd.conf`. Start by opening the config file to verify that the settings in your configuration match those below:

```
$ sudo nano /etc/vsftpd.conf
```

/etc/vsftpd.conf

```
. . .
# Allow anonymous FTP? (Disabled by default).
anonymous_enable=NO
#
# Uncomment this to allow local users to log in.
local_enable=YES
. . .
```

Next, let's enable the user to upload files by uncommenting the `write_enable` setting:

/etc/vsftpd.conf

```
. . .
write_enable=YES
```

We'll also uncomment the `chroot` to prevent the FTP-connected user from accessing any files or commands outside the directory tree:

/etc/vsftpd.conf

```
. . .
chroot_local_user=YES
. . .
```

Let's also add a `user_sub_token` to insert the username in our `local_root directory` path so our configuration will work for this user and any additional future users. Add these settings anywhere in the file:

/etc/vsftpd.conf

```
. . .
user_sub_token=$USER
local_root=/home/$USER/ftp
```

Let's also limit the range of ports that can be used for passive FTP to make sure enough connections are available:

/etc/vsftpd.conf

```
. . .
pasv_min_port=40000
pasv_max_port=50000
```

> **Note:** In step 2, we opened the ports that we set here for the passive port range. If you change the values, be sure to update your firewall settings.

To allow FTP access on a case-by-case basis, let's set the configuration so that users have access only when they are explicitly added to a list, rather than by default:

/etc/vsftpd.conf

```
_
userlist_file=/etc/vsftpd.userlist
userlist_deny=NO
```

ied FTP

When you're done making the changes, save the file and exit the editor.

Finally, let's add our user to `/etc/vsftpd.userlist`. Use the `-a` flag to append to the file:

```
$ echo "sammy" | sudo tee -a /etc/vsftpd.userlist
```

Check that it was added as you expected:

```
$ cat /etc/vsftpd.userlist
```

```
Output
sammy
```

Restart the daemon to load the configuration changes:

```
$ sudo systemctl restart vsftpd
```

With the configuration in place, let's move on to testing FTP access.

Step 5 — Testing FTP Access

We've configured the server to allow only the user `sammy` to connect via FTP. Let's make sure that this works as expected.

Anonymous users should fail to connect: We've disabled anonymous access. Let's test that by trying to connect anonymously. If our configuration is set up properly, anonymous users should be denied permission. Open another terminal window and run the following command. Be sure to replace `203.0.113.0` with your server's public IP address:

```
$ ftp -p 203.0.113.0
```

```
Output
Connected to 203.0.113.0.
220 (vsFTPd 3.0.3)
Name (203.0.113.0:default): anonymous
530 Permission denied.
```

Close the connection:

```
ftp> bye
```

Users other than `sammy` should fail to connect: Next, let's try connecting as our sudo user. They should also be denied access, and it should happen before they're allowed to enter their password:

```
$ ftp -p 203.0.113.0
```

```
Output
Connected to 203.0.113.0.
220 (vsFTPd 3.0.3)
Name (203.0.113.0:default): sudo_user
530 Permission denied.
ftp: Login failed.
ftp>
```

Close the connection:

```
ftp> bye
```

The user `sammy` should be able to connect, read, and write files: Let's make sure that our designated user can connect:

```
$ ftp -p 203.0.113.0
```

```
Output
Connected to 203.0.113.0.
220 (vsFTPd 3.0.3)
Name (203.0.113.0:default): sammy
331 Please specify the password.
Password: your_user's_password
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp>
```

Let's change into the `files` directory and use the `get` command to transfer the test file we created earlier to our local machine:

```
ftp> cd files
ftp> get test.txt
```

```
Output
227 Entering Passive Mode (203,0,113,0,169,12).
150 Opening BINARY mode data connection for test.txt (16 bytes).
226 Transfer complete.
16 bytes received in 0.0101 seconds (1588 bytes/s)
ftp>
```

Next, let's upload the file with a new name to test write permissions:

```
ftp> put test.txt upload.txt
```

```
Output
227 Entering Passive Mode (203,0,113,0,164,71).
150 Ok to send data.
226 Transfer complete.
16 bytes sent in 0.000894 seconds (17897 bytes/s)
```

Close the connection:

```
ftp> bye
```

Now that we've tested our configuration, let's take steps to further secure our server.

Step 6 — Securing Transactions

Since FTP does *not* encrypt any data in transit, including user credentials, we'll enable TLS/SSL to provide that encryption. The first step is to create the SSL certificates for use with `vsftpd`.

Let's use `openssl` to create a new certificate and use the `-days` flag to make it valid for one year. In the same command, we'll add a private 2048-bit RSA key. By setting both the

```
$ sudo openssl req -x509 -nodes -days 365 -newkey rsa:2048 -keyout /etc/ssl/private/vsftpd
```

You'll be prompted to provide address information for your certificate. Substitute your own information for the highlighted values below:

```
Output
Generating a 2048 bit RSA private key
.....................................................................+++
...........+++
writing new private key to '/etc/ssl/private/vsftpd.pem'
-----
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:NY
Locality Name (eg, city) []:New York City
Organization Name (eg, company) [Internet Widgits Pty Ltd]:DigitalOcean
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name) []: your_server_ip
Email Address []:
```

For more detailed information about the certificate flags, see OpenSSL Essentials: Working with SSL Certificates, Private Keys and CSRs

Once you've created the certificates, open the `vsftpd` configuration file again:

```
$ sudo nano /etc/vsftpd.conf
```

Toward the bottom of the file, you will see two lines that begin with `rsa_`. Comment them out so they look like this:

/etc/vsftpd.conf

```
. . .
# rsa_cert_file=/etc/ssl/certs/ssl-cert-snakeoil.pem
```

Below them, add the following lines that point to the certificate and private key we just created:

/etc/vsftpd.conf

```
. . .
rsa_cert_file=/etc/ssl/private/vsftpd.pem
rsa_private_key_file=/etc/ssl/private/vsftpd.pem
. . .
```

After that, we will force the use of SSL, which will prevent clients that can't deal with TLS from connecting. This is necessary to ensure that all traffic is encrypted, but it may force your FTP user to change clients. Change `ssl_enable` to `YES`:

/etc/vsftpd.conf

```
. . .
ssl_enable=YES
. . .
```

After that, add the following lines to explicitly deny anonymous connections over SSL and to require SSL for both data transfer and logins:

/etc/vsftpd.conf

```
. . .
allow_anon_ssl=NO
force_local_data_ssl=YES
force_local_logins_ssl=YES
. . .
```

After this, configure the server to use TLS, the preferred successor to SSL, by adding the following lines:

/etc/vsftpd.conf

```
. . .
ssl_tlsv1=YES
ssl_sslv2=NO
ssl_sslv3=NO
. . .
```


se it can
currently

means key lengths equal to or greater than 128 bits:

/etc/vsftpd.conf

```
. . .
require_ssl_reuse=NO
ssl_ciphers=HIGH
. . .
```

The finished file section should look like this:

/etc/vsftpd.conf

```
# This option specifies the location of the RSA certificate to use for SSL
# encrypted connections.
#rsa_cert_file=/etc/ssl/certs/ssl-cert-snakeoil.pem
#rsa_private_key_file=/etc/ssl/private/ssl-cert-snakeoil.key
rsa_cert_file=/etc/ssl/private/vsftpd.pem
rsa_private_key_file=/etc/ssl/private/vsftpd.pem
ssl_enable=YES
allow_anon_ssl=NO
force_local_data_ssl=YES
force_local_logins_ssl=YES
ssl_tlsv1=YES
ssl_sslv2=NO
ssl_sslv3=NO
require_ssl_reuse=NO
ssl_ciphers=HIGH
```

When you're done, save and close the file.

Restart the server for the changes to take effect:

```
$ sudo systemctl restart vsftpd
```

At this point, we will no longer be able to connect with an insecure command-line client. If we tried, we'd see something like:

```
Output
ftp -p 203.0.113.0
Connected to 203.0.113.0.
220 (vsFTPd 3.0.3)
```

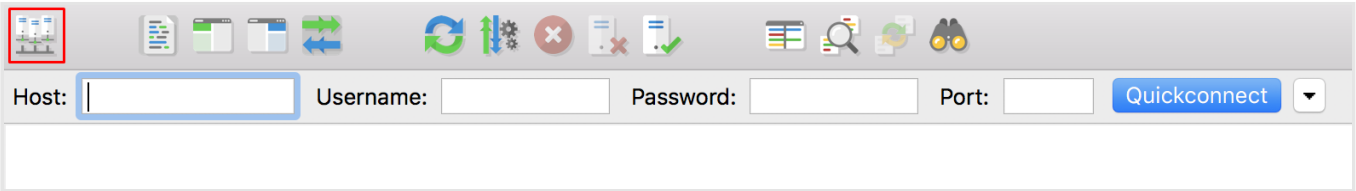
```
ftp: Login failed.
421 Service not available, remote server has closed connection
ftp>
```

Next, let's verify that we can connect using a client that supports TLS.

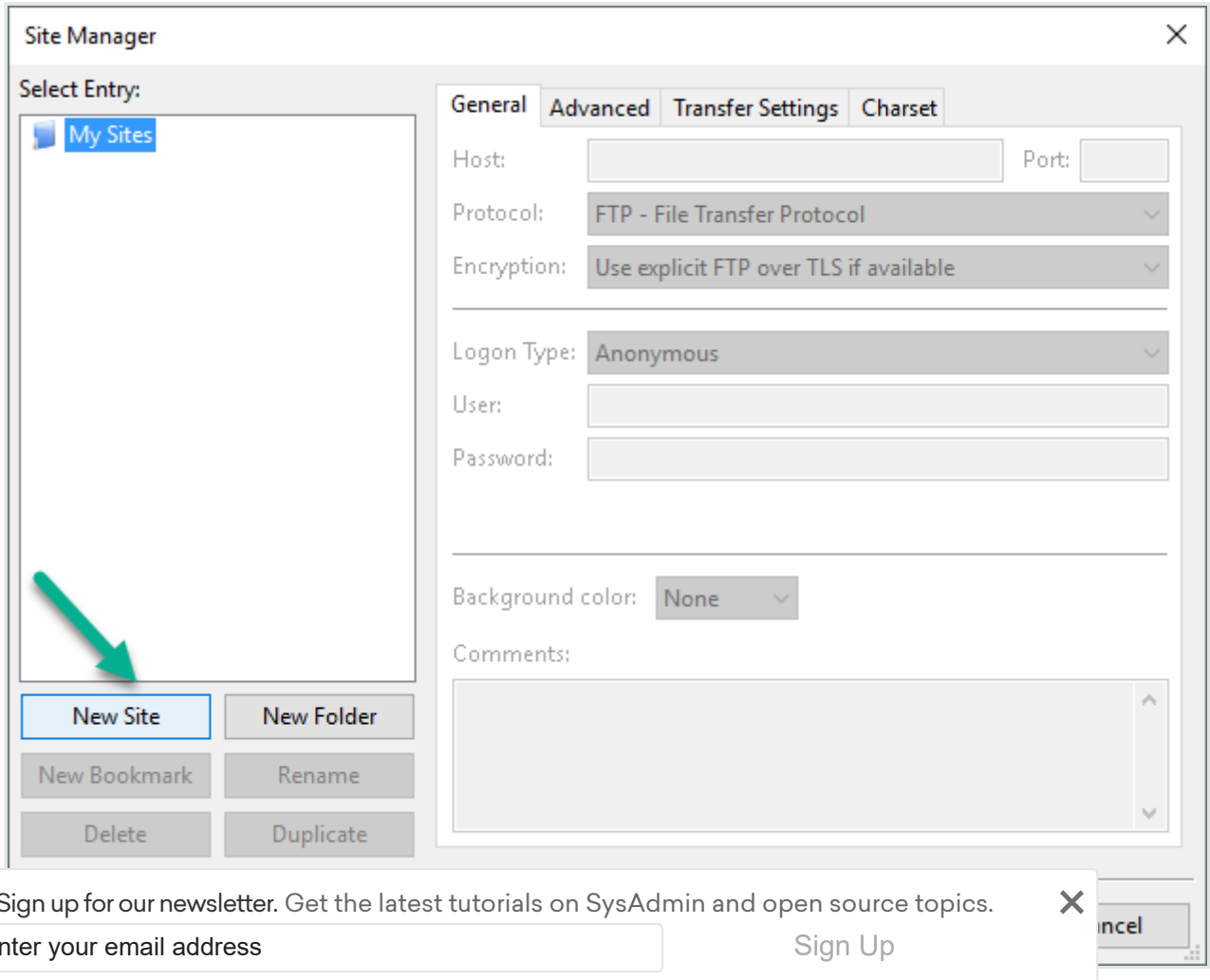
Step 7 — Testing TLS with FileZilla

Most modern FTP clients can be configured to use TLS encryption. We will demonstrate how to connect with FileZilla because of its cross-platform support. Consult the documentation for other clients.

When you first open FileZilla, find the Site Manager icon just above the word **Host**, the left-most icon on the top row. Click it:



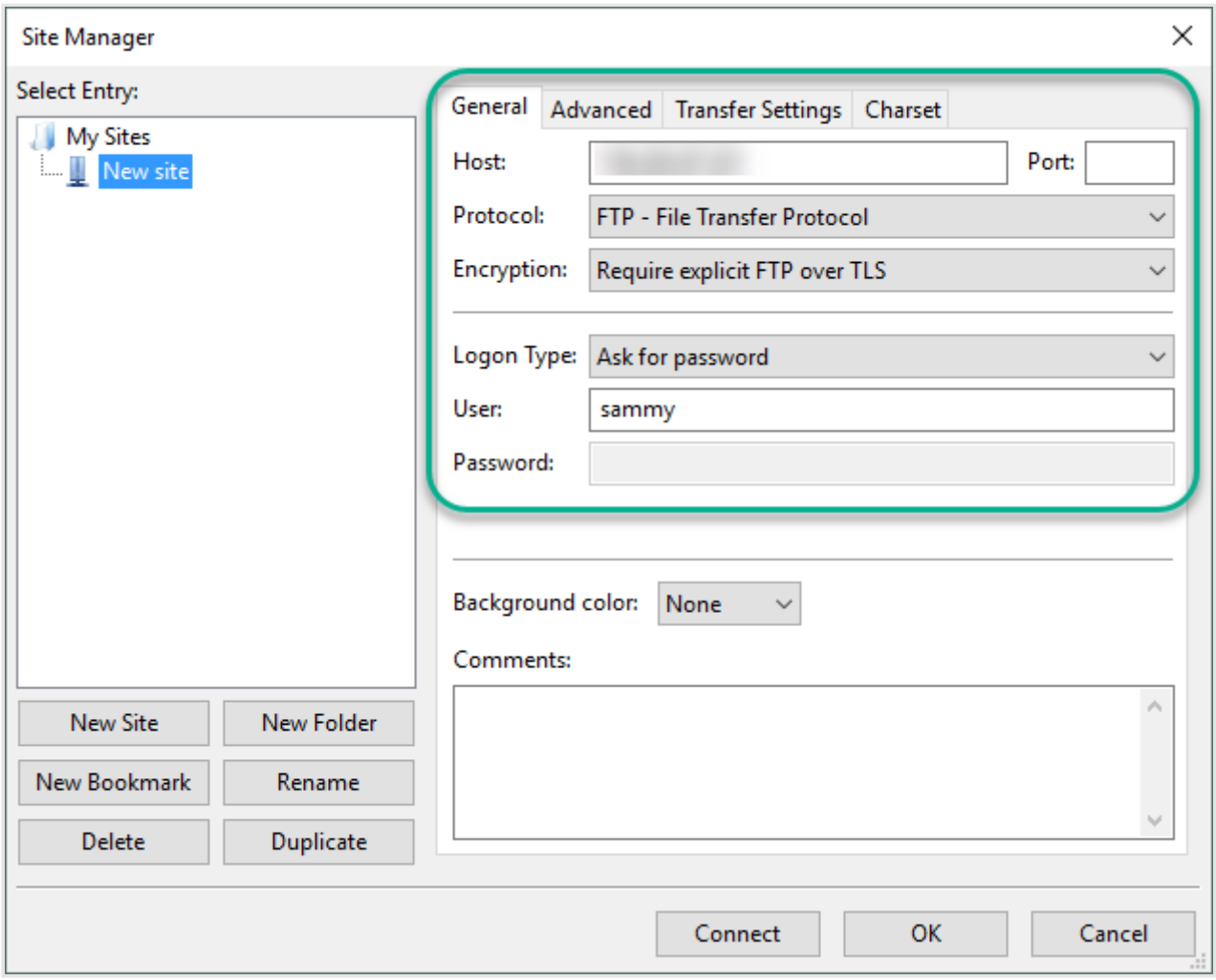
A new window will open. Click the **New Site** button in the bottom right corner:



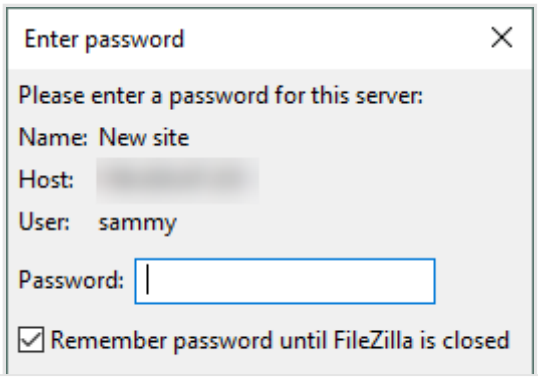
Under **My Sites** a new icon with the words **New site** will appear. You can name it now or return later and use the **Rename** button.

Fill out the **Host** field with the name or IP address. Under the **Encryption** drop down menu, select **Require explicit FTP over TLS**.

For **Logon Type**, select **Ask for password**. Fill in your FTP user in the **User** field:

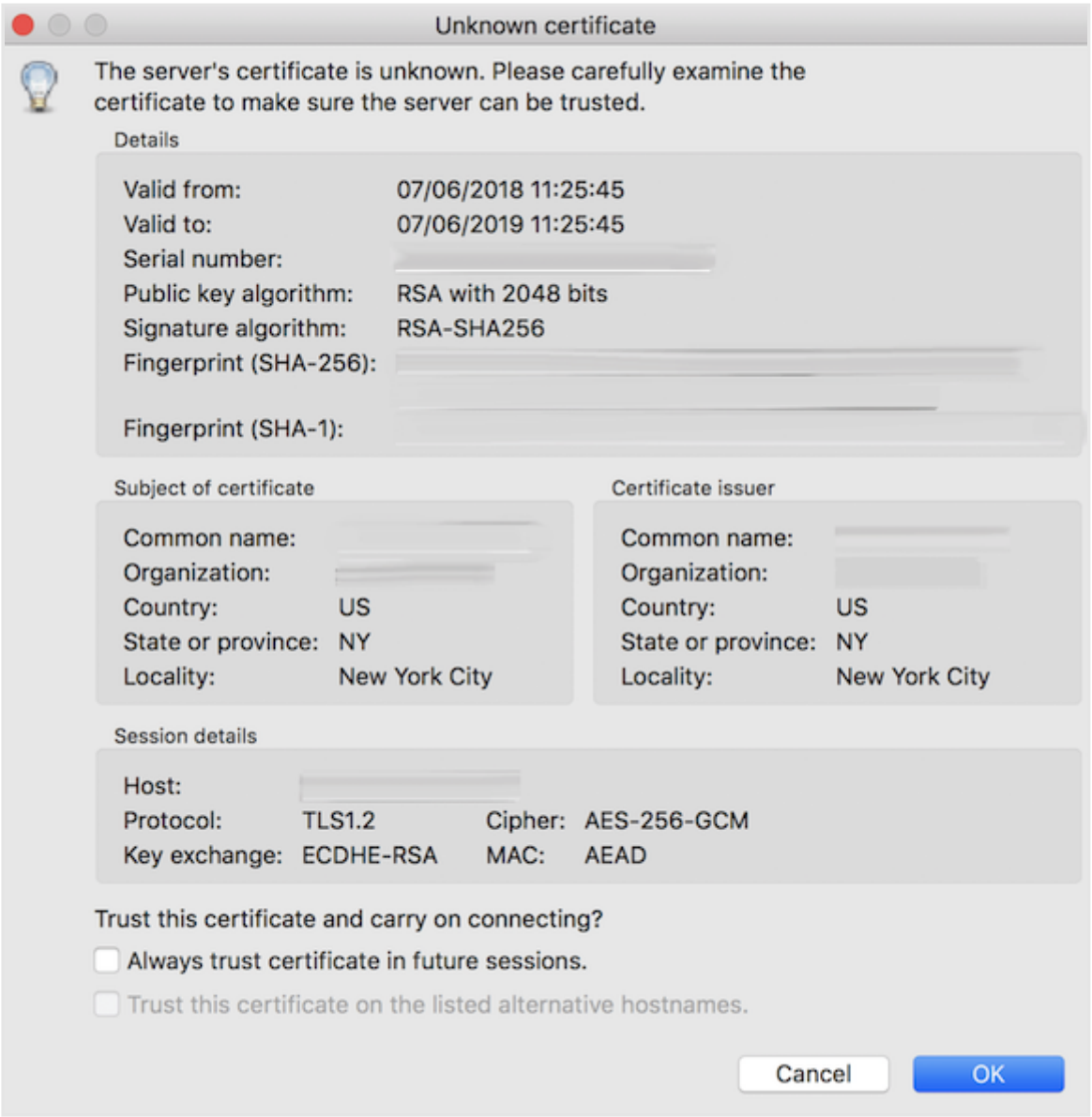


Click **Connect** at the bottom of the interface. You will be asked for the user's password:

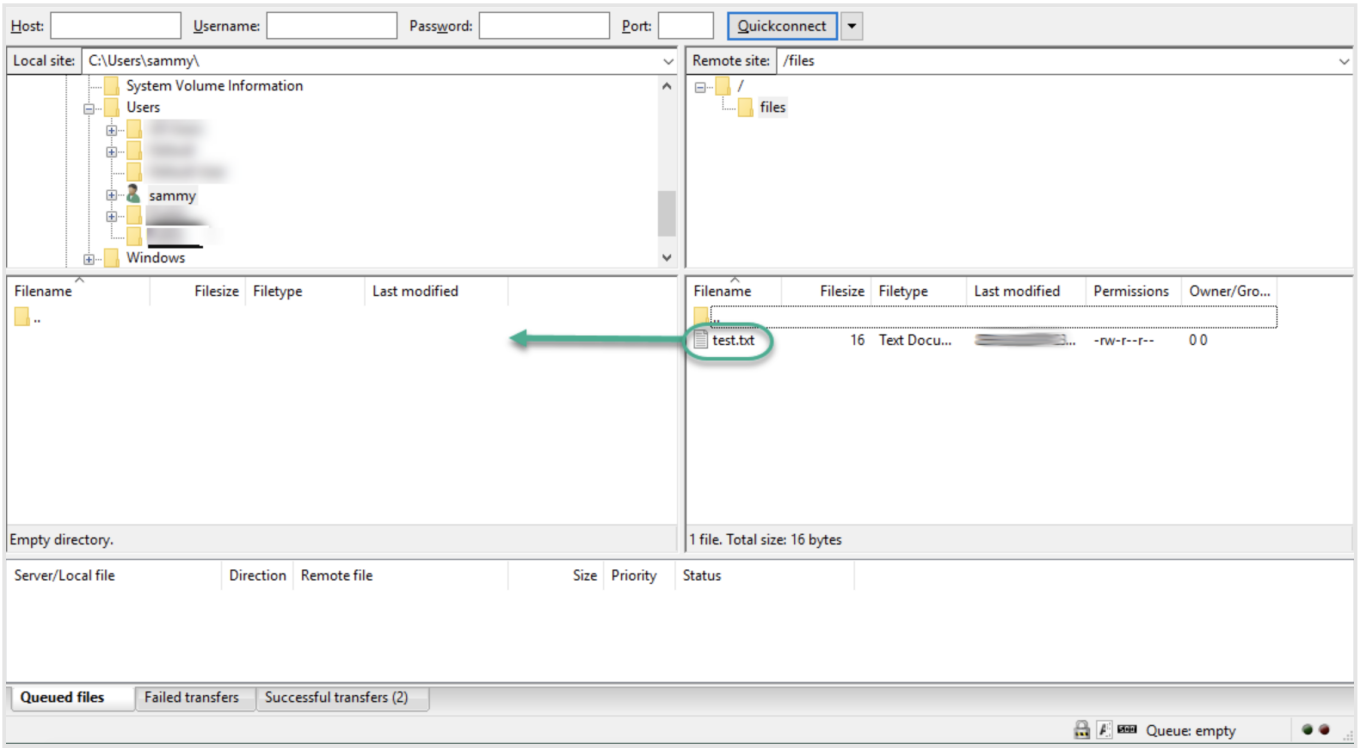


Click **OK** to connect. You should now be connected with your server with TLS/SSL encryption.

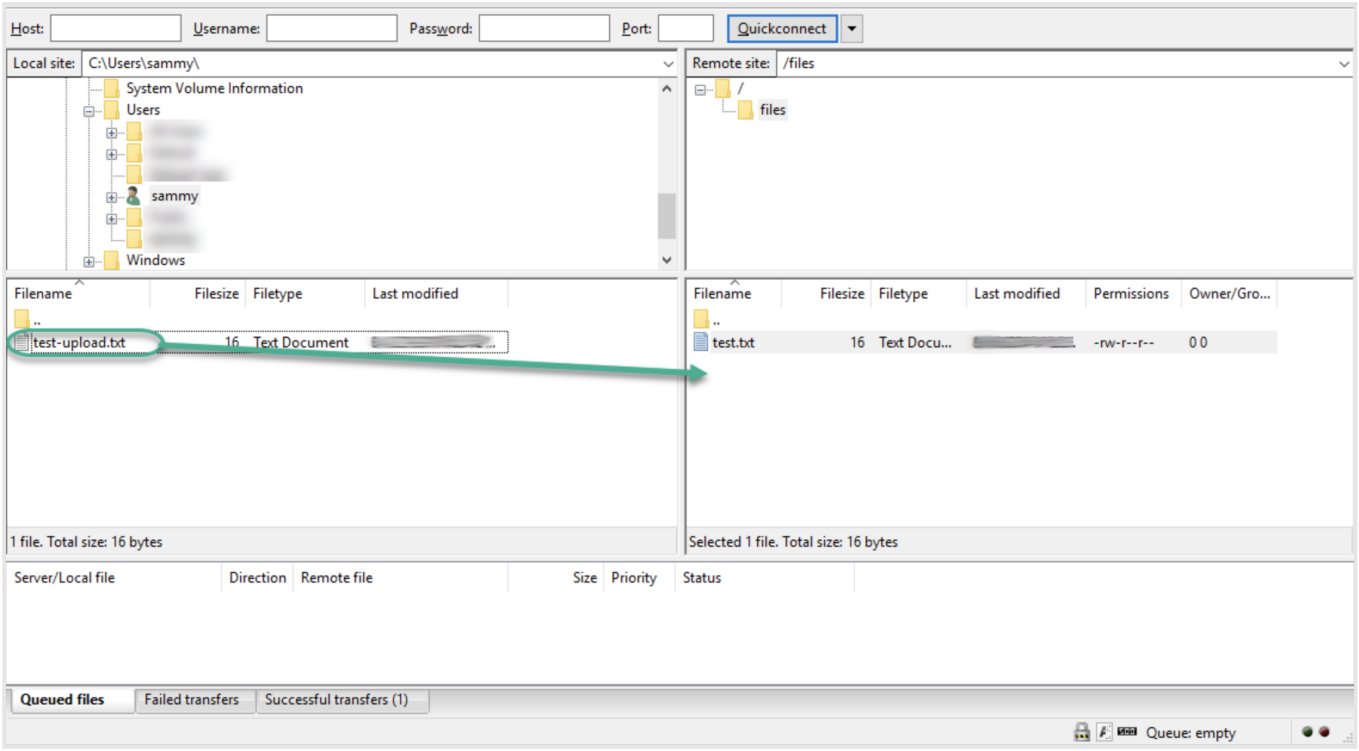
Upon success, you will be presented with a server certificate that looks like this:



When you've accepted the certificate, double-click the `files` folder and drag `upload.txt` to the left to confirm that you're able to download files:



When you've done that, right-click on the local copy, rename it to `upload-tls.txt` and drag it back to the server to confirm that you can upload files:



You've now confirmed that you can securely and successfully transfer files with SSL/TLS enabled.

Step 8 — Disabling Shell Access (Optional)

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to prevent it is by creating a custom shell. This will not provide any encryption, but it will limit the access of a compromised account to files accessible by FTP.

First, open a file called `ftponly` in the `bin` directory:

```
$ sudo nano /bin/ftponly
```

Add a message telling the user why they are unable to log in:

/bin/ftponly

```
#!/bin/sh
echo "This account is limited to FTP access only."
```

Save the file and exit your editor.

Change the permissions to make the file executable:

```
$ sudo chmod a+x /bin/ftponly
```

Open the list of valid shells:

```
$ sudo nano /etc/shells
```

At the bottom add:

/etc/shells

```
. . .
/bin/ftponly
```

Update the user's shell with the following command:

```
$ sudo usermod sammy -s /bin/ftponly
```

Now try logging into your server as `sammy`:

```
$ ssh sammy@your_server_ip
```

You should see something like:

```
Output
This account is limited to FTP access only.
Connection to 203.0.113.0 closed.
```

This confirms that the user can no longer `ssh` to the server and is limited to FTP access only.

Conclusion

In this tutorial we covered setting up FTP for users with a local account. If you need to use an external authentication source, you might want to look into `vsftpd`'s support of virtual users. This offers a rich set of options through the use of PAM, the Pluggable Authentication Modules, and is a good choice if you manage users in another system such as LDAP or Kerberos.

By: Melissa Anderson By: Kathleen Juell

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6 Comments

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ahmedalmulki *September 7, 2018*

0 Great Article, but I want to know how can I change the user FTP directory to /var/www/html/sammy/ftp instead of the /home/sammy/ftp ?

Jiggy1com *May 15, 2019*

0 I'm thinking we simply change local_root to the path we want to give them access to

```
local_root=/var/www/example.com
```

Also, I think we can add the user to a group (find another tut) Then

```
chown -R :group /var/www/example.com
```

So more than 1 user can ftp in to CRUD ;-)

manndavidjapan *November 2, 2018*

2 I simply couldn't get this to work. It is such a well written article, but no matter how hard I tried, I always got a "connection refused" message. As soon as I changed from ftp to sftp, everything started to work.

smoder78 *February 2, 2019*

0 I could not get it to work.

robifw *November 17, 2018*

0 Great Articel!

What if we try to ftp with the root user? Can we make a difference if the user is root then we can see the all folder in the /home directory or something?

d4lv *April 15, 2019*

0 everything ok except now i cant login with root ssh :/ i have only access with ftp