

# Distributed Load Testing in Apache JMeter

## Introduction

In this documentation we tried to illustrate Performance Testing on any website Login module by intercepting the API with BlazeMeter. Then test it on different PCs in a distributed system in Apache JMeter with different load. So, our end goal here is, testing the Performance and Security of Login Modules of a Website.

## Objective

In our case we are testing the Login module of <https://recruiter.bdjobs.com/> website. To do that we have Signed Up new accounts for testing purposes. After that we have Logged In with those credentials while intercepting the Login API with BlazeMeter. The Detail Process to Intercept Login API has been described in some other section of this manual which can be found below. After that we have set up a Distributed System on 3 PCs. And Setup the Testing environment. Here we have tested the API with a different number of threads(users) like: 999 total threads (each PC executes 333 threads) received zero error. So, this is the overall Summary of this documentation which illustrates our intention to conduct this Test.

## Environment Setup

### PC configuration

#### PC 1 (Master PC):

Operating System: Windows 10 Pro (64 bit)  
Processor: Intel(R) Core (TM) i3-4130 CPU @ 3.40GHz  
Ram: 16 GB  
IP Address: 172.16.9.142

## PC 2 (Slave PC):

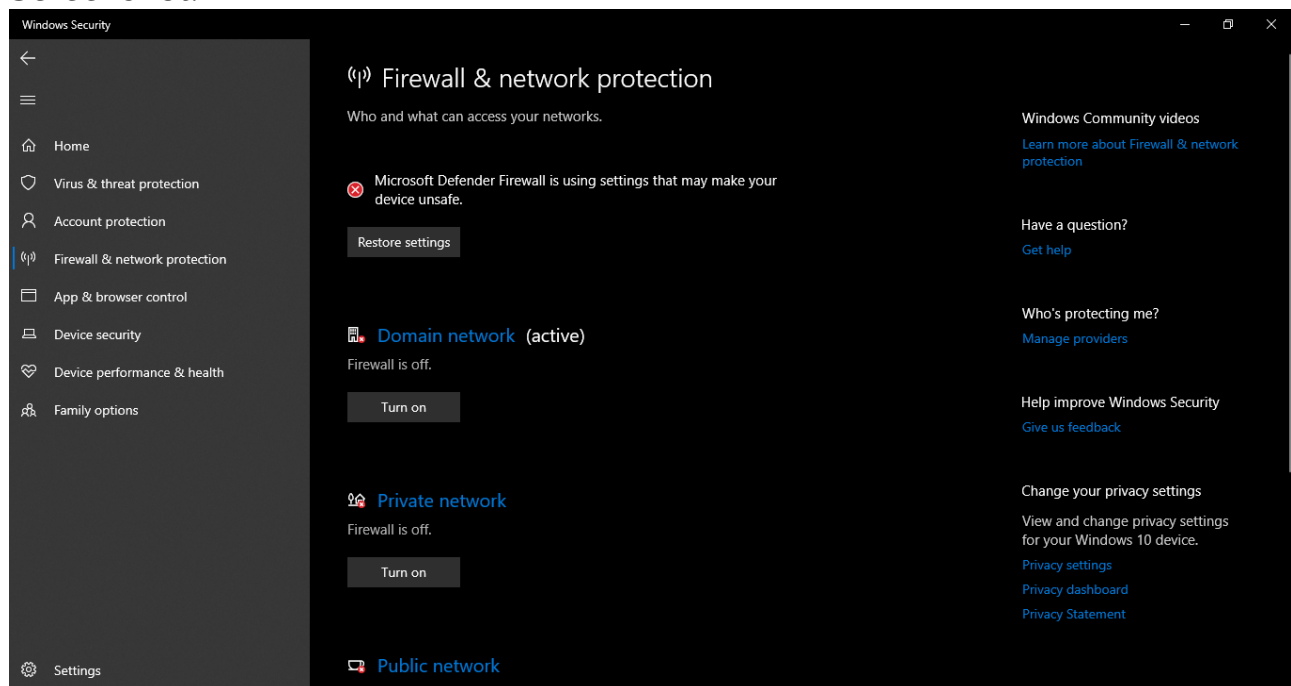
Operating System: Windows 11 Pro (64 bit)  
Processor: Intel(R) Core (TM) i3-4130 CPU @ 3.40GHz  
Ram: 8 GB  
IP Address: 172.16.9.129

## PC 3 (Slave PC):

Operating System: Windows 10 Pro (64 bit)  
Processor: Intel(R) Core (TM) i5-7400 CPU @ 3.00GHz  
Ram: 16 GB  
IP Address: 172.16.2.147

## Network Configuration:

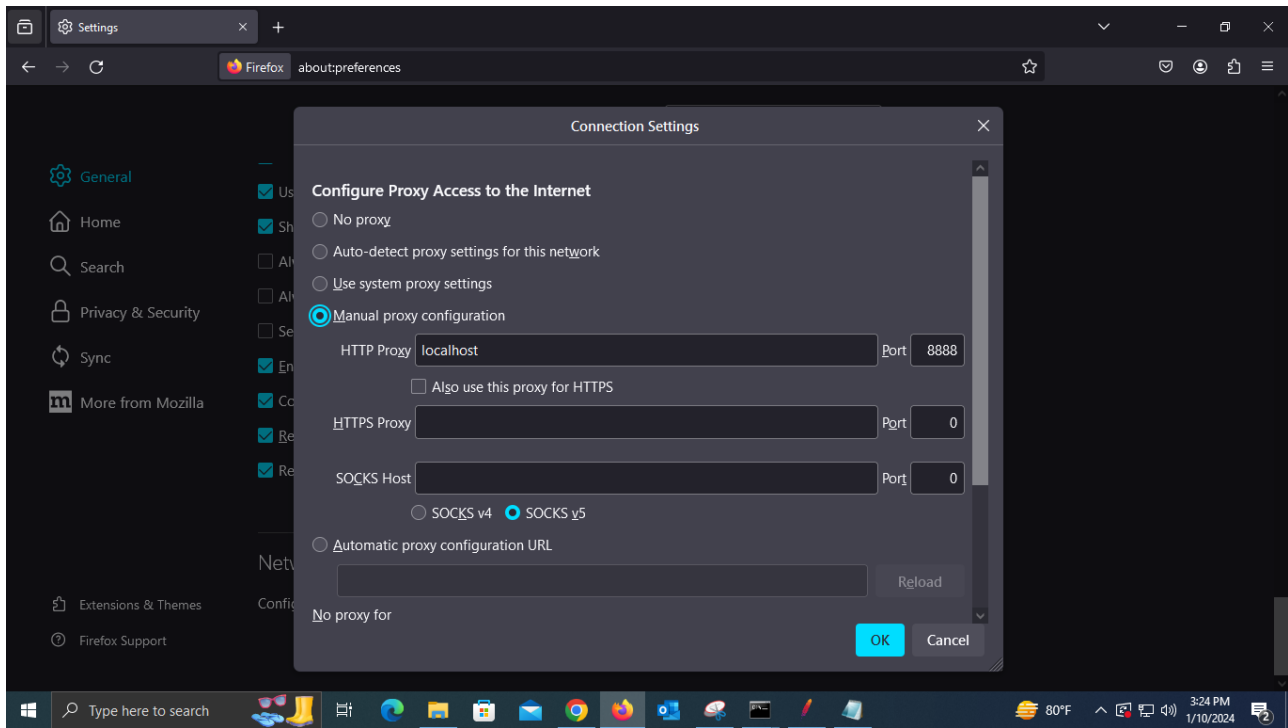
For Master and Slave PCs you need to disable windows firewall. Check the below Screenshot.



Moreover, for all Slave PCs you have to enable manual proxy settings. Which can be found on the Setting portion of Mozilla Firefox (Recommended Browser). Follow the below steps to enable manual proxy on Firefox:

1. Go to the Firefox browser.
2. Go to the application menu on the right side of the browser, click on it.
3. Select settings.

4. Scroll down to network settings.
  5. Click settings
  6. Select Manual proxy configuration and set HTTP proxy= localhost and port =8888.
  7. Click OK.
- Check Below Screenshot.



## Step 1: Install Java

Make sure you have Java (Required Java 8+) installed on your both master and slave machine. The version of java must be the same on both machines. For my project I have used java **17.0.7**. You can download it from this link:

<https://www.oracle.com/java/technologies/javase/jdk17-archive-downloads.html>

## Java SE Development Kit 17.0.7

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Product / File Description	File Size	Download
Linux Arm 64 Compressed Archive	172.12 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_linux-aarch64_bin.tar.gz">https://download.oracle.com/java/17/archive/jdk-17.0.7_linux-aarch64_bin.tar.gz</a> (sha256 )
Linux Arm 64 RPM Package	171.87 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_linux-aarch64_bin.rpm">https://download.oracle.com/java/17/archive/jdk-17.0.7_linux-aarch64_bin.rpm</a> (sha256 )
Linux x64 Compressed Archive	173.30 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_linux-x64_bin.tar.gz">https://download.oracle.com/java/17/archive/jdk-17.0.7_linux-x64_bin.tar.gz</a> (sha256 )
Linux x64 Debian Package	148.86 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_linux-x64_bin.deb">https://download.oracle.com/java/17/archive/jdk-17.0.7_linux-x64_bin.deb</a> (sha256 )
Linux x64 RPM Package	173.04 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_linux-x64_bin.rpm">https://download.oracle.com/java/17/archive/jdk-17.0.7_linux-x64_bin.rpm</a> (sha256 )
macOS Arm 64 Compressed Archive	167.78 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_macos-aarch64_bin.tar.gz">https://download.oracle.com/java/17/archive/jdk-17.0.7_macos-aarch64_bin.tar.gz</a> (sha256 )
macOS Arm 64 DMG Installer	167.19 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_macos-aarch64_bin.dmg">https://download.oracle.com/java/17/archive/jdk-17.0.7_macos-aarch64_bin.dmg</a> (sha256 )
macOS x64 Compressed Archive	170.21 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_macos-x64_bin.tar.gz">https://download.oracle.com/java/17/archive/jdk-17.0.7_macos-x64_bin.tar.gz</a> (sha256 )
macOS x64 DMG Installer	169.63 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_macos-x64_bin.dmg">https://download.oracle.com/java/17/archive/jdk-17.0.7_macos-x64_bin.dmg</a> (sha256 )
Windows x64 Compressed Archive	172.19 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_windows-x64_bin.zip">https://download.oracle.com/java/17/archive/jdk-17.0.7_windows-x64_bin.zip</a> (sha256 )
Windows x64 Installer	153.28 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_windows-x64_bin.exe">https://download.oracle.com/java/17/archive/jdk-17.0.7_windows-x64_bin.exe</a> (sha256 )
Windows x64 MSI Installer	152.07 MB	<a href="https://download.oracle.com/java/17/archive/jdk-17.0.7_windows-x64_bin.msi">https://download.oracle.com/java/17/archive/jdk-17.0.7_windows-x64_bin.msi</a> (sha256 )

After downloading and installing java, you have to check it from the command line. To check the java version, open the command line and write [java --version] if it replies to the below message then java has successfully installed in your machine.

```
Command Prompt
Microsoft Windows [Version 10.0.19045.3570]
(c) Microsoft Corporation. All rights reserved.

C:\Users\asik>java --version
java 17.0.7 2023-04-18 LTS
Java(TM) SE Runtime Environment (build 17.0.7+8-LTS-224)
Java HotSpot(TM) 64-Bit Server VM (build 17.0.7+8-LTS-224, mixed mode, sharing)

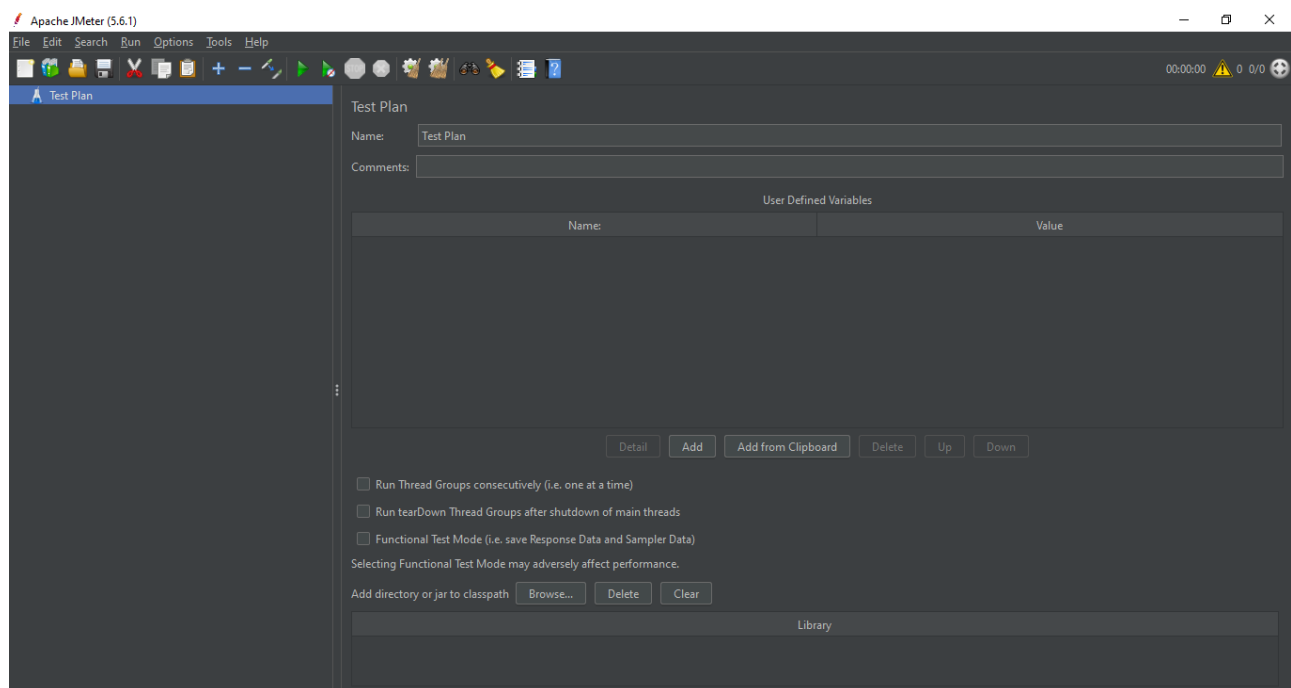
C:\Users\asik>
```

Otherwise restart and check the java version in your machine again.

## Step 2: Install Apache JMeter

Make sure you have Apache JMeter installed on your machine. In our case we have used Apache JMeter **Version 5.6.1**. You can download the latest version from the Apache JMeter website: [https://jmeter.apache.org/download\\_jmeter.cgi](https://jmeter.apache.org/download_jmeter.cgi)

Please download your desired version of Apache JMeter from the above given link. After downloading (Binary Zip File) extract it to any location on your Hard Drive. We have extracted it on Local Disk(C). Then open the Apache JMeter Folder then click to bin Folder. Finally click the jmeter.bat file. With this Apache JMeter got opened.



## Step 3: Configure Master and Slave Machine

### For Master PC:

1. Go to the JMeter bin folder and edit jmeter.properties.
2. Uncomment, remote\_host=[Insert slave PC IP 1],[slave PC IP 2]. If you want to use your master PC as a Slave PC, you can insert your Master PC IP address at the last in the **remote host**. As for our setup we have used the following:  
remote\_hosts=172.16.2.147,172.16.9.129,172.16.9.142

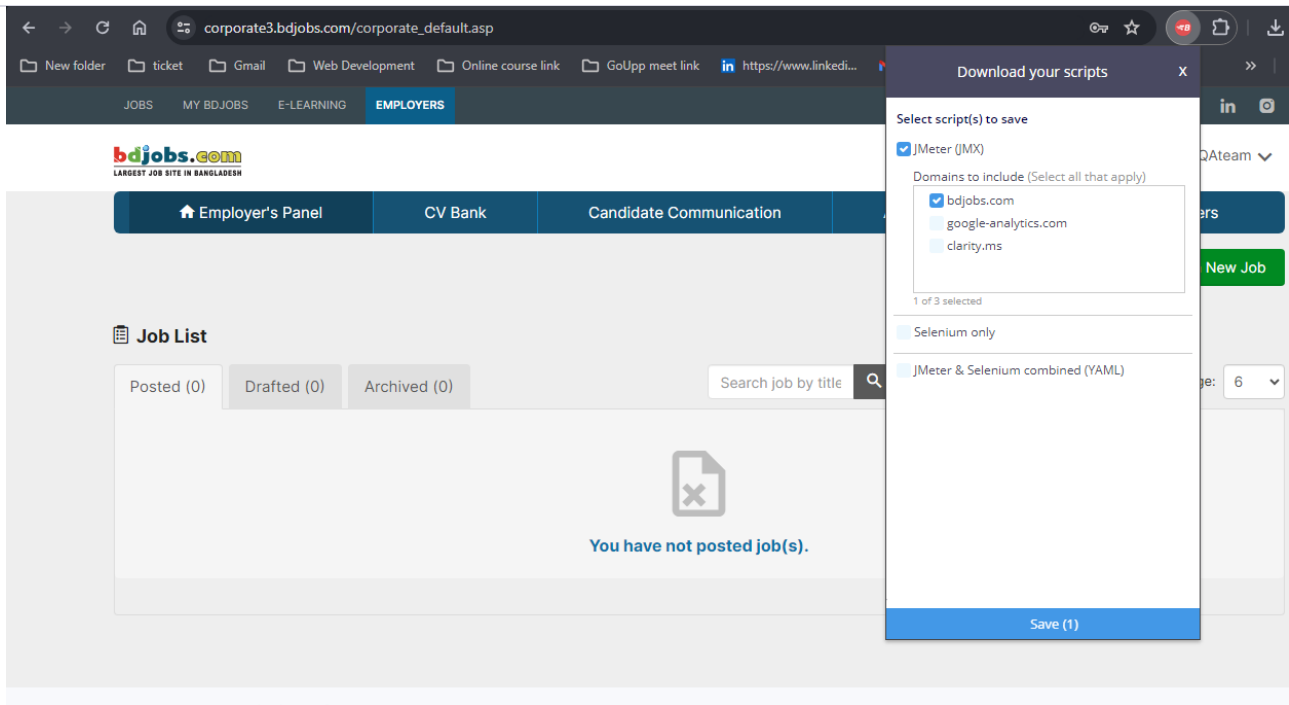
3. Uncomment, server.rmi.localport=4000.
4. From the bin click create-rmi-keystore.bat and input information accordingly. The information they will be asking is the following: Your first and last name, Organizational unit name, Organization name, Name of your city and locality, Name of state or province, Two-letter country code.
5. After providing the above information (it doesn't need to be valid) another verification question will be asked type yes for that.
6. Then a rmi\_keystore.jks will be generated. Send this file to all slave PCs.
7. Note that the rmi\_keystore.jks file **must be present** in the bin folder for Master and All the Slave PCs.

#### For Slave PC:

1. Open jmeter.properties file.
2. Comment, remote\_host.
3. Uncomment, server.rmi.localport = 4000
4. **Make sure that** you have rmi\_keystore.jks file in the bin folder.

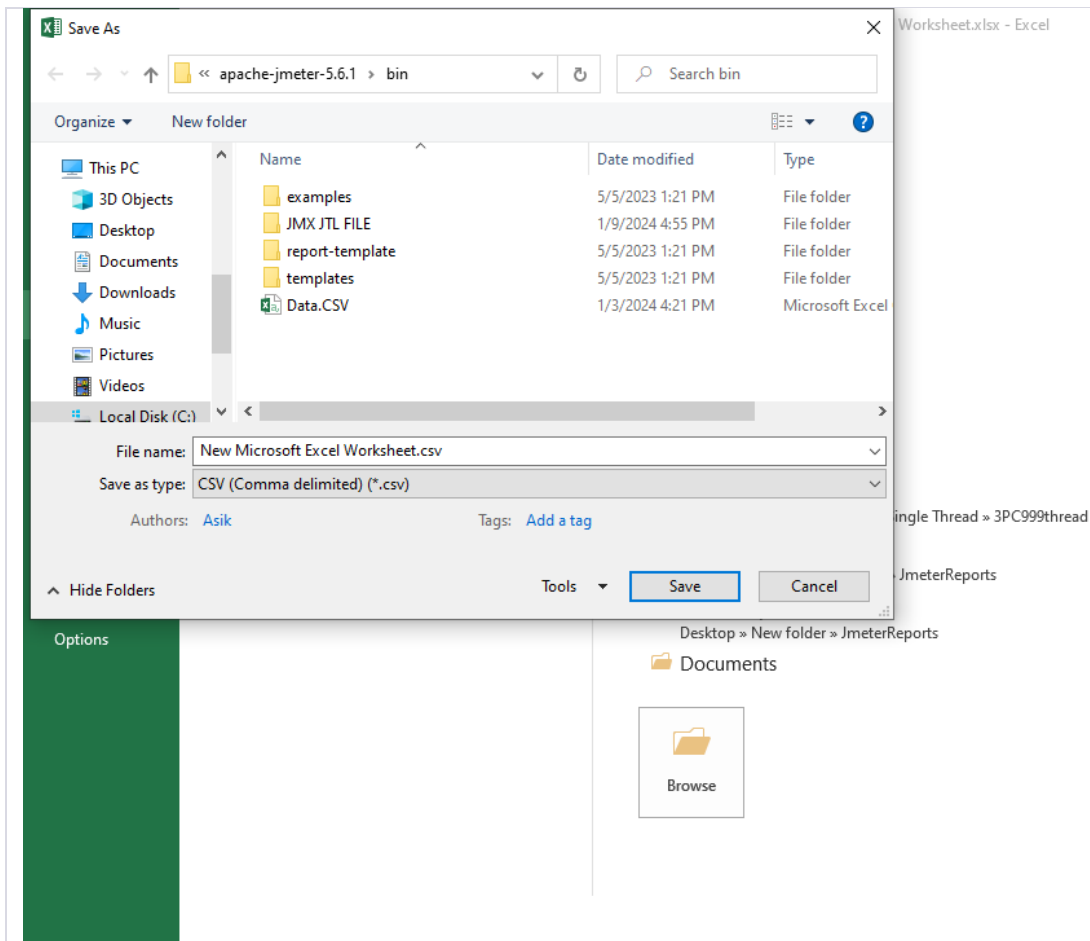
#### Step 4: Collecting API with BlazeMeter

1. Go to Mozilla Firefox browser, click on extensions and search BlazeMeter.
2. Add to extension.
3. Click the extension BlazeMeter and hit the Sign Up.
4. Create an account.
5. After successfully creating an account, close the browser and reopen it.
6. Now go to <https://recruiter.bdjobs.com/>
7. Click on extension BlazeMeter and click record button.
8. Input username and password in the text field.
9. After successfully Login, stop the BlazeMeter recording.
10. Go to BlazeMeter extension and click save file as JMX file.
11. Click bdjobs.com inside the JMX file as we want to use only the bdjobs.com API.
12. Save it and keep it inside the bin folder of JMeter.



## Step 4: Create a CSV file

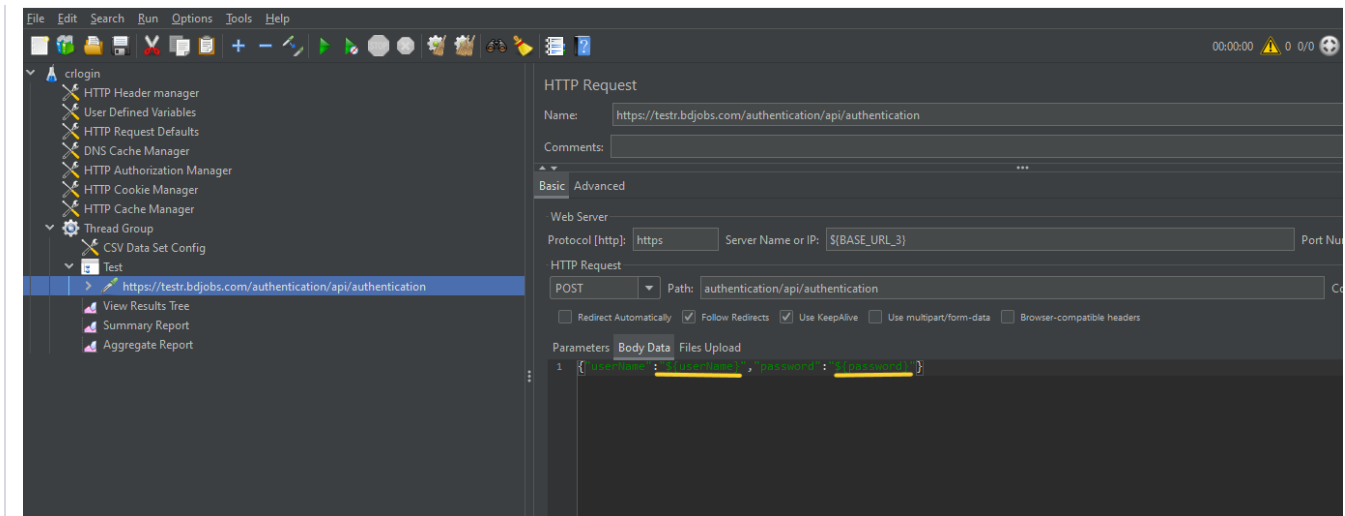
1. Go to bin folder of JMeter
2. Create an Excel file and insert multiple userName and password for login.
3. Save that file as CSV (comma delimited).



## Step 5: Create a Test Plan(For Master and Slave PCs)

1. Open JMeter and click File > Open > JMeter > bin > crlogin.jmx
2. Expand test file of thread group
3. Choose your API. For us we have chosen an authentication api which is a post method of userName and password.
4. Click on Thread Group > Test > authentication API > Body Data
5. Make user credentials (userName,password) dynamic. For us it was: {"userName":"AskiahBillah","password":"Asik1234"} after making it dynamic it is {"userName":"\${userName}","password":"\${password}"}. Please see Screenshot given below:





6. Right click on the thread group > Add > Config Element > CSV Data Set Config
7. Click CSV Data Set Config and browse your CSV file from the bin folder. For us: C:/apache-jmeter-5.6.1/bin/Data.CSV
8. Insert your variable name with a single comma. For us: userName,password
9. Go to the Thread Group and set the thread. For us: We have set 333 threads for all PCs.
10. Click Save.

## Step 6: Add Listeners (For Master and Slave PCs)

1. Right-click on the Thread Group, navigate to "Add" > "Listener," and choose the desired listener(s) for your report. Common listeners include:
  - View Results Tree
  - Summary Report
  - Response Times Over Time
  - Active Threads Over Time

For us: We have chosen 3 listeners:

- View Results Tree
- Summary Report
- Aggregate Report

## Step 7: Opening Server (For Master and Slave PCs)

1. Go to the bin folder of JMeter
2. Click jmeter-server.bat

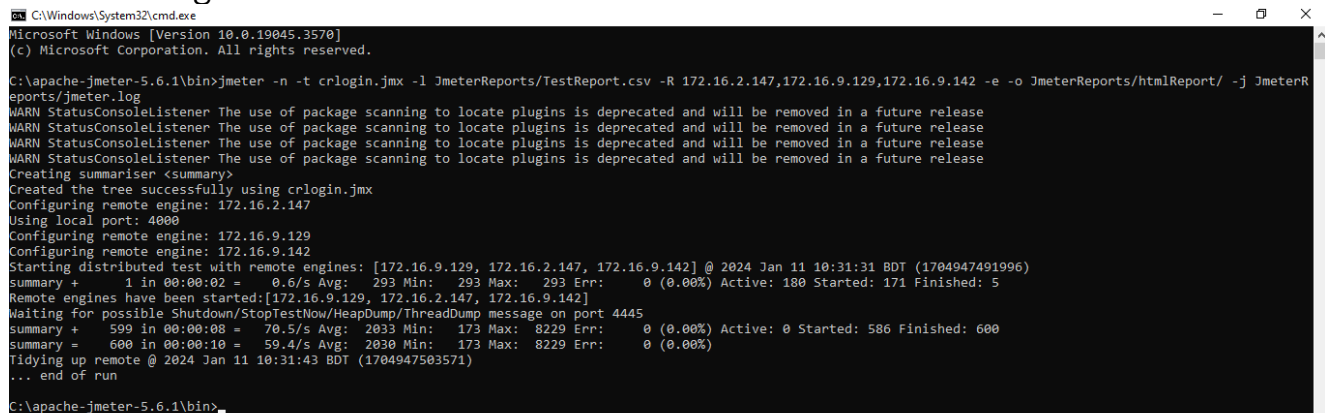
It will open a server to communicate with one another. Make sure all the PCs show the same server port on the command line.

## Step 8: Run the Test

1. Go to bin folder of JMeter and open command prompt
2. Run this: `jmeter -n -t [JMX file name] -l JmeterReports/TestReport.csv -R [Slave PC IP address1],[Slave PC IP address2] -e -o JmeterReports/htmlReport/ -j JmeterReports/jmeter.log`

For us: `jmeter -n -t crlogin.jmx -l JmeterReports/TestReport.csv -R 172.16.2.147,172.16.9.129,172.16.9.142 -e -o JmeterReports/htmlReport/ -j JmeterReports/jmeter.log`

The following Screenshot is showing that `jmeter-server.bat` file opened and launched the server successfully on master and all slave PCs. First Screenshot is Master PC and the following two are Slave PC1 and Slave PC2.



```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19045.3570]
(c) Microsoft Corporation. All rights reserved.

C:\apache-jmeter-5.6.1\bin>jmeter -n -t crlogin.jmx -l JmeterReports/TestReport.csv -R 172.16.2.147,172.16.9.129,172.16.9.142 -e -o JmeterReports/htmlReport/ -j JmeterR
reports/jmeter.log
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
Creating summariser <summary>
Created the tree successfully using crlogin.jmx
Configuring remote engine: 172.16.2.147
Using local port: 4000
Configuring remote engine: 172.16.9.129
Configuring remote engine: 172.16.9.142
Starting distributed test with remote engines: [172.16.9.129, 172.16.2.147, 172.16.9.142] @ 2024 Jan 11 10:31:31 BDT (1704947491996)
summary + 1 in 00:00:02 = 0.6/s Avg: 293 Min: 293 Max: 293 Err: 0 (0.00%) Active: 180 Started: 171 Finished: 5
Remote engines have been started:[172.16.9.129, 172.16.2.147, 172.16.9.142]
Waiting for possible Shutdown/StopTestNow/HeapDump/ThreadDump message on port 4445
summary + 599 in 00:00:08 = 70.5/s Avg: 2033 Min: 173 Max: 8229 Err: 0 (0.00%) Active: 0 Started: 586 Finished: 600
summary = 600 in 00:00:10 = 59.4/s Avg: 2030 Min: 173 Max: 8229 Err: 0 (0.00%)
Tidying up remote @ 2024 Jan 11 10:31:43 BDT (1704947503571)
... end of run

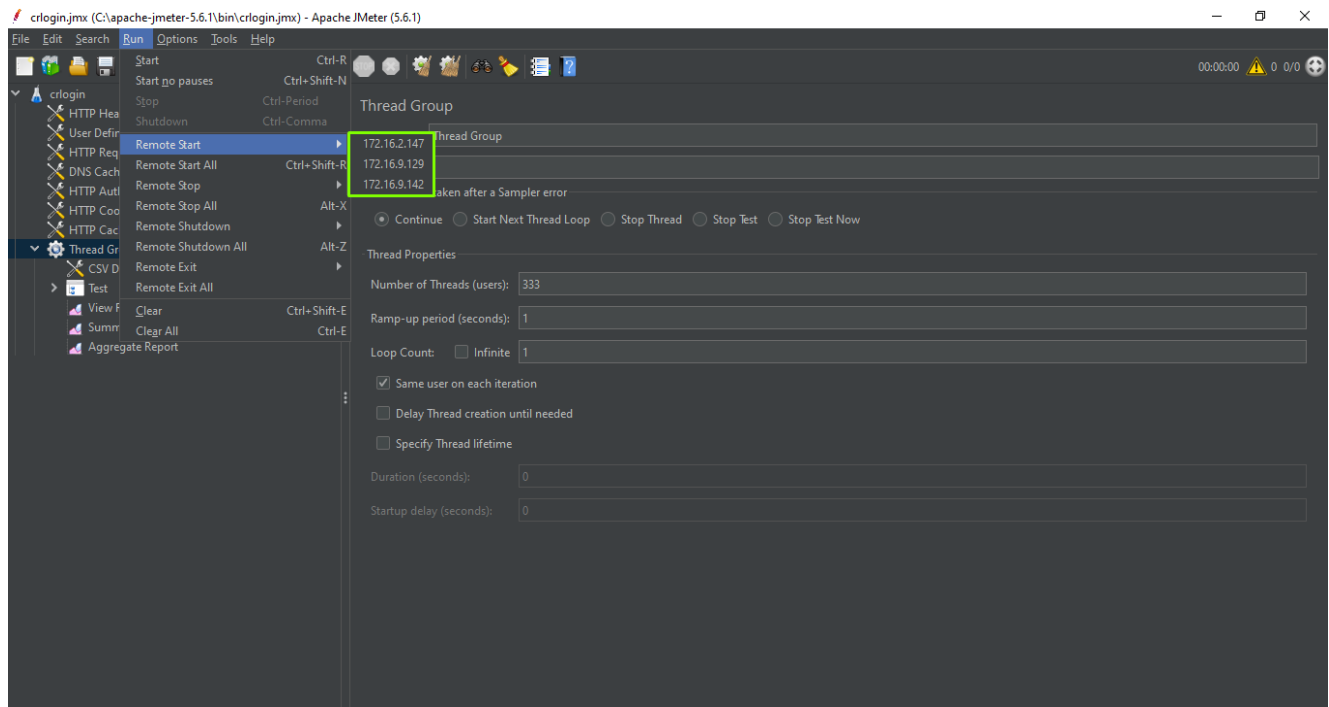
C:\apache-jmeter-5.6.1\bin>
```

```
C:\WINDOWS\system32\cmd.exe
Could not find ApacheJmeter_core.jar ...
... Trying JMeter_HOME=...
Found ApacheJMeter_core.jar
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
Using local port: 4000
Created remote object: UnicastServerRef2 [liveRef: [endpoint:[172.16.2.147:4000,SSLRMIServerSocketFactory(host=IT-Amin/172.16.2.147, keyStoreLocation=rmi_keystore.jks, type=JKS, trustStoreLocation=rmi_keystore.jks, type=JKS, alias=rmi)],SSLRMIClientSocketFactory(keyStoreLocation=rmi_keystore.jks, type=JKS, trustStoreLocation=rmi_keystore.jks, type=JKS, alias=rmi)](local,objID:[-403c66a5:18cf6c0e1c9:-7fff, -7205261932741071031]]]

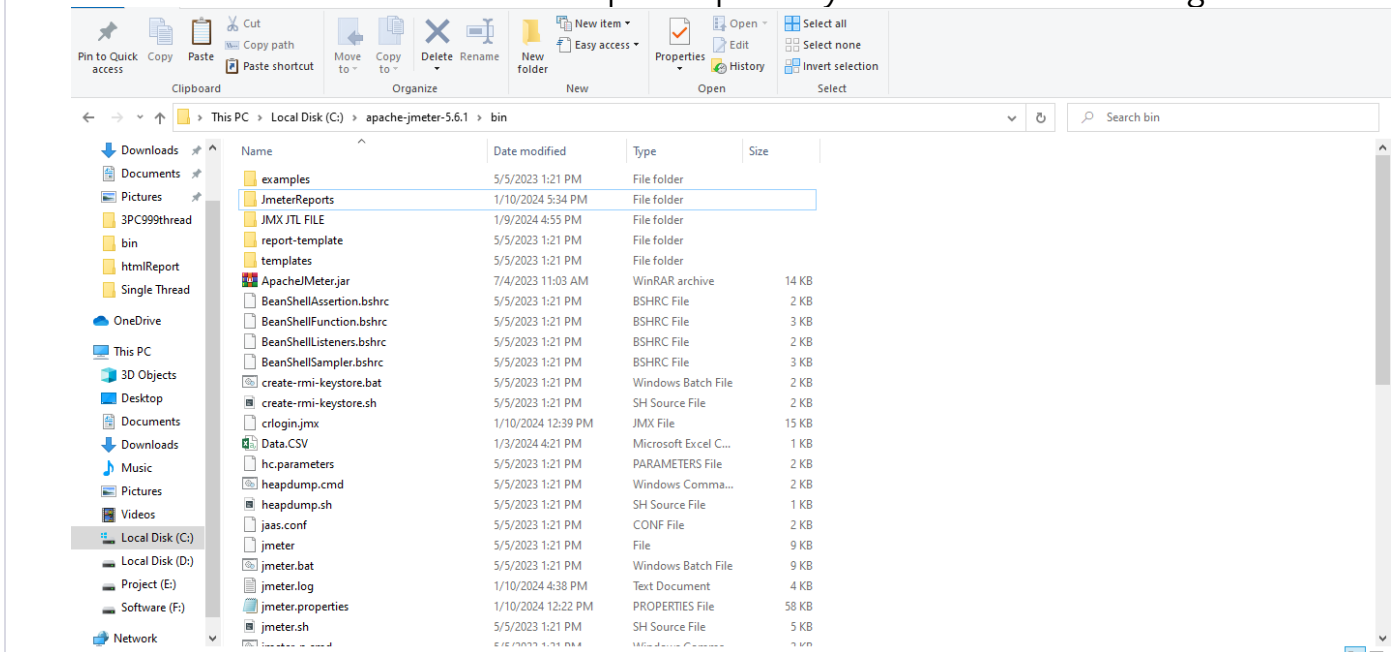
C:\Windows\system32\cmd.exe
Could not find ApacheJmeter_core.jar ...
... Trying JMeter_HOME=...
Found ApacheJMeter_core.jar
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
WARN StatusConsoleListener The use of package scanning to locate plugins is deprecated and will be removed in a future release
Using local port: 4000
Created remote object: UnicastServerRef2 [liveRef: [endpoint:[172.16.9.129:4000,SSLRMIServerSocketFactory(host=IT-Sabbir/172.16.9.129, keyStoreLocation=rmi_keystore.jks, type=JKS, trustStoreLocation=rmi_keystore.jks, type=JKS, alias=rmi)],SSLRMIClientSocketFactory(keyStoreLocation=rmi_keystore.jks, type=JKS, trustStoreLocation=rmi_keystore.jks, type=JKS, alias=rmi)](local,objID:[5d251b73:18cf2e510af:-7fff, -87332127273892368382]]]
```

We have used our master PC as a slave so the last IP address is our Master PCs IP address.

Now the given Screenshot represents that the Master PC Has 3 Slave PCs (Master PC also acting as a Slave PC).



3. After running the command, it will **generate a JmeterReports** in your bin folder. Which contains HTML and CSV Report separately. Like the Screenshots given below:



Pin to Quick access

Copy

Paste

Cut

Copy path

Paste shortcut

Move to

Copy to

Delete

Rename

New folder

New item

Easy access

Properties

Open

Edit

History

Select all

Select none

Invert selection

Clipboard

Organize

New

Open

Select

← → ↑ ↓

This PC > Local Disk (C:) > apache-jmeter-5.6.1 > bin > JmeterReports

Search JmeterReports

Downloads

Documents

Pictures

3PC999thread

bin

htmlReport

Single Thread

OneDrive

This PC

3D Objects

Desktop

Documents

Downloads

Music

Pictures

Videos

Local Disk (C:)

Local Disk (D:)

Project (E:)

Software (F:)

Network

Name	Date modified	Type	Size
htmlReport	1/10/2024 5:34 PM	File folder	
jmeter.log	1/9/2024 4:44 PM	Text Document	22 KB
TestReport.csv	1/9/2024 4:44 PM	Microsoft Excel C...	15 KB

3 items

Pin to Quick access

Copy

Paste

Cut

Copy path

Paste shortcut

Move to

Copy to

Delete

Rename

New folder

New item

Easy access

Properties

Open

Edit

History

Select all

Select none

Invert selection

Clipboard

Organize

New

Open

Select

← → ↑ ↓

This PC > Local Disk (C:) > apache-jmeter-5.6.1 > bin > JmeterReports > htmlReport

Search htmlReport

Downloads

Documents

Pictures

3PC999thread

bin

htmlReport

Single Thread

OneDrive

This PC

3D Objects

Desktop

Documents

Downloads

Music

Pictures

Videos

Local Disk (C:)

Local Disk (D:)

Project (E:)

Software (F:)

Network

Name	Date modified	Type	Size
content	1/10/2024 5:34 PM	File folder	
sbadmin2-1.0.7	1/10/2024 5:34 PM	File folder	
index.html	1/9/2024 4:44 PM	Microsoft Edge H...	10 KB
statistics.json	1/9/2024 4:44 PM	JSON Source File	2 KB

4 items