JMeter(Performace Testing) YouTube link: Link

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1. **What is JMeter? why it is Used? And features**

Ans: Jmeter is an open-source software that is designed to load test functional behavior and measure the performance of the application. Jmeter is platform-independent because it's a Java application.

Jmeter is used to analyze and measure the performance of the application. Jmeter is originally used for testing web Applications or FTP applications. But Nowadays it is used for functional tests, database service tests and API tests, etc.

Features:

- JMeter is a performance test application.
- JMeter is build using Java.
- JMeter is completely free and open source created by Apache.
- Support Recording.
- We can also use CLI command line option.
- We can view the Report.

2. **Jmeter Advantages:**
   - ✓ Open source license
   - ✓ Friendly GUI.
   - ✓ Platform Independent
   - ✓ Full multi-threading framework
   - ✓ Visualize Test Result
   - ✓ Easy Installation
   - ✓ Highly Extensible
   - ✓ Unlimited testing capability
   - ✓ Support multiple protocol

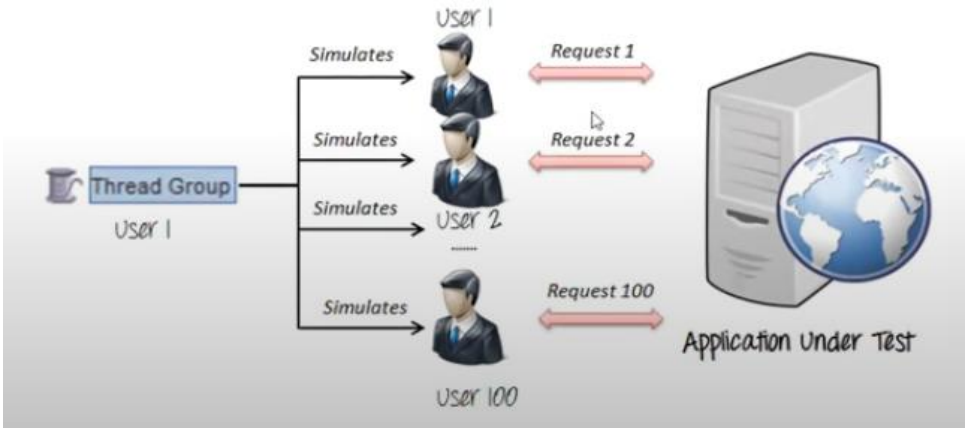
3. **What is elements in JMeter.**

The different components of Jmeter are called elements. Each elements are designed for a specific purpose.

4. **Some Elements of JMeter:**

- Thread Group:---- Thread Group is a collection of threads Every thread represent one user using the application under test.

  Example:



- Listener:---Listener shows the result of the test

  - Graph result listeners display the server response times on a Graph
  - View Result Tree show results of the user request in basic HTML format
  - Table Result show summary of a test result in table format
  - Log show summary of a test results in the text file

.

- Sampler:---Samplers are different types of requests sent by Thread Groups.

- Configuration:-- Used to set up defaults and variables.

5. Create First Test in JMeter.

Step-1: Start JMeter

Step-2: Create a TestPlan

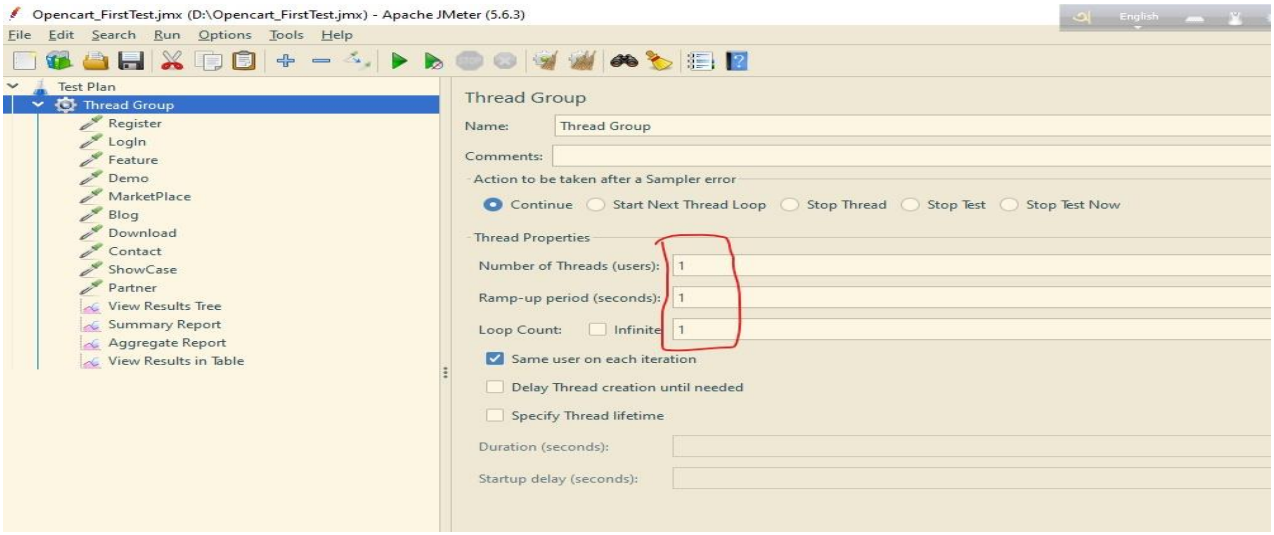
Step-3: Create a thread group(Users)

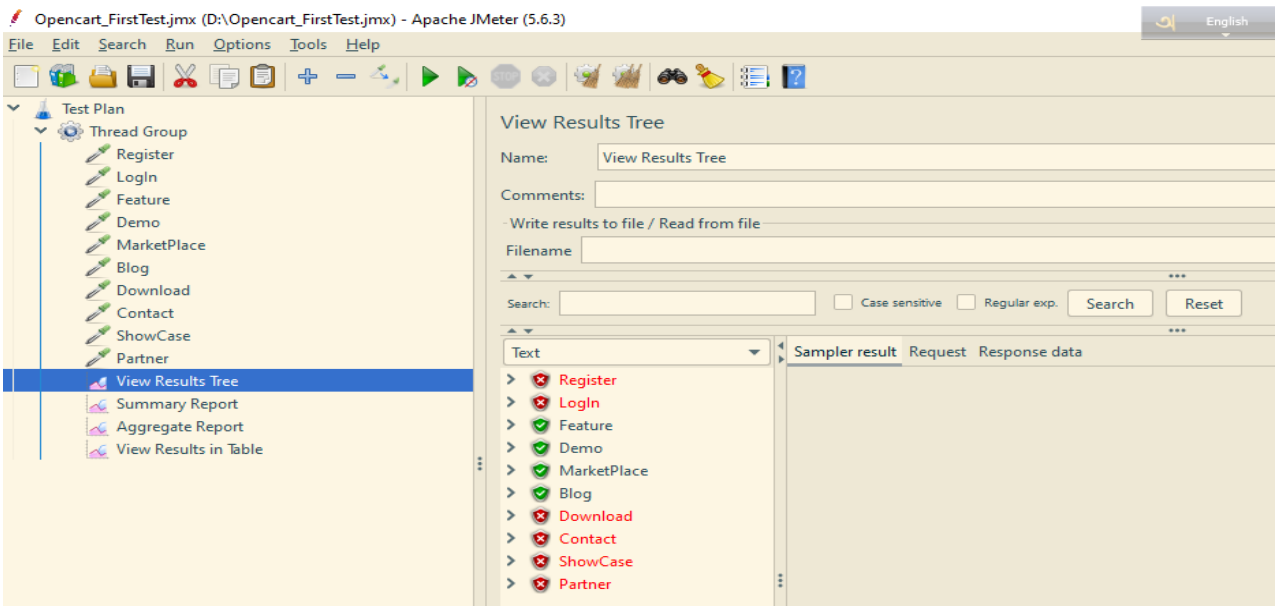
Step-4: Add a Sampler (HTTP)

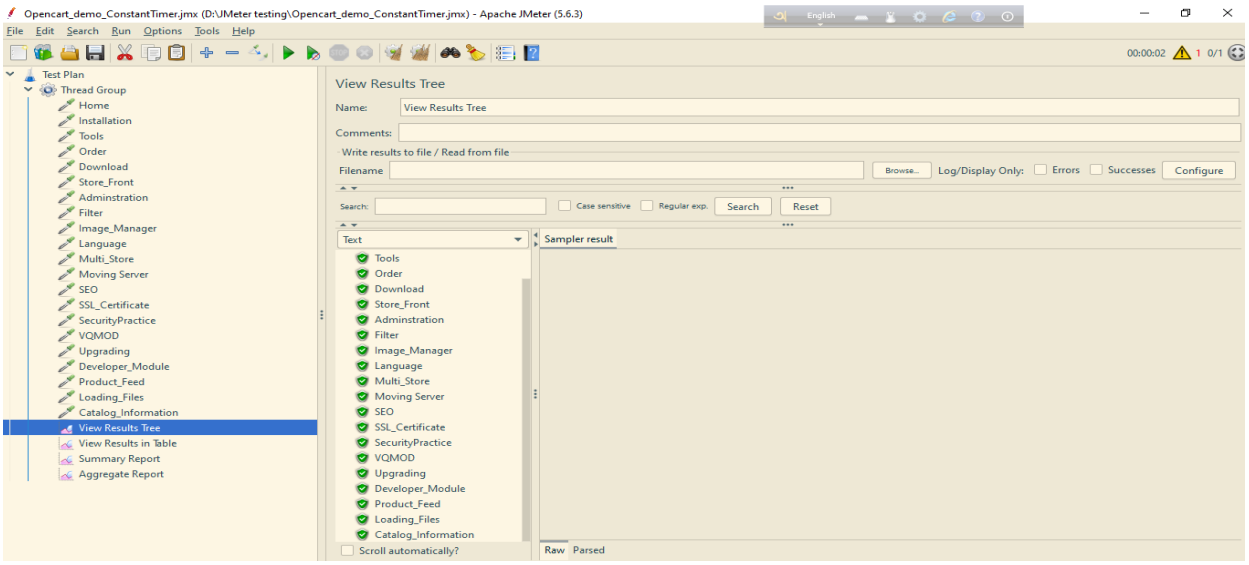
Step-5: Add Listeners

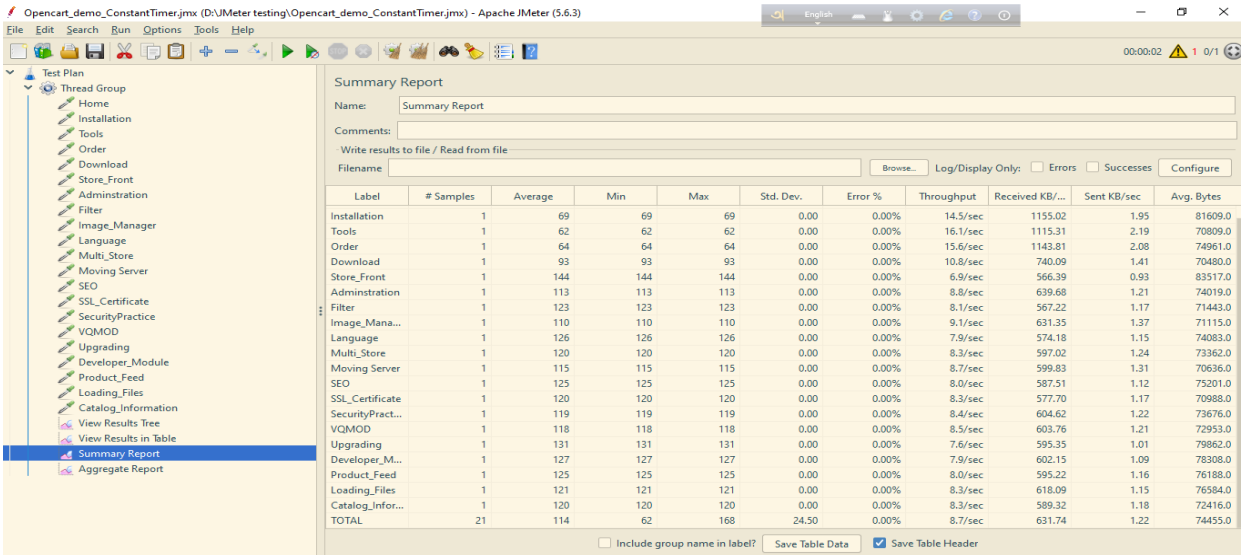
Step-6: Save Test Plan

Step-7: Run Test Plan

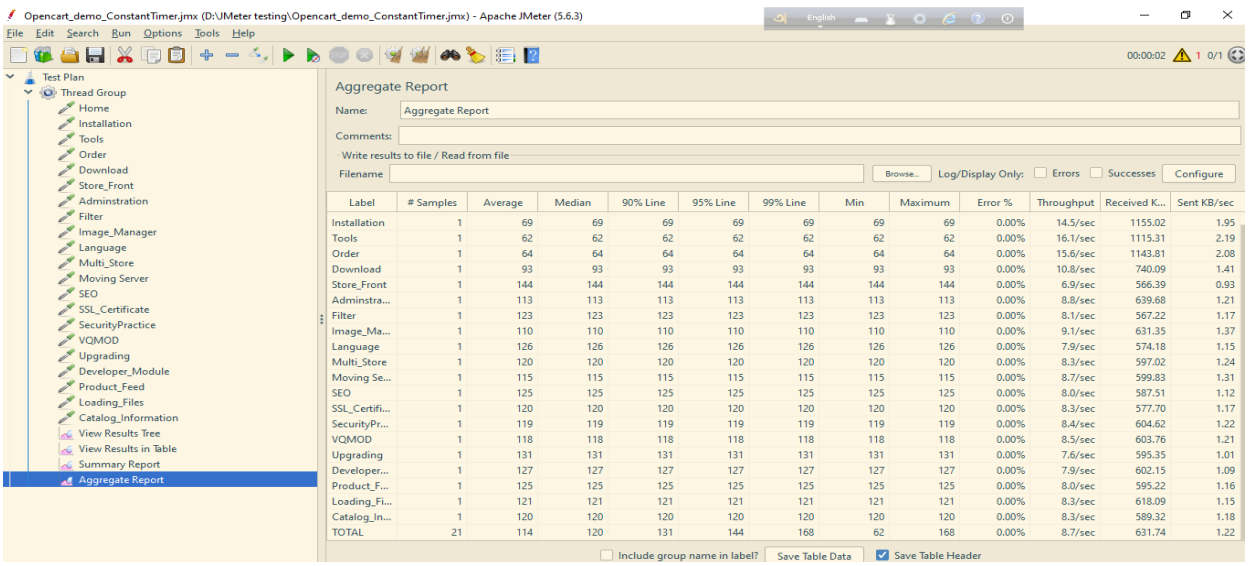








Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/...	Sent KB/sec	Avg. Bytes
Installation	1	69	69	69	0.00	0.00%	14.5/sec	1155.02	1.95	81609.0
Tools	1	62	62	62	0.00	0.00%	16.1/sec	1115.31	2.19	70809.0
Order	1	64	64	64	0.00	0.00%	15.6/sec	1143.81	2.08	74961.0
Download	1	93	93	93	0.00	0.00%	10.8/sec	740.09	1.41	70480.0
Store_Front	1	144	144	144	0.00	0.00%	6.9/sec	566.39	0.93	83517.0
Adminstration	1	113	113	113	0.00	0.00%	8.8/sec	639.68	1.21	74019.0
Filter	1	123	123	123	0.00	0.00%	8.1/sec	567.22	1.17	71443.0
Image_Mana...	1	110	110	110	0.00	0.00%	9.1/sec	631.35	1.37	71115.0
Language	1	126	126	126	0.00	0.00%	7.9/sec	574.18	1.15	74083.0
Multi_Store	1	120	120	120	0.00	0.00%	8.3/sec	597.02	1.24	73362.0
Moving Server	1	115	115	115	0.00	0.00%	8.7/sec	599.83	1.31	70636.0
SEO	1	125	125	125	0.00	0.00%	8.0/sec	587.51	1.12	75201.0
SSL_Certificate	1	120	120	120	0.00	0.00%	8.3/sec	577.70	1.17	70988.0
SecurityPract...	1	119	119	119	0.00	0.00%	8.4/sec	604.62	1.22	73676.0
VQMOD	1	118	118	118	0.00	0.00%	8.5/sec	603.76	1.21	72953.0
Upgrading	1	131	131	131	0.00	0.00%	7.6/sec	595.35	1.01	79862.0
Developer_M...	1	127	127	127	0.00	0.00%	7.9/sec	602.15	1.09	78308.0
Product_Feed	1	125	125	125	0.00	0.00%	8.0/sec	595.22	1.16	76188.0
Loading_Files	1	121	121	121	0.00	0.00%	8.3/sec	618.09	1.15	76584.0
Catalog_Infor...	1	120	120	120	0.00	0.00%	8.3/sec	589.32	1.18	72416.0
TOTAL	21	114	62	168	24.50	0.00%	8.7/sec	631.74	1.22	74455.0



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Installation	1	69	69	69	69	69	69	69	0.00%	14.5/sec	1155.02	1.95
Tools	1	62	62	62	62	62	62	62	0.00%	16.1/sec	1115.31	2.19
Order	1	64	64	64	64	64	64	64	0.00%	15.6/sec	1143.81	2.08
Download	1	93	93	93	93	93	93	93	0.00%	10.8/sec	740.09	1.41
Store_Front	1	144	144	144	144	144	144	144	0.00%	6.9/sec	566.39	0.93
Adminstra...	1	113	113	113	113	113	113	113	0.00%	8.8/sec	639.68	1.21
Filter	1	123	123	123	123	123	123	123	0.00%	8.1/sec	567.22	1.17
Image_Ma...	1	110	110	110	110	110	110	110	0.00%	9.1/sec	631.35	1.37
Language	1	126	126	126	126	126	126	126	0.00%	7.9/sec	574.18	1.15
Multi_Store	1	120	120	120	120	120	120	120	0.00%	8.3/sec	597.02	1.24
Moving Se...	1	115	115	115	115	115	115	115	0.00%	8.7/sec	599.83	1.31
SEO	1	125	125	125	125	125	125	125	0.00%	8.0/sec	587.51	1.12
SSL_Certifi...	1	120	120	120	120	120	120	120	0.00%	8.3/sec	577.70	1.17
SecurityPr...	1	119	119	119	119	119	119	119	0.00%	8.4/sec	604.62	1.22
VQMOD	1	118	118	118	118	118	118	118	0.00%	8.5/sec	603.76	1.21
Upgrading	1	131	131	131	131	131	131	131	0.00%	7.6/sec	595.35	1.01
Developer...	1	127	127	127	127	127	127	127	0.00%	7.9/sec	602.15	1.09
Product_F...	1	125	125	125	125	125	125	125	0.00%	8.0/sec	595.22	1.16
Loading_Fi...	1	121	121	121	121	121	121	121	0.00%	8.3/sec	618.09	1.15
Catalog_In...	1	120	120	120	120	120	120	120	0.00%	8.3/sec	589.32	1.18
TOTAL	21	114	120	131	144	168	62	168	0.00%	8.7/sec	631.74	1.22

6. Timer in JMeter and types of Timer:

JMeter sends requests without applying any delay between each sampler/request. If you perform load testing/stress testing on your server without any delay then it will be overloaded. As a result it won't be able to give you realistic results.

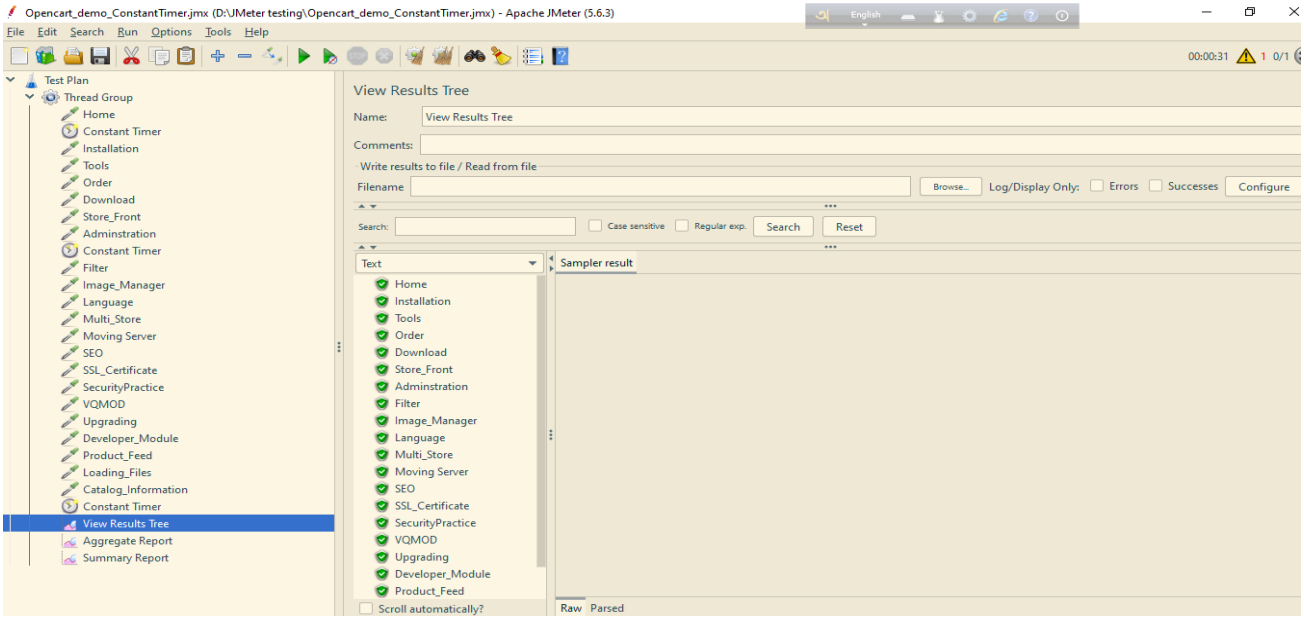
JMeter Timer is the solution for all of these problems.These timer elements can be added in a test plan.

Different types of JMeter Timers:

Constant timer : Constant timer is used to define the execution time of any request

Example: Added Constant timer 5000milisecond =5sec

Request1 executed------5sc-------- Request2 execute-------5sec- -------Request3 executed



Picture: Constant Timer

Uniform Random timer

And More

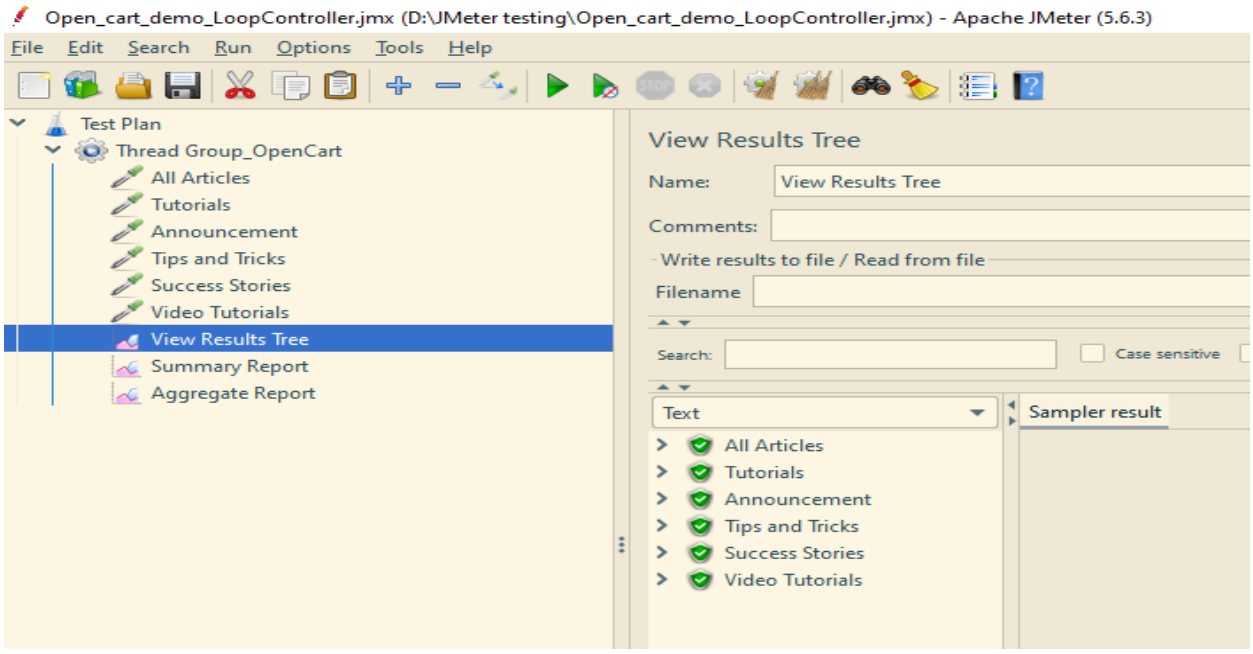
7. Controllers in JMeter

Controllers in JMeter

- **Logic Controller** let you handle the order of processing Samplers/Requests in a Thread.
- Logic Controllers will decide "When & How" to send a request to a web server.
- JMeter provides several Logic Controller, which are as follows:
  - Critical Section Controller
  - ForEach Controller
  - If Controller
  - Include Controller
  - Interleave Controller
  - Loop Controller
  - Module controller
  - Once Only Controller
  - Random Controller
  - Random Order Controller
  - Recording Controller
  - Runtime Controller
  - Simple Controller
  - Switch Controller
  - Throughput Controller
  - Transaction Controller
  - While Controller

8. **Loop Controller**: Loop Controllers makes the user request run a specific number of time or run forever.

Task of Loop Controller: Execute a specific request multiple times



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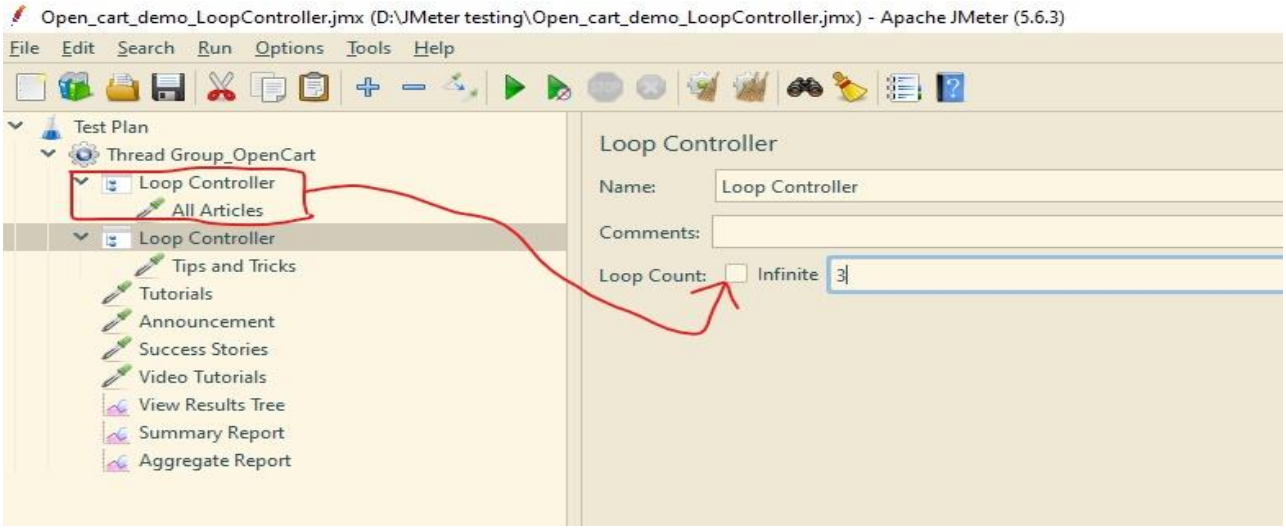
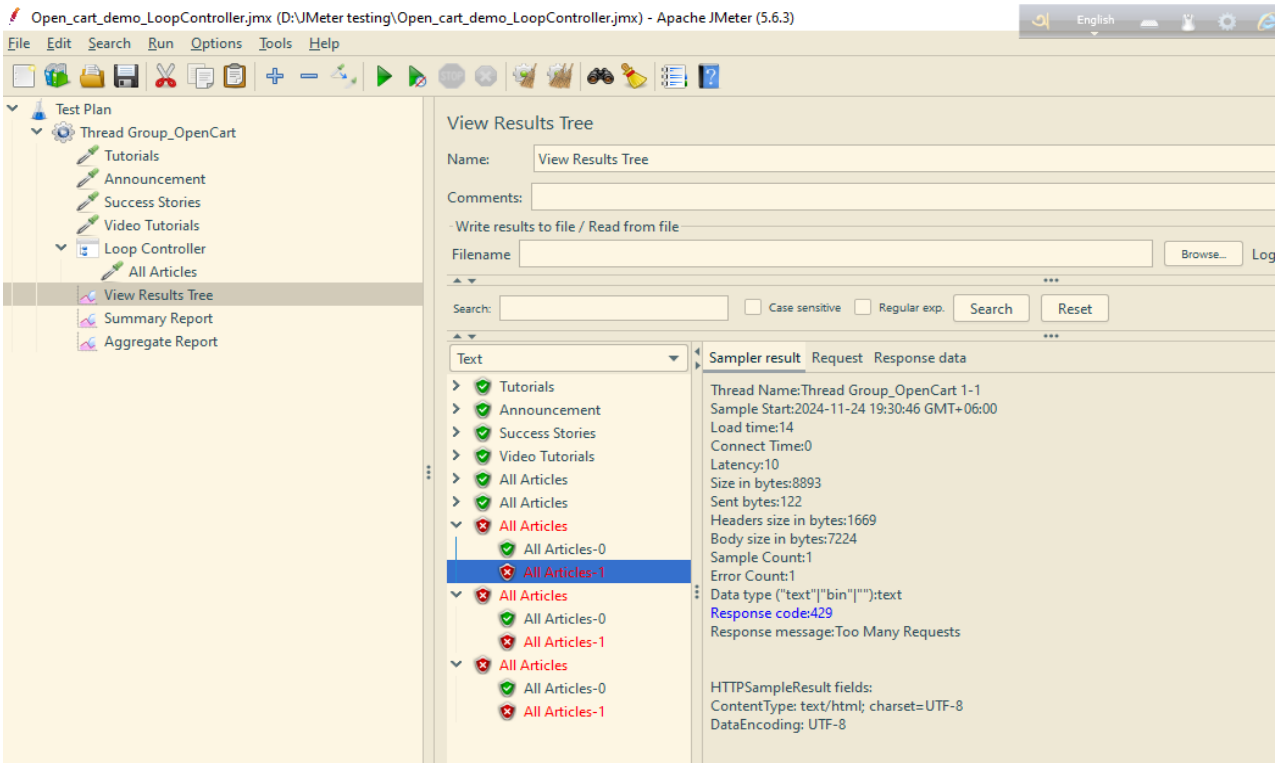
All Articles	1	1994	1994	1994	1994	1994	1994	1994	0.00%	30.1/min	16.82	0.12
Tutorials	1	1135	1135	1135	1135	1135	1135	1135	0.00%	52.9/min	30.30	0.25
Announce...	1	1388	1388	1388	1388	1388	1388	1388	0.00%	43.2/min	23.81	0.20
Tips and Tr...	1	1251	1251	1251	1251	1251	1251	1251	0.00%	48.0/min	26.54	0.22
Success St...	1	876	876	876	876	876	876	876	0.00%	1.1/sec	26.57	0.32
Video Tuto...	1	1205	1205	1205	1205	1205	1205	1205	0.00%	49.8/min	26.59	0.23
TOTAL	6	1308	1205	1388	1994	1994	876	1994	0.00%	45.9/min	24.14	0.21

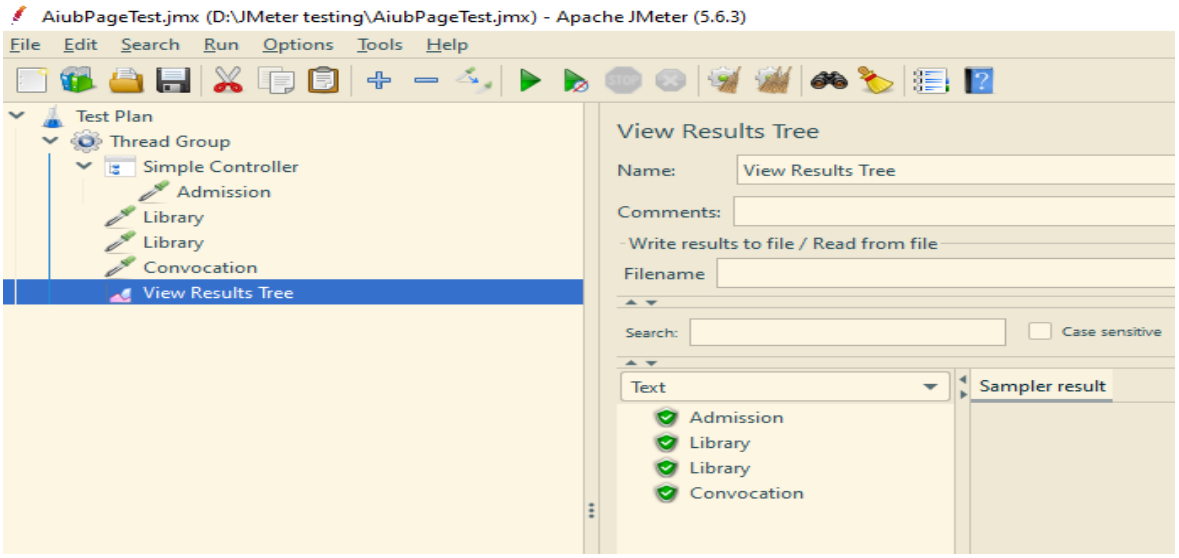
Loop Controller Image below:





Simple Controller: A simple controller is just like a container which have one or more request.

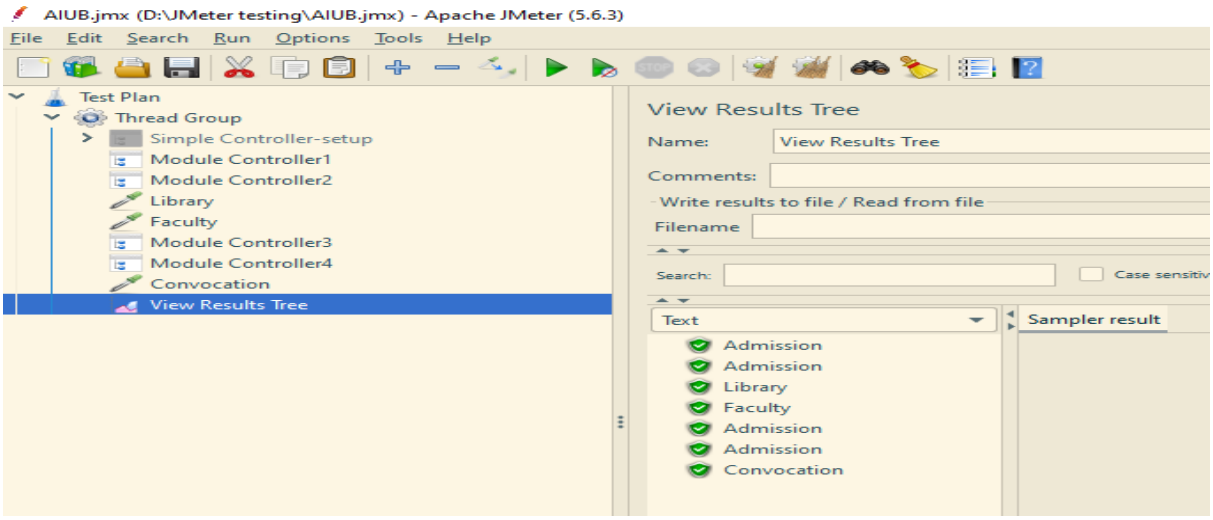
Picture: Simple Controller



Modular Controller: A modular controller is a type of controller that will call another controller through this controller

.Note: For executing a request multiple times sequentially, we need to use Modular Controller. (Simple controller must be Disabled)

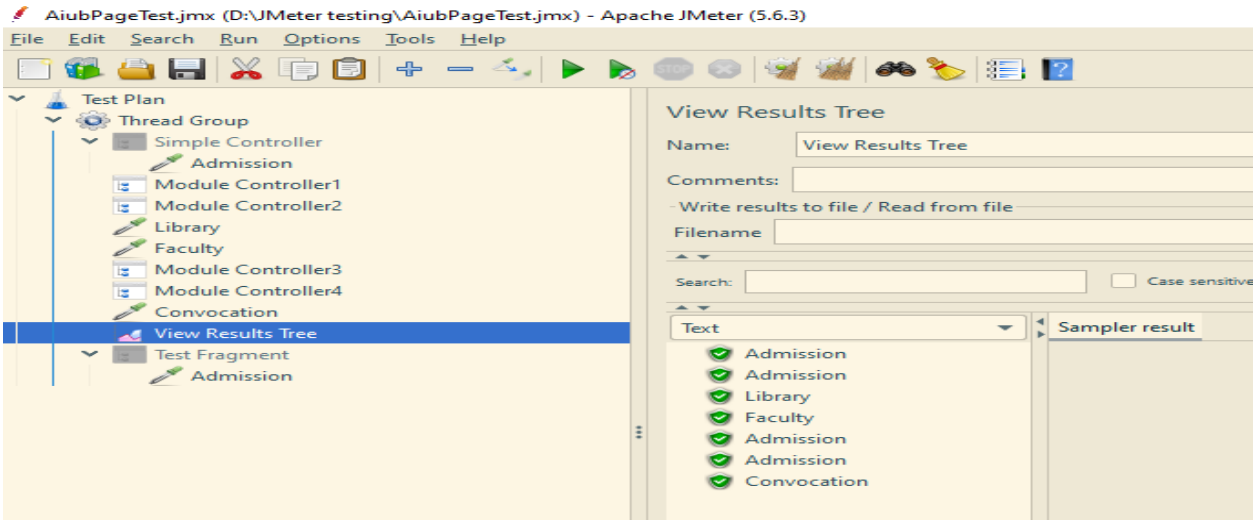
Picture: Modular Controller



Test Fragment: Test Fragment is an alternative of a simple controller. It's not a controller, it's like a folder.

Note: In modular controller , we will select Test Fragment and Test Frament and simple controller must be disabled.

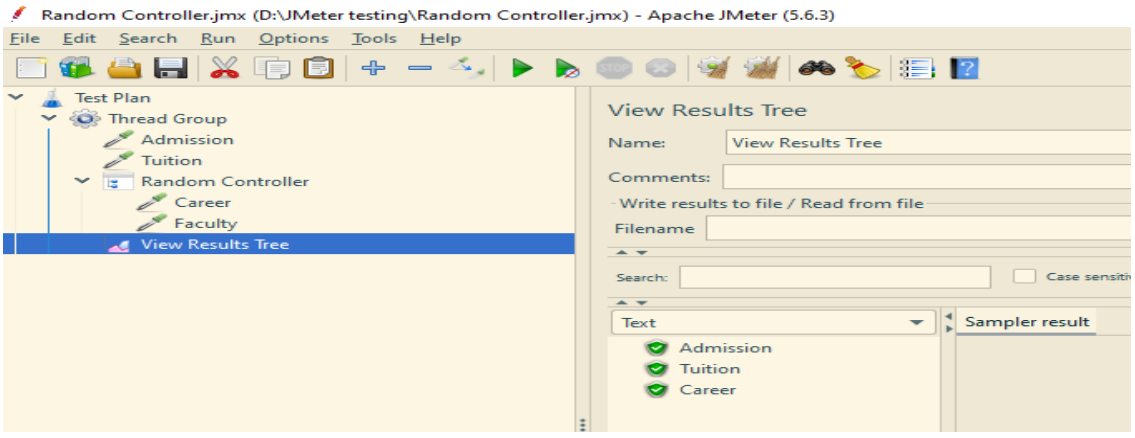
Picture: Test Fragment



Include Controller: Include Controller works like Modular controller. Way to complete Include Controller: First Save the 'Admission' from test fragment with a folder name.Then disable All modular controller and create Include controller for every modular controllers and put that Include controller under the modular controller.

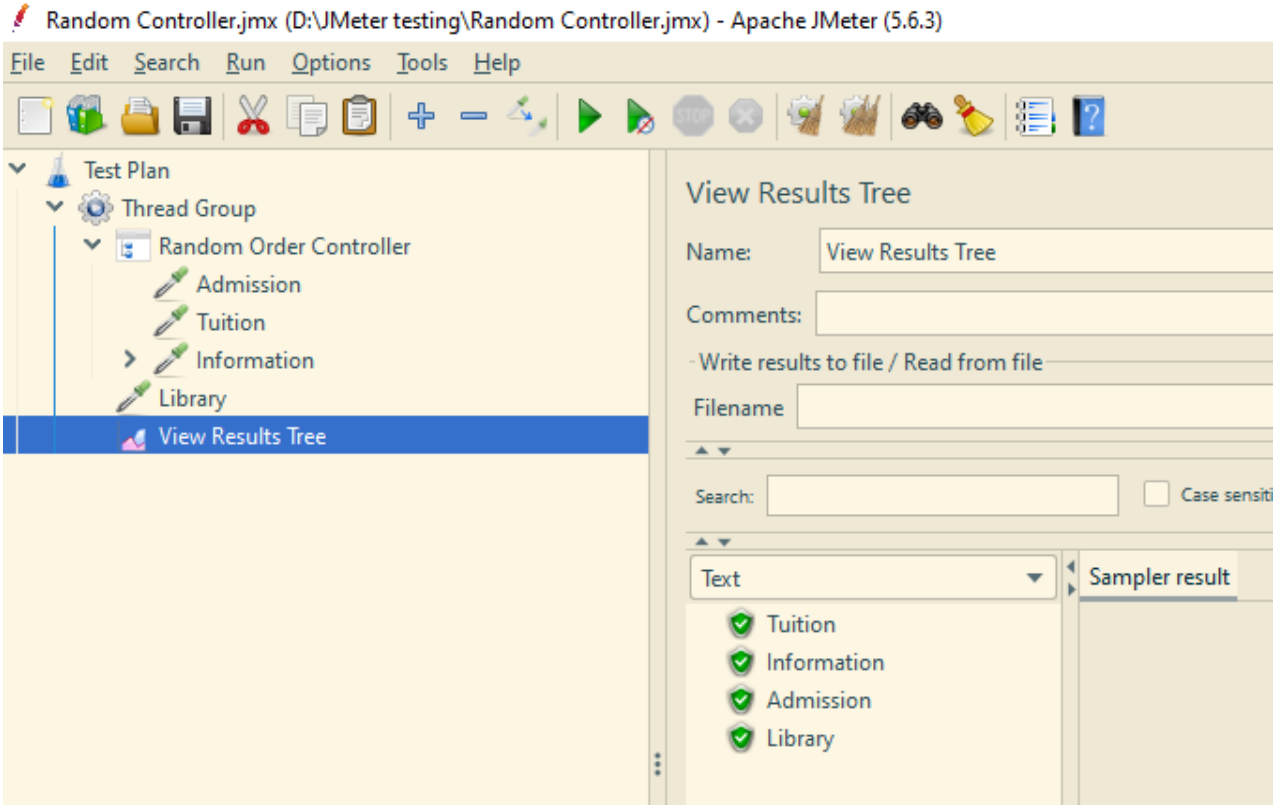
Random Controller: In Random Controller, you will have multiple request. But it will execute only one request at a time which will be included in the Random controller container.

Picture: Random Controller



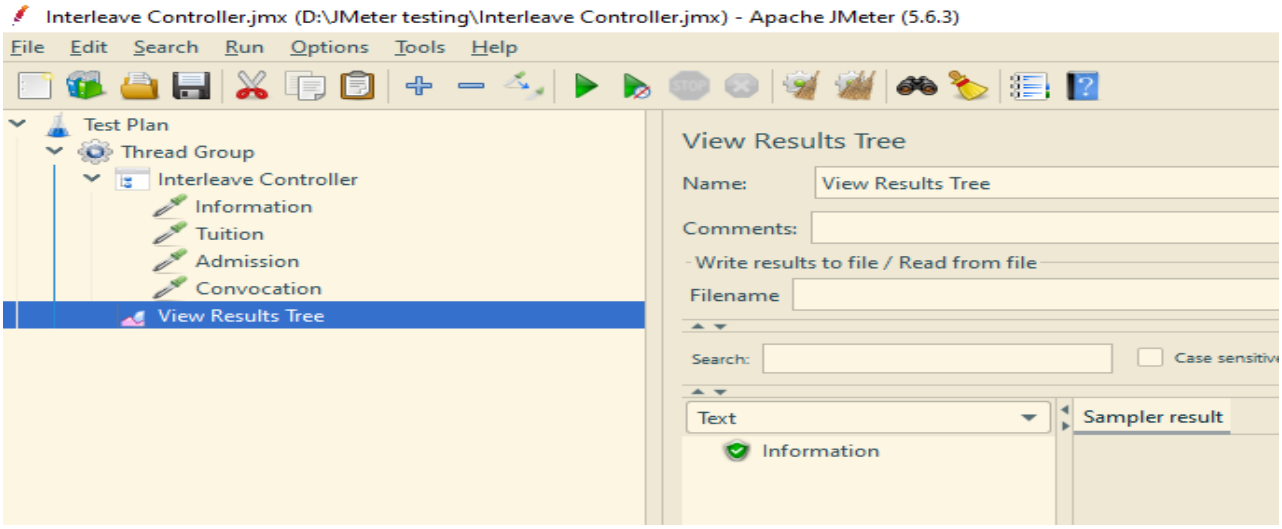
Random order controller: In Random order controller, you will have multiple requests. And all the requests will be executed at a time in a Random basis.

Picture: Random Order Controller



Interleave Controller: The Interleave controller will execute only one request at a time in sequential order.

Picture: Interleave Controller.



Distributed load: Distributing a workload across multiple machines or nodes.

10 users(Threads group) ----4 Request-----

HTTP Request-1 = Information ----3 users' word load

HTTP Requst-2 = Tuition -------2 users' word load

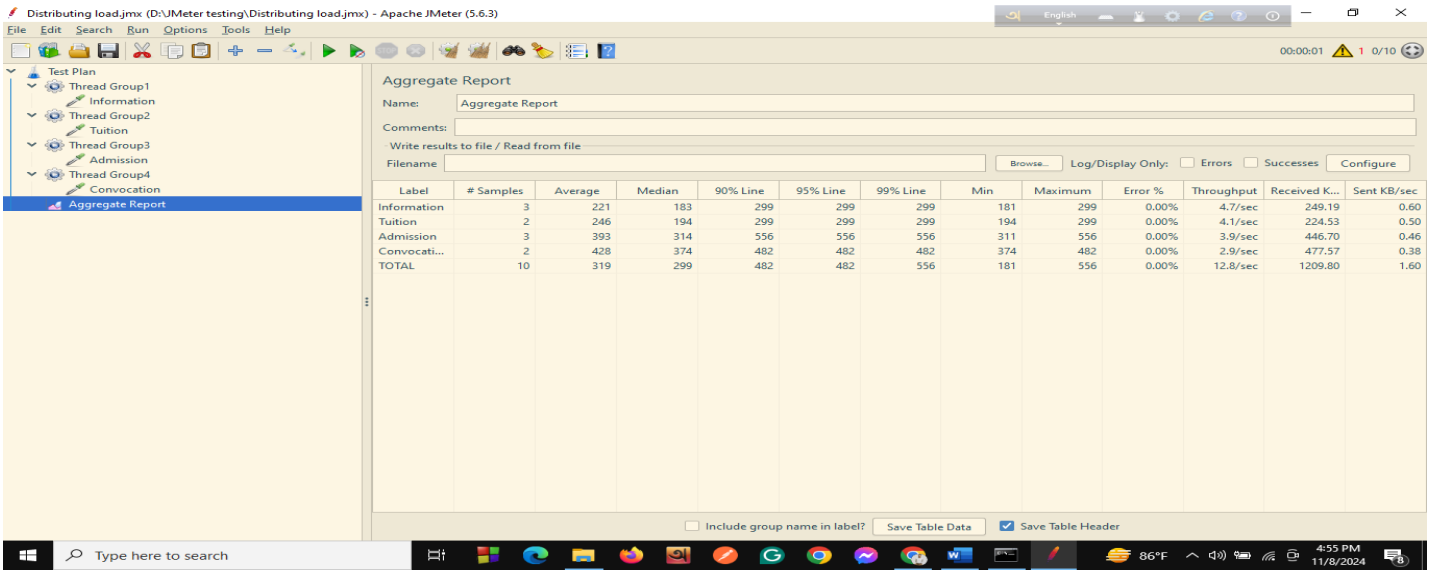
HTTP Request-3 = Admission ----3 users' word load

HTTP Request-4 = Convocation ----2 users' word load.

Task: I want to distribute work load across the 4 pages.

Drawbacks of Distributing load to perform load testing of a Website:

We need to create multiple thread groups for each page to distribute the workload. In a real project, there will be more than a thousand of users to distribute the workload. That will be time-consuming and tough to do create thousands of thread groups. That is why we used a Throughput Controller to minimize the time and work pressure



Picture : Distributing load

.**Throughput Controller**: The throughput controller is used to distribute the load among every thread group.

http request-1-----Information---(20%)

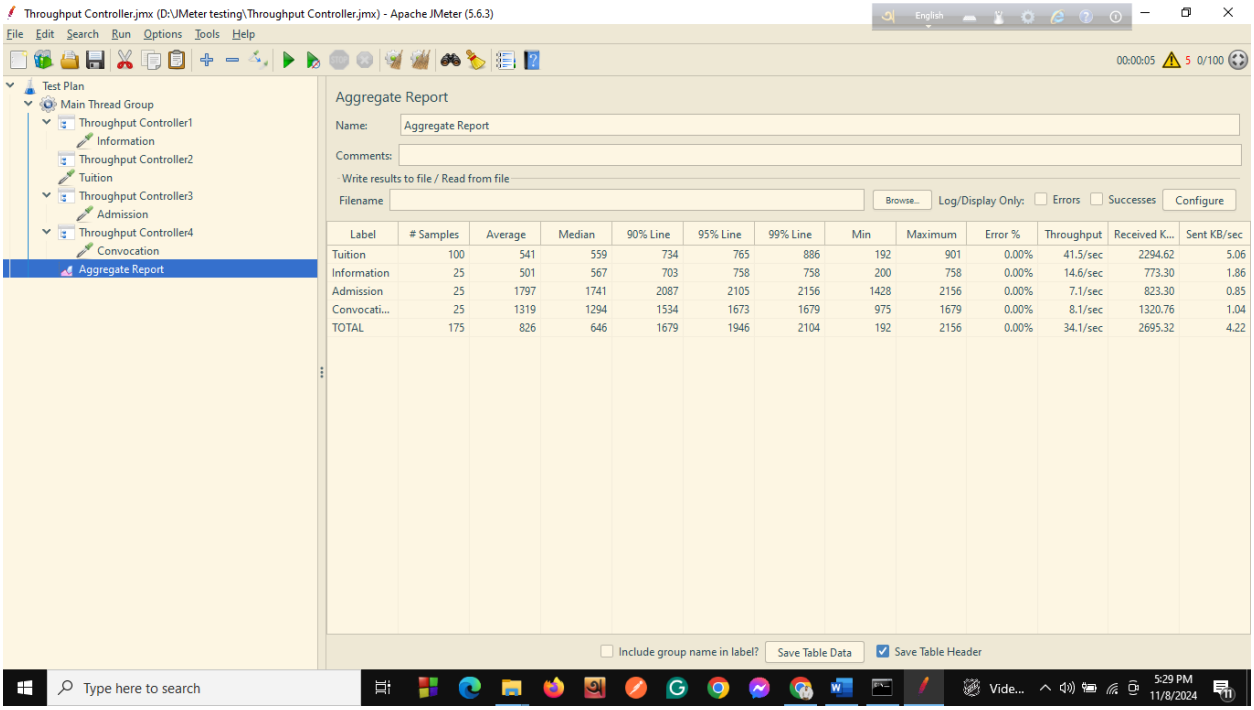
http request-2----Tuition-----(15%)

http request-3----Admission—(45%)

http request-4----Convocation---(20%)

Task :

Procedure: First we neet to create a thread group and named it as “Main thread Group”.Under Main thread groups we will create multiple Throughput Controller for each of the Pages. Then we will distribute 100 users among this 4 pages.



Picture: Throughput controller

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How to create first Jmeter Test

1 Start JMeter

2 Create a TestPlan

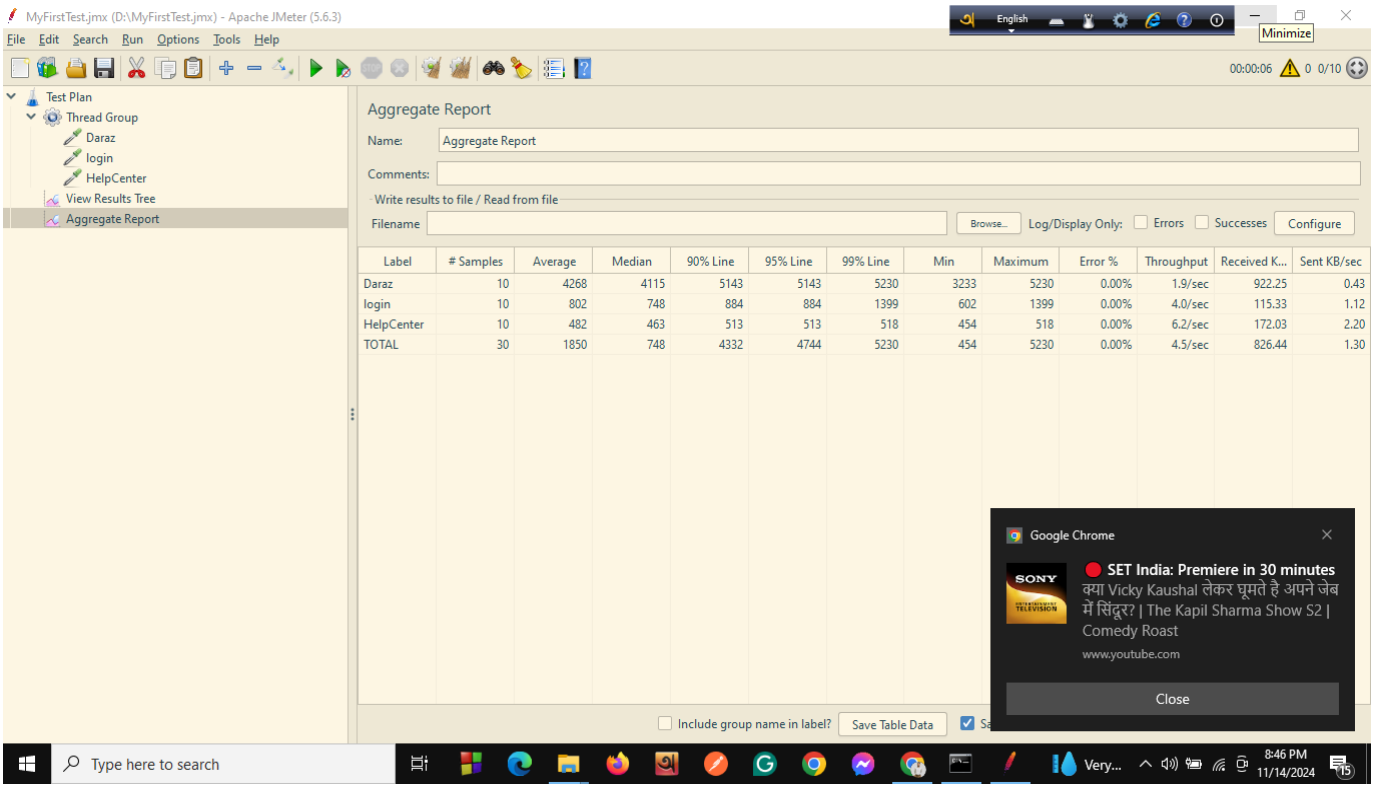
3 Create a Thread Group (Users)

4 Add a Sampler (Http)

5 Add Listeners

6 Run the Test

Photo: 1st Test



Listener in JMeter:

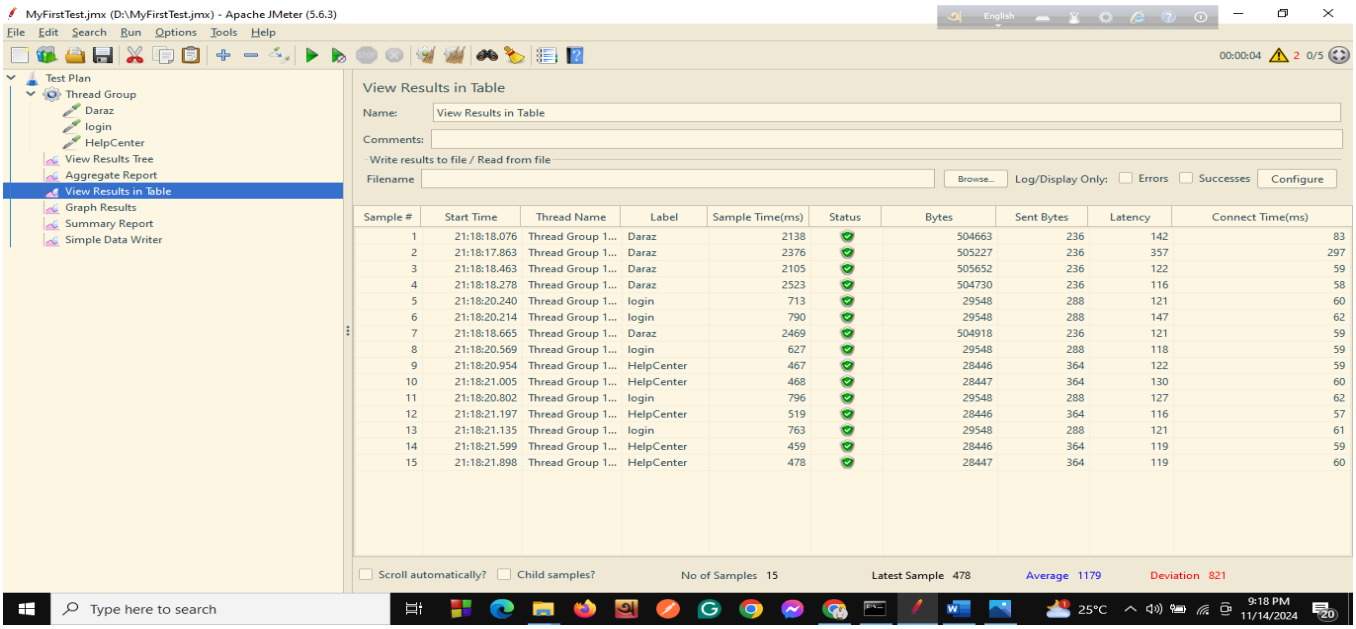
JMeter Listeners (Reporting) Used for Reporting

listener = elements that gather information about the performance test used to view results/metrics of the test

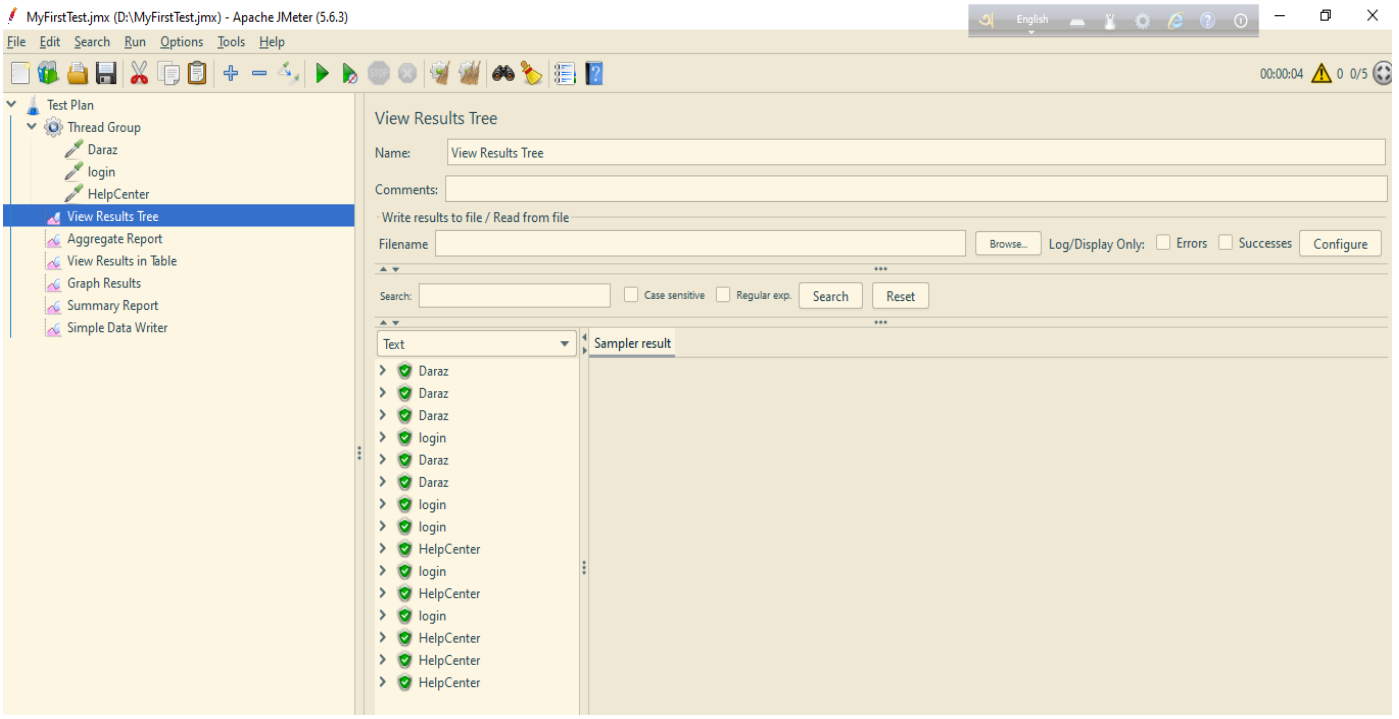
Latency = time to first byte

0ms————————1000ms————————2000ms 0ms ———————————————— 2000 ms

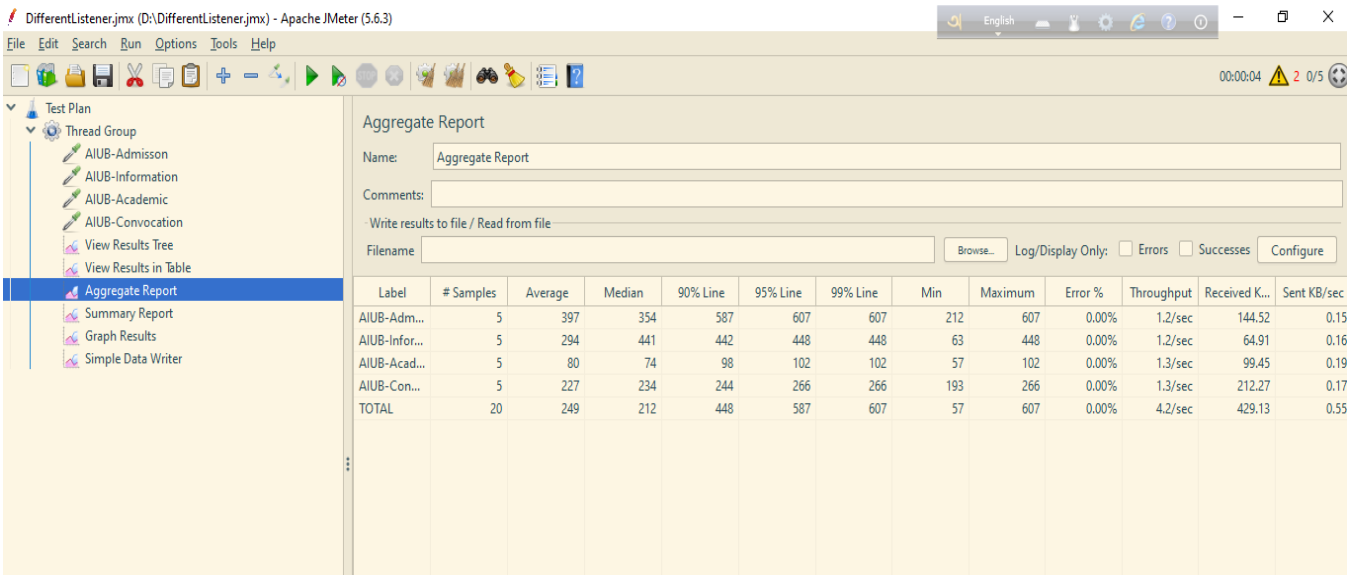
1 View Results in Table :



2 View Results Tree:

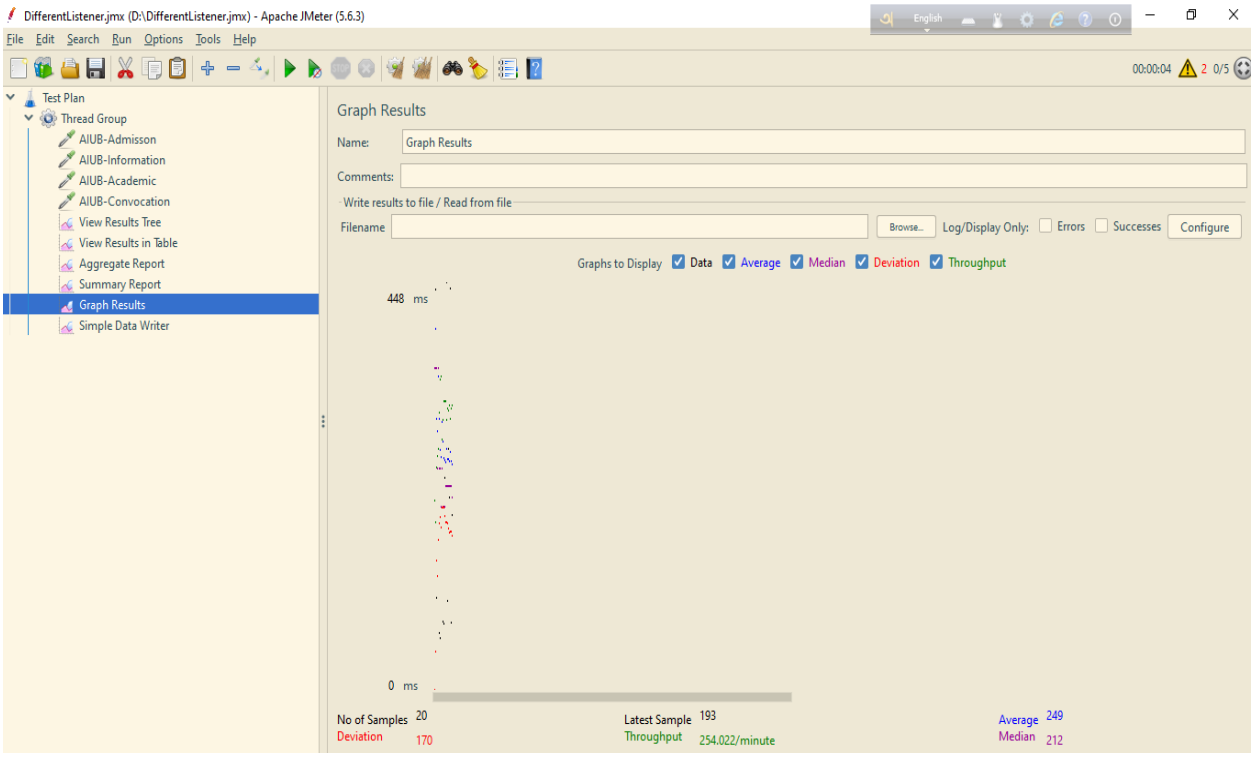


3 Aggregate Report :

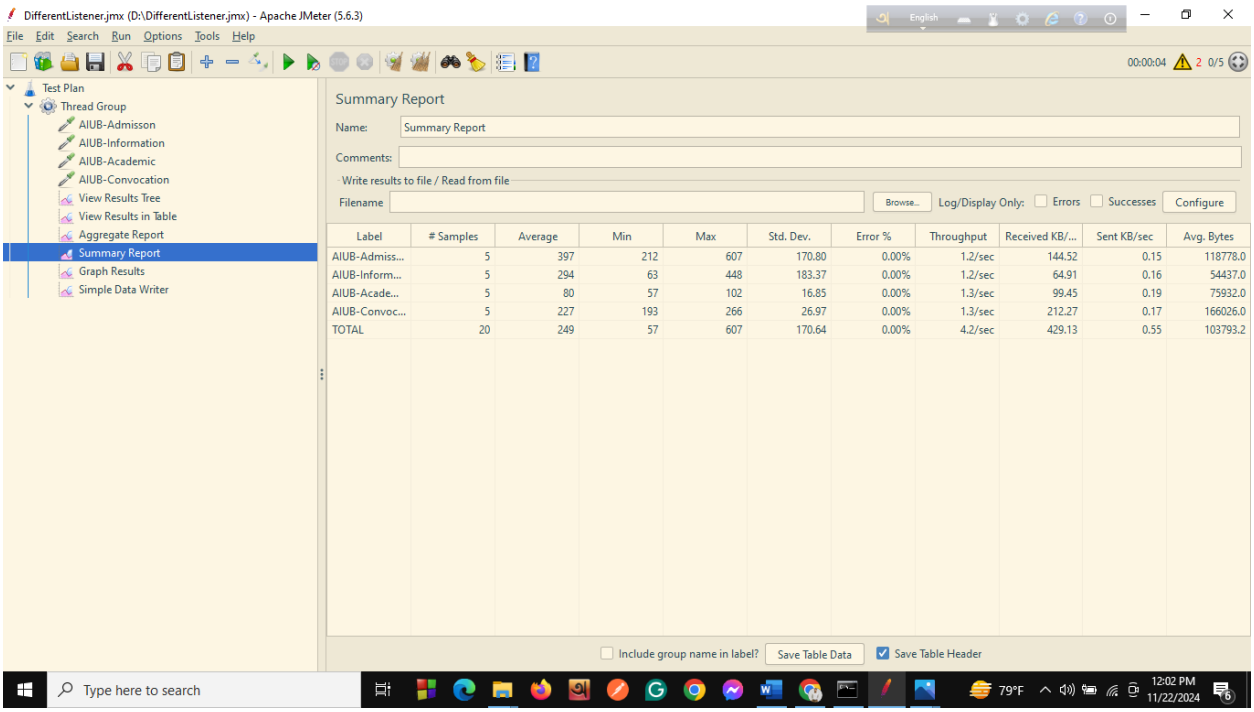


Label	# Samples	Average	Median	90% Line	95% Line	99% Line	Min	Maximum	Error %	Throughput	Received K...	Sent KB/sec
AIUB-Adm...	5	397	354	587	607	607	212	607	0.00%	1.2/sec	144.52	0.15
AIUB-Infor...	5	294	441	442	448	448	63	448	0.00%	1.2/sec	64.91	0.16
AIUB-Acad...	5	80	74	98	102	102	57	102	0.00%	1.3/sec	99.45	0.19
AIUB-Con...	5	227	234	244	266	266	193	266	0.00%	1.3/sec	212.27	0.17
TOTAL	20	249	212	448	587	607	57	607	0.00%	4.2/sec	429.13	0.55

4 Graph Results:



5 Summary Report



6 Simple Data Writer:

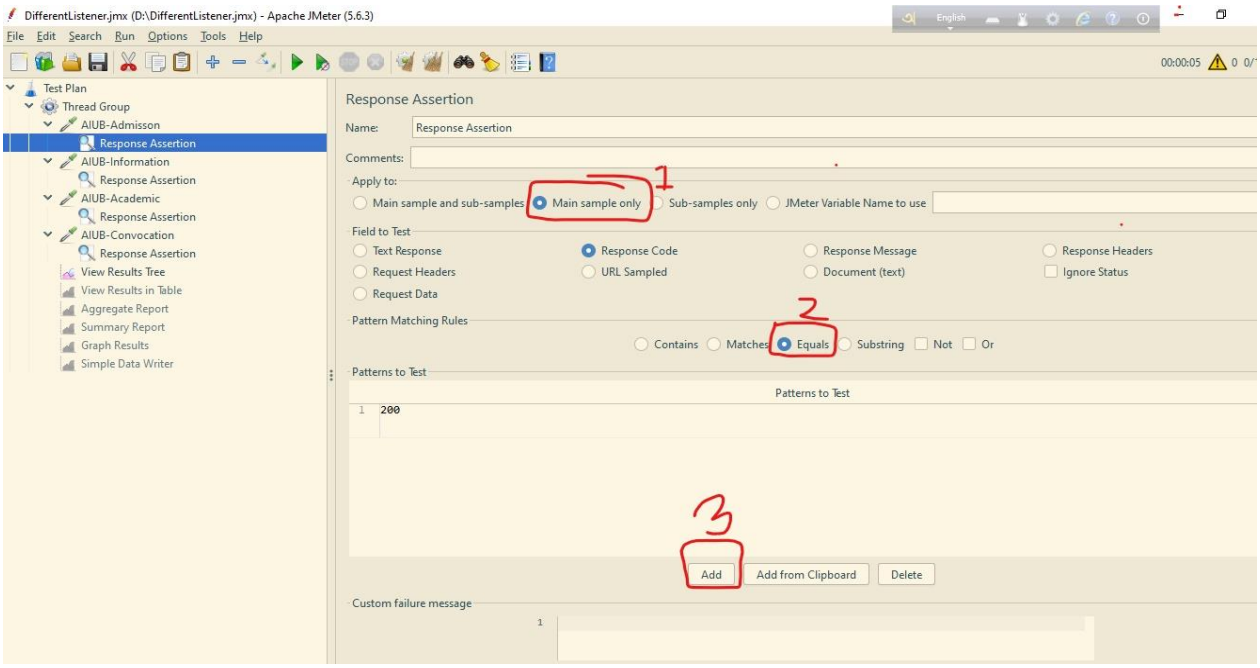
Difference between Clear All and Clear:

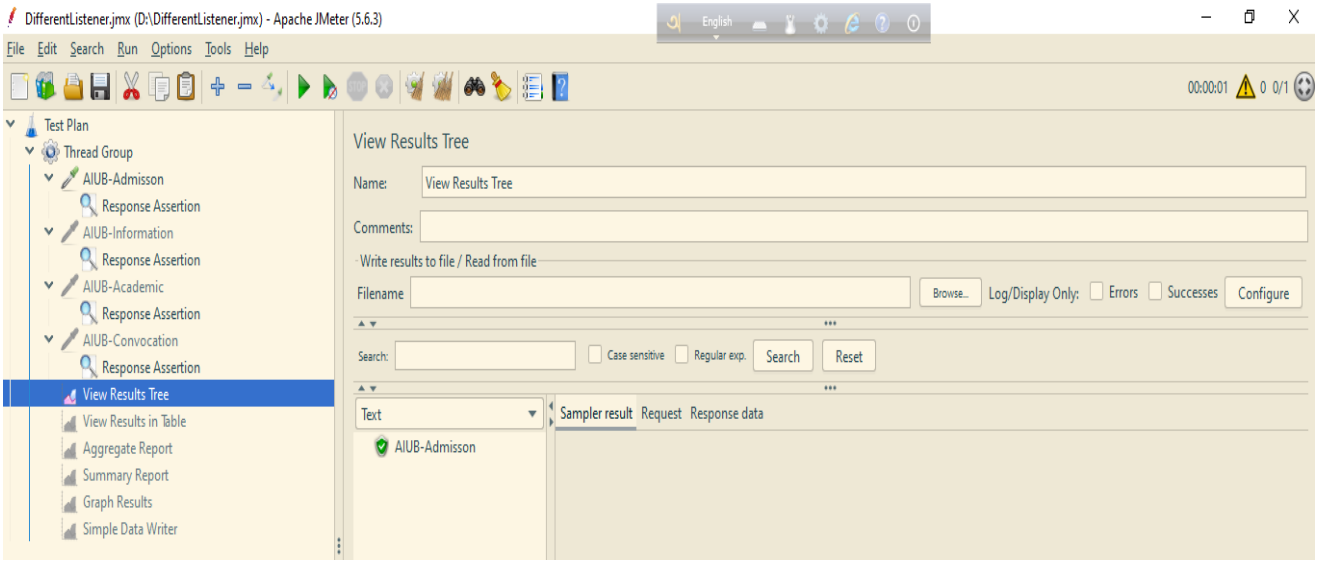
Clear: Clear will only clean the result from the selected Listener.

Clear All: Clear All will clean all the listeners that you have added.

Assertions Assertions = checks on the Request/Response

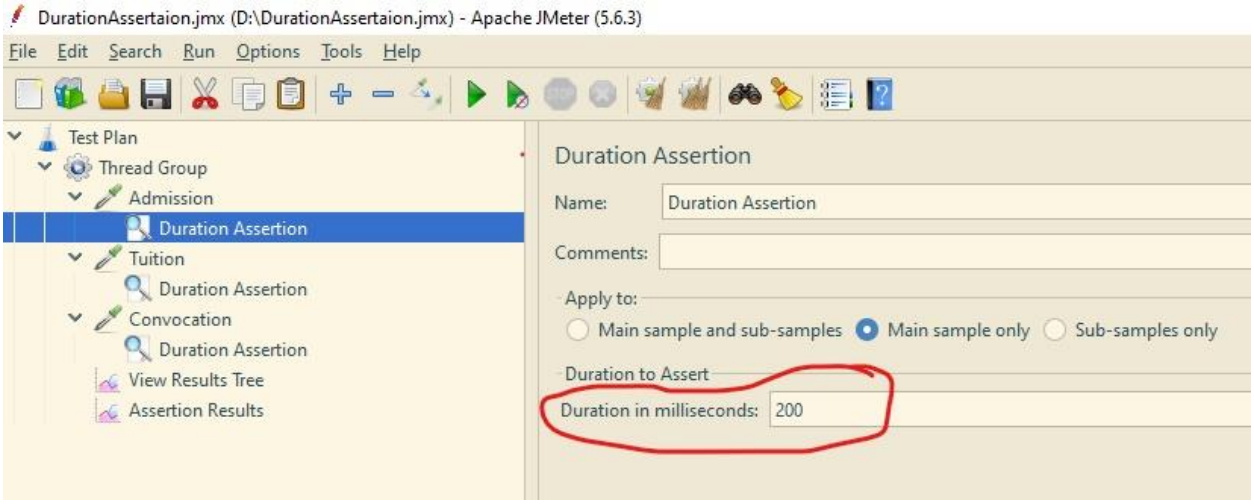
1 **Response Assertion :** (Response code 200.) Note: Use Assertion Result



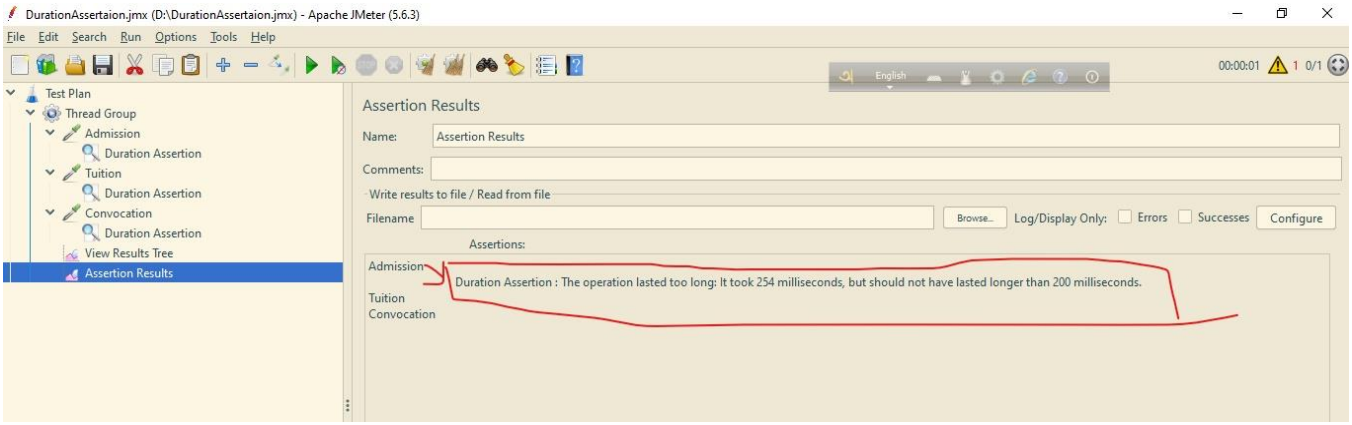


2 **Duration Assertion:** We can give the duration in milliseconds in Duration assertion, if any sampler takes more than the given time that is a failure

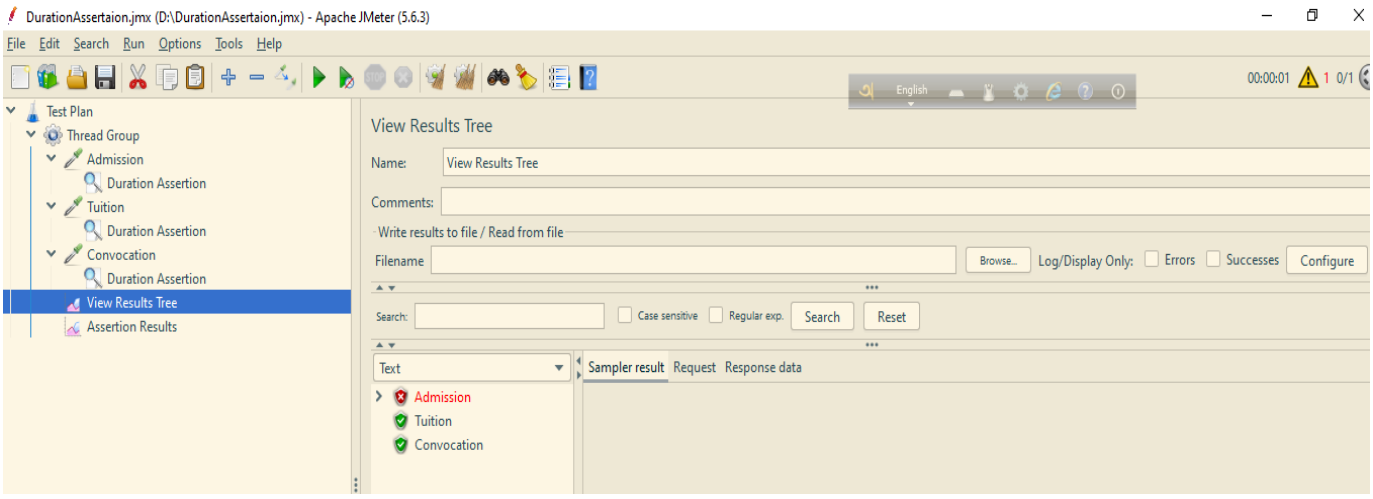
Picture-1



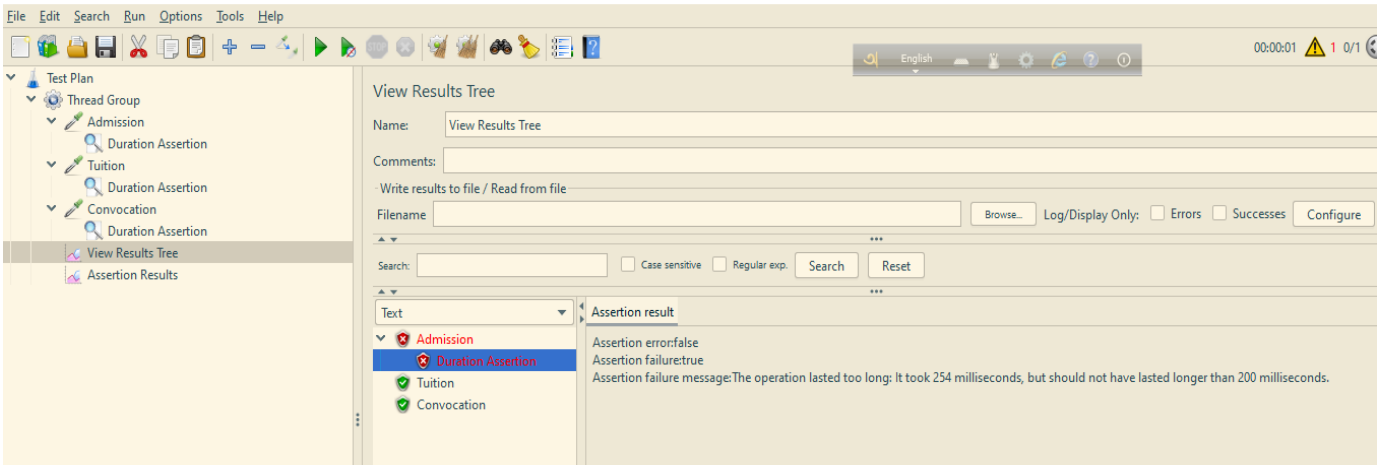
Picture-2:



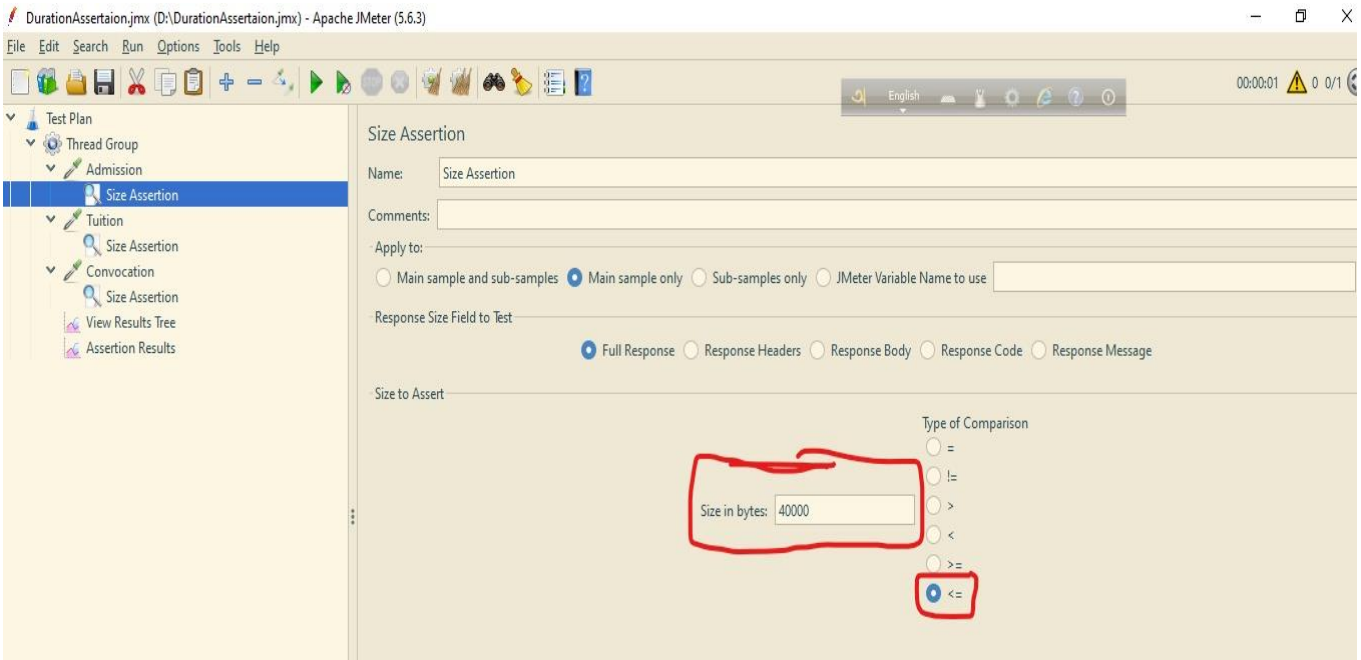
Picture-3:

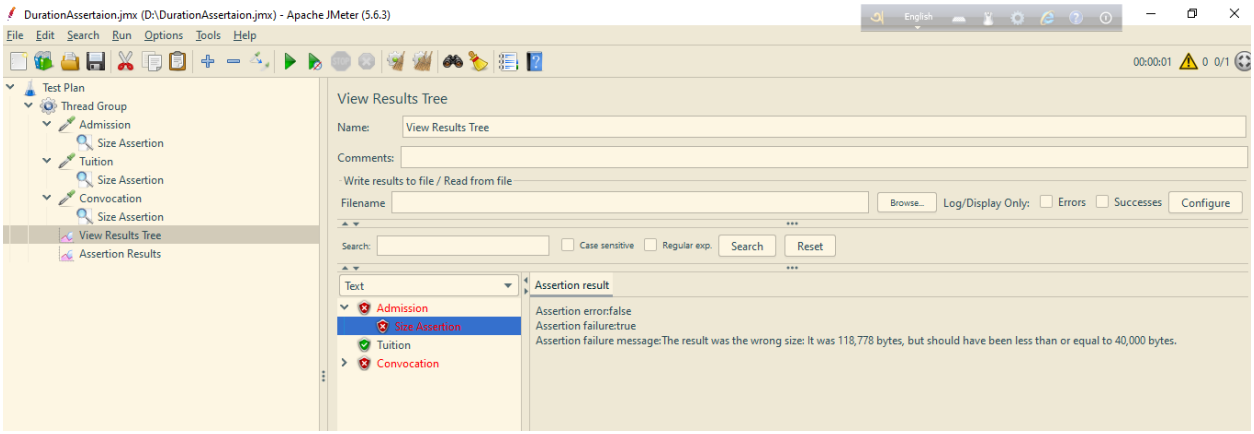


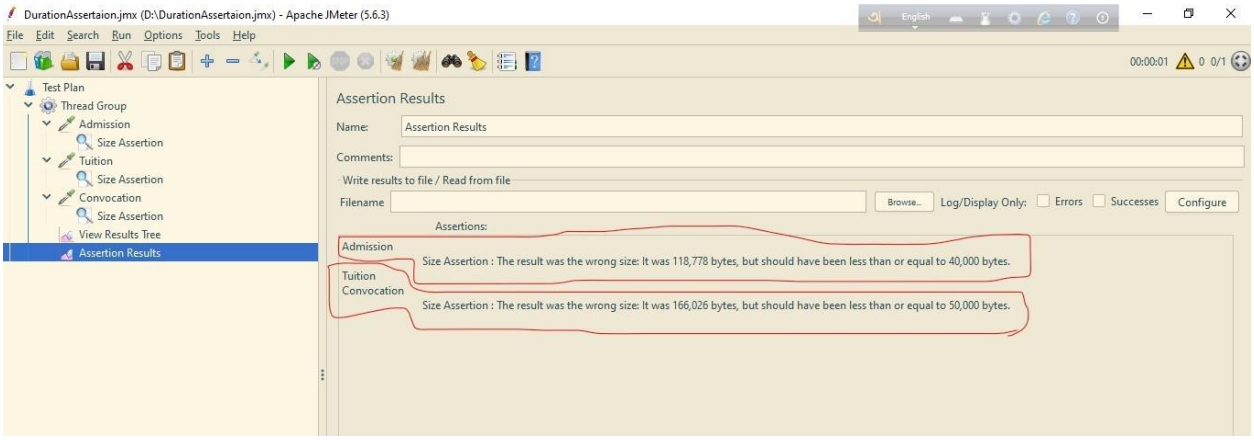
Picture-4



3 **Size Assertion**: In size assertion we can give the size in bytes of a sample,if the size doesn't match than there will be an error.







4 HTML Assertion

5 XML JSON Assertion

6 XPATH Assertion

How to get data from CSV File

JMeter (Config elements)-

How to get data from CSV File Config Element

- CSV Data Set Config

1 Add CSV Data Set Config

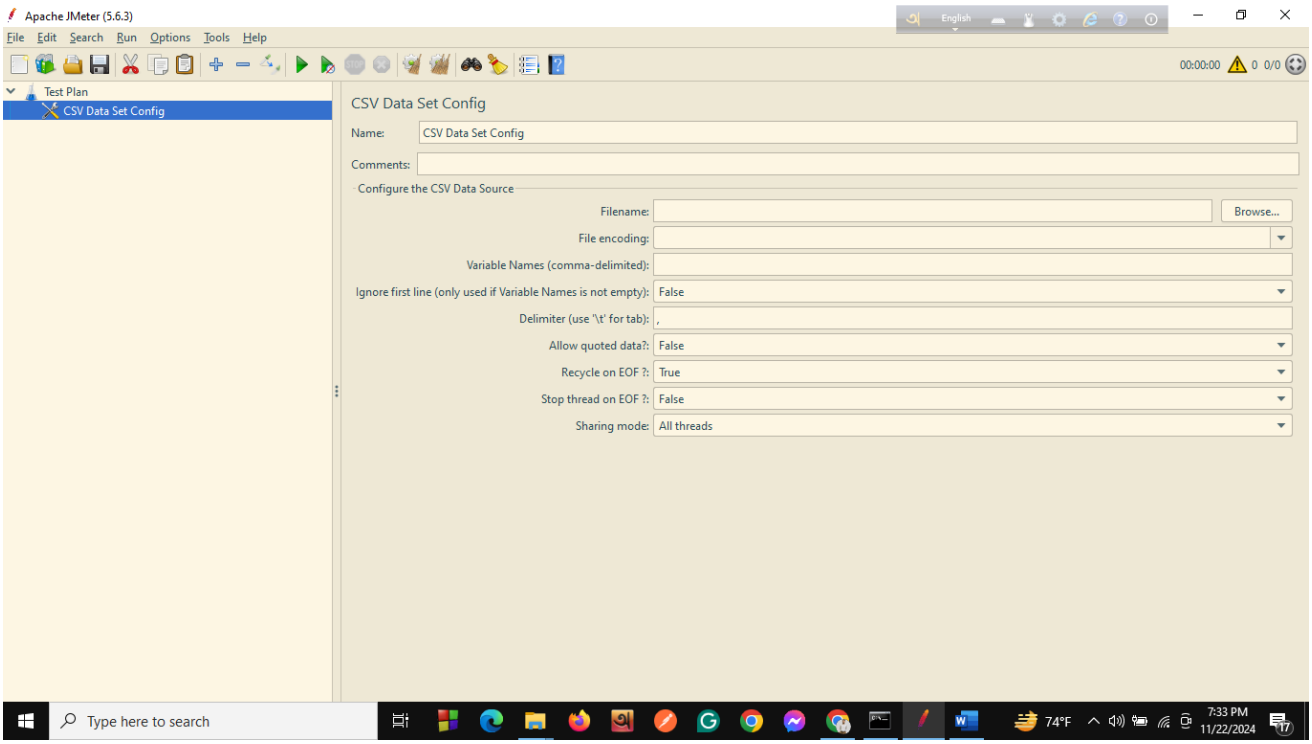
2 Create a csv file and add data

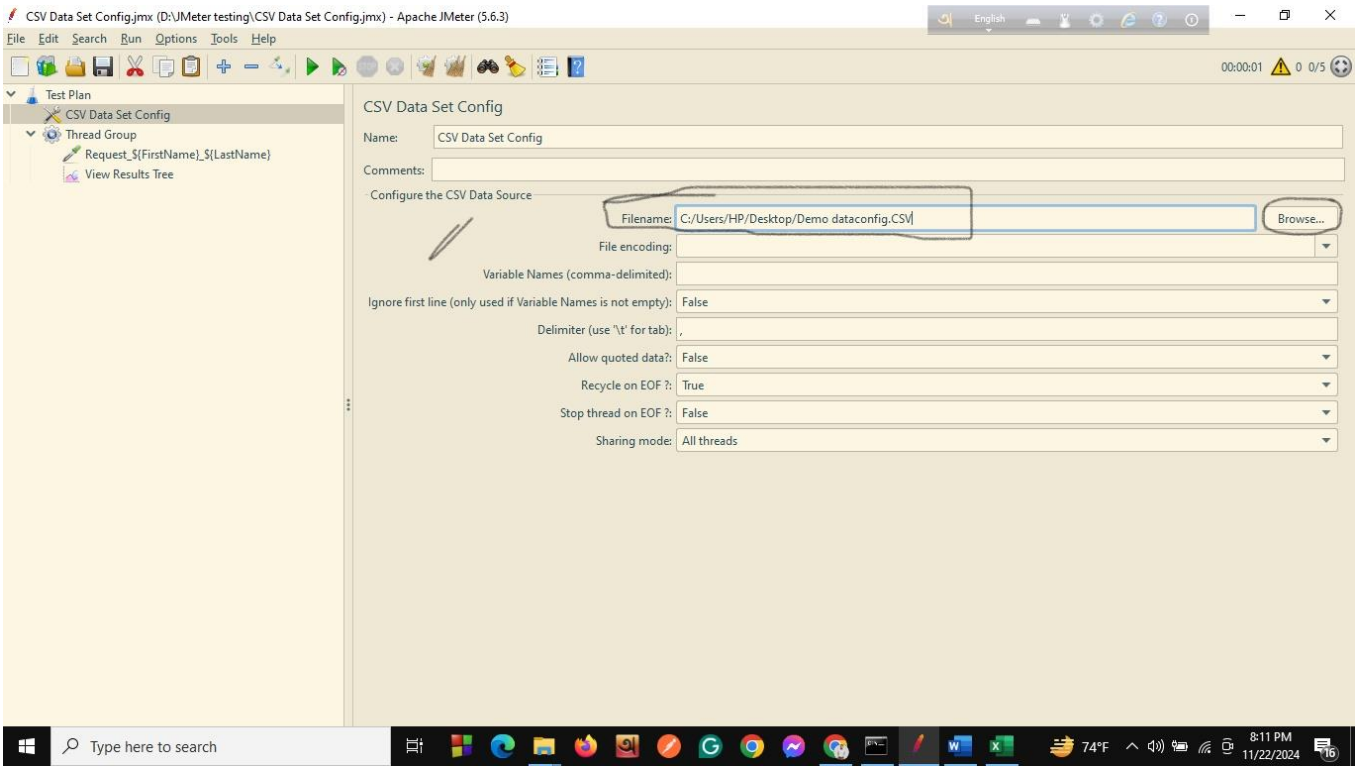
3 Refer the csv file in JMeter's csv data set config

4 Refer values from csv file using syntax ${variableName}

5 Run and validate

Step -1


Apache JMeter (5.6.3)
File Edit Search Run Options Tools Help
Test Plan
CSV Data Set Config
CSV Data Set Config
Name: CSV Data Set Config
Comments:
Configure the CSV Data Source
Filename:
Browse...
File encoding:
Variable Names (comma-delimited):
Ignore first line (only used if Variable Names is not empty): False
Delimiter (use '\t' for tab): ,
Allow quoted data?: False
Recycle on EOF ?: True
Stop thread on EOF ?: False
Sharing mode: All threads
Type here to search
74°F
7:33 PM
11/22/2024


CSV Data Set Config.jmx (D:\JMeter testing\CSV Data Set Config.jmx) - Apache JMeter (5.6.3)
File Edit Search Run Options Tools Help
Test Plan
CSV Data Set Config
Thread Group
Request_${FirstName}_${LastName}
View Results Tree
CSV Data Set Config
Name: CSV Data Set Config
Comments:
Configure the CSV Data Source
Filename: C:/Users/HP/Desktop/Demo dataconfig.CSV
Browse...
File encoding:
Variable Names (comma-delimited):
Ignore first line (only used if Variable Names is not empty): False
Delimiter (use '\t' for tab): ,
Allow quoted data?: False
Recycle on EOF ?: True
Stop thread on EOF ?: False
Sharing mode: All threads
Type here to search
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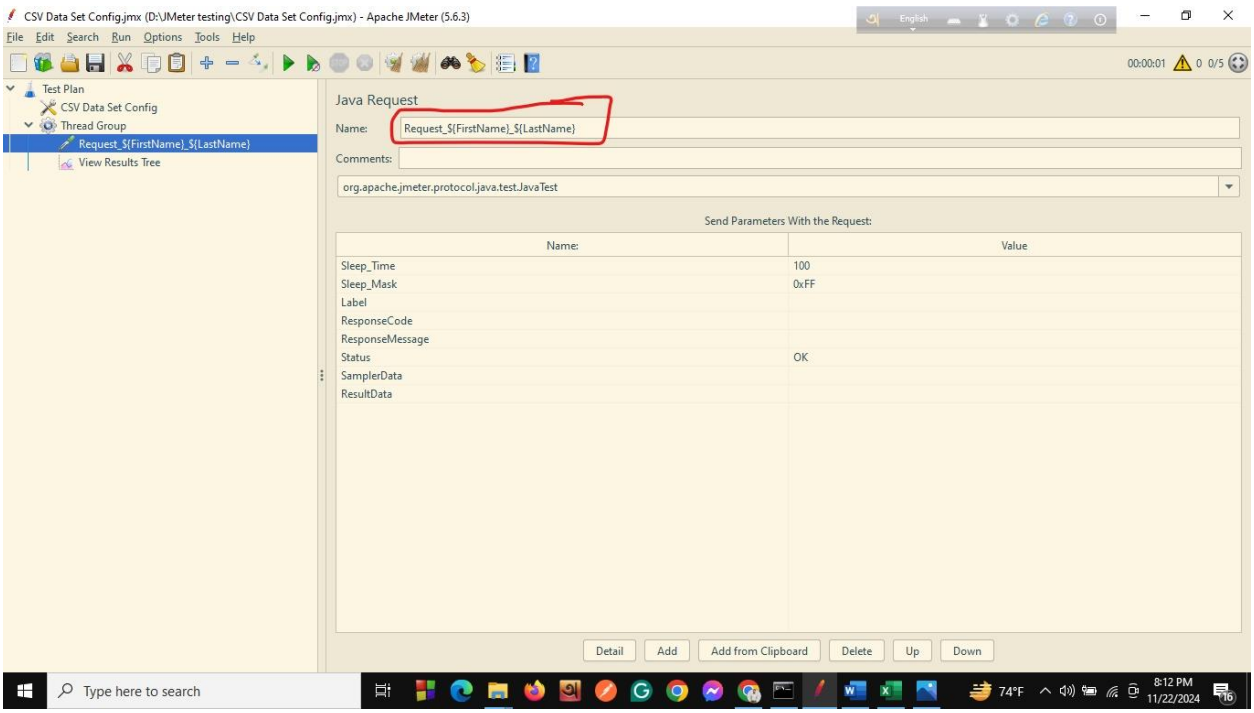
CSV Data Set Config.jmx (D:\JMeter testing\CSV Data Set Config.jmx) - Apache JMeter (5.6.3)
File Edit Search Run Options Tools Help
Test Plan
CSV Data Set Config
Thread Group
Request_${FirstName}_${LastName}
View Results Tree
Java Request
Name: Request_${FirstName}_${LastName}
Comments:
org.apache.jmeter.protocol.java.test.JavaTest
Send Parameters With the Request:
Name: Value
Sleep_Time 100
Sleep_Mask 0xFF
Label
ResponseCode
ResponseMessage
Status OK
SamplerData
ResultData
Detail Add Add from Clipboard Delete Up Down
Type here to search
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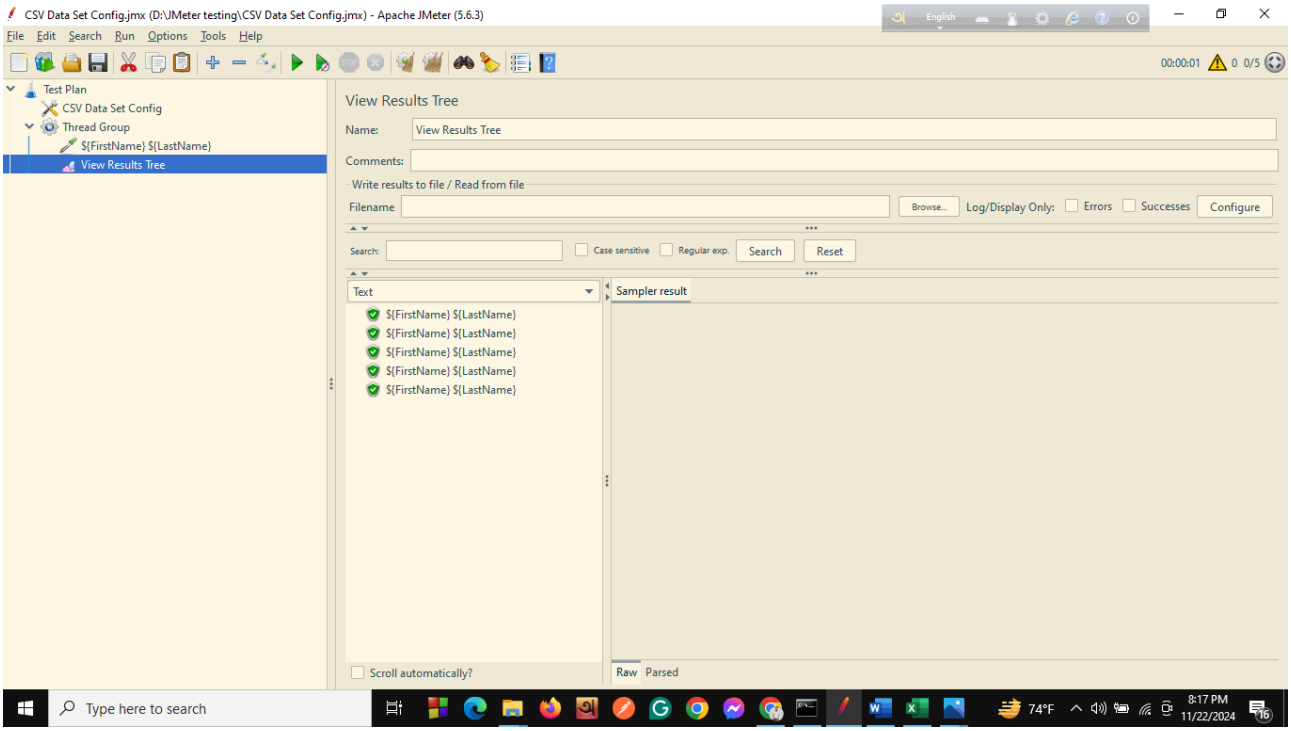
CSV Data Set Config.jmx (D:\JMeter testing\CSV Data Set Config.jmx) - Apache JMeter (5.6.3)
File Edit Search Run Options Tools Help
Test Plan
CSV Data Set Config
Thread Group
${FirstName} ${LastName}
View Results Tree
View Results Tree
Name: View Results Tree
Comments:
Write results to file / Read from file
Filename Browse... Log/Display Only: Errors Successes Configure
Search: Case sensitive Regular exp. Search Reset
Text
Sampler result
${FirstName} ${LastName}
${FirstName} ${LastName}
${FirstName} ${LastName}
${FirstName} ${LastName}
${FirstName} ${LastName}
Scroll automatically?
Raw Parsed
Type here to search
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How to use Blazemeter to Record JMeter Tests

1 Create Blazemeter Account

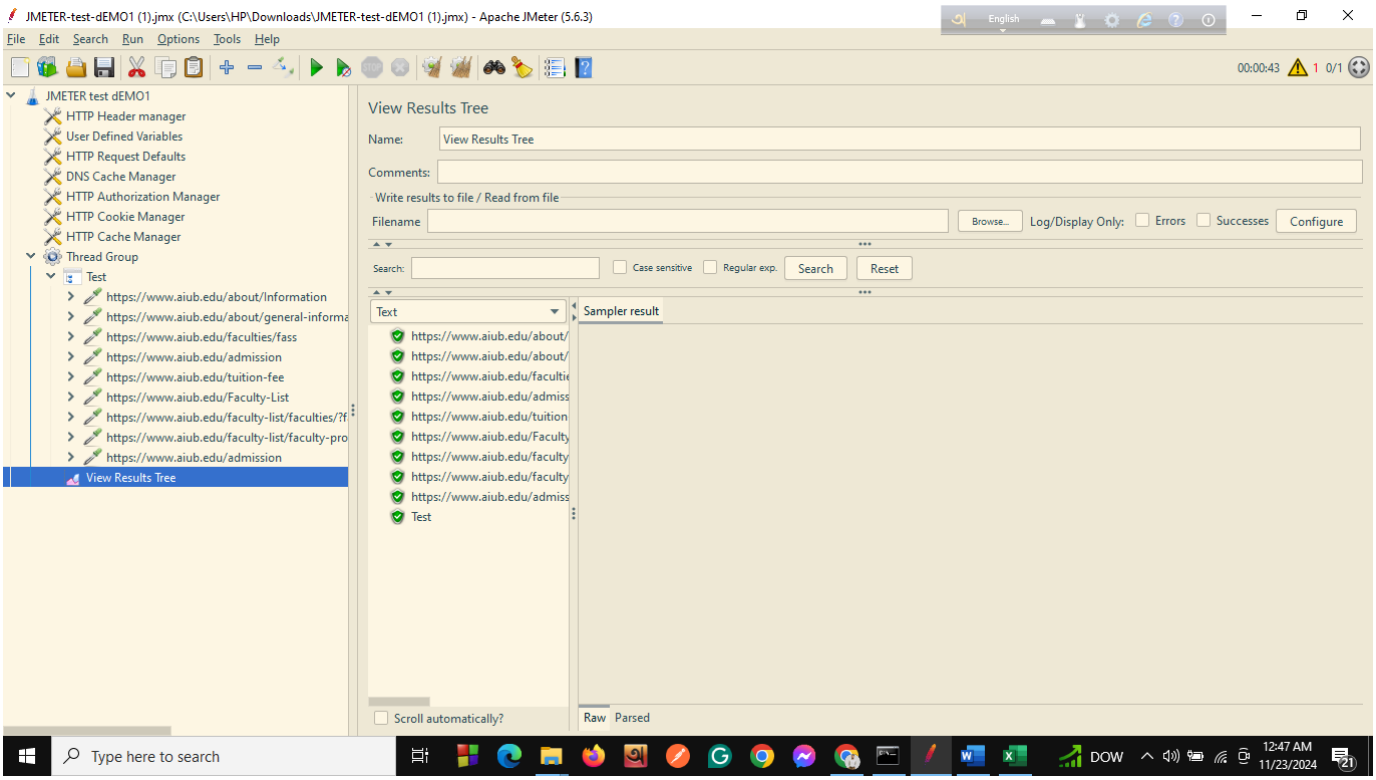
2 Get Blazemeter Extension

3 Login to Blazemeter

4 Record test

5 Save JMX

6 Add JMX in JMeter and Run



How to create HTML report from CMD and GUI

How to run JMeter from command line GUI consumes memory, slower integrate with any external process CI CD

1. How to run JMeter test from command line
2. How to log results
3. How to see command line help and options

4. How to run from any location on your system (add in Path env variables)

Step-1: Create a test plan or use existing test plan.

(Add HTTP request—Then add config element called HTTP cookie manager, HTTP cache manager add Listener called View result tree then add an assertion called Duration Assertion.)

Step-2: Open cmd line and goto jmeter bin folder.

Step-3: Run command with (jmeter -n -t "location of your test file" -l "location of results file")

How to extend JMeter | JMeter Plugins Manager

Whenever you are looking for some new functionality/feature in your existing Jmeter software, and you do not find those features in existing JMeter software, then you need to add a JMeter plugins manager to extend Jmeter in your JMeter software.

Easy & Quick way to:

- Find plugins
- Install
- Uninstall
- Upgrade

Plugins - https://jmeter-plugins.org/wiki/Start/

1: Download plugins manager jar from https://jmeter-plugins.org/wiki/PluginsManager/

2: Add the jar file in jmeter lib/ext folder and restart JMeter

3: Check JMeter plugins manager is added

JMeter Script with Real-time example

Scenario: You are working on E-commerce application and business planning to launch promotional sales on New year. Promotions will be available exactly at 12 mid night. Marketing team started marketing so that customers will know about these promotions.

Business Expectations: All promotions should be available and user/customers should be able to avail the promotions without any delays and issues.

Problem: Unexpected number of customers accessing the application can cause the slowness and customers might not be able to avail the offers.

Solution: Performance needs to be tested before the event launch.

Test case 1: Users access the application at launch time.