Performance testing with JMeter

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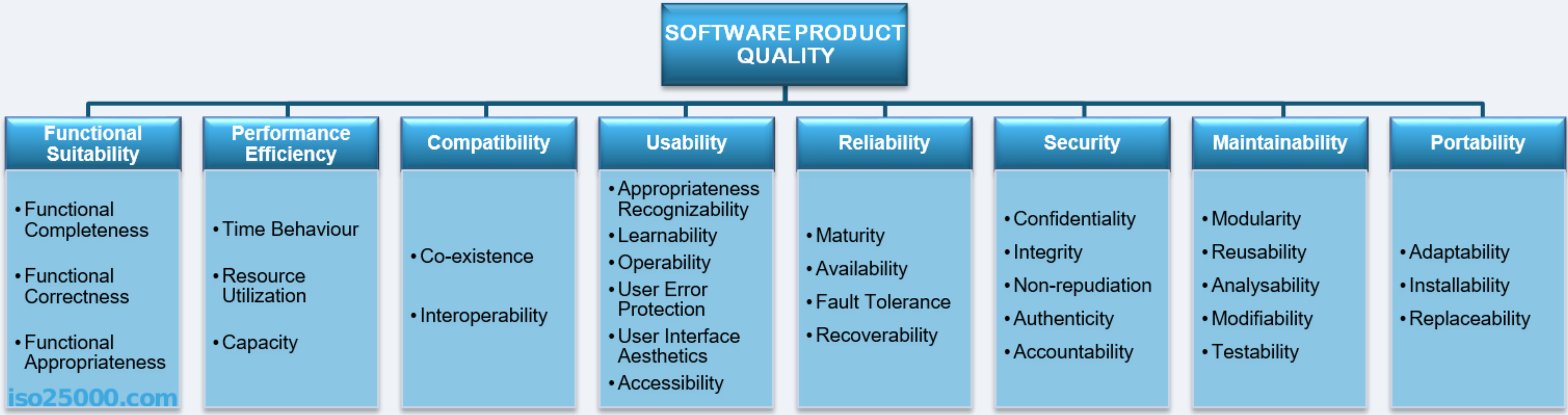
deti

ISO/IEC 25010:2011 Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — **System and software quality models**



https://blog.codacy.com/iso-25010-software-quality-model/

Functional quality characteristics/factors are just a part of the story…

Holistic view: need to consider quality characteristics in the product conception and development

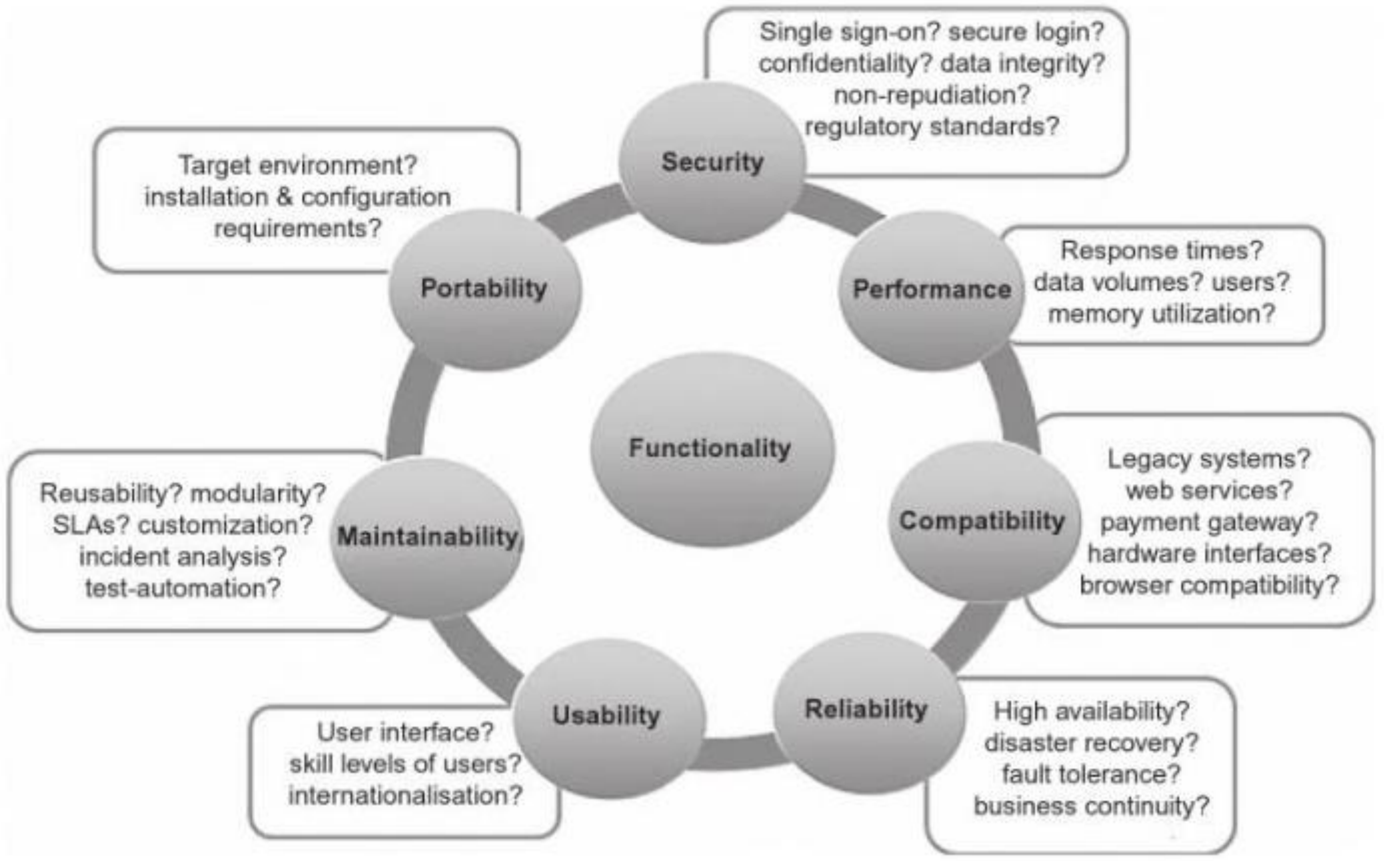

Single sign-on? secure login? confidentiality? data integrity? non-repudiation? regulatory standards?
Security
Target environment? installation & configuration requirements?
Portability
Performance
Response times? data volumes? users? memory utilization?
Functionality
Legacy systems? web services? payment gateway? hardware interfaces? browser compatibility?
Compatibility
Reusability? modularity? SLAs? customization? incident analysis? test-automation?
Maintainability
Usability
User interface? skill levels of users? internationalisation?
Reliability
High availability? disaster recovery? fault tolerance? business continuity?

FIGURE 6.2

Holistic View of Product Quality.

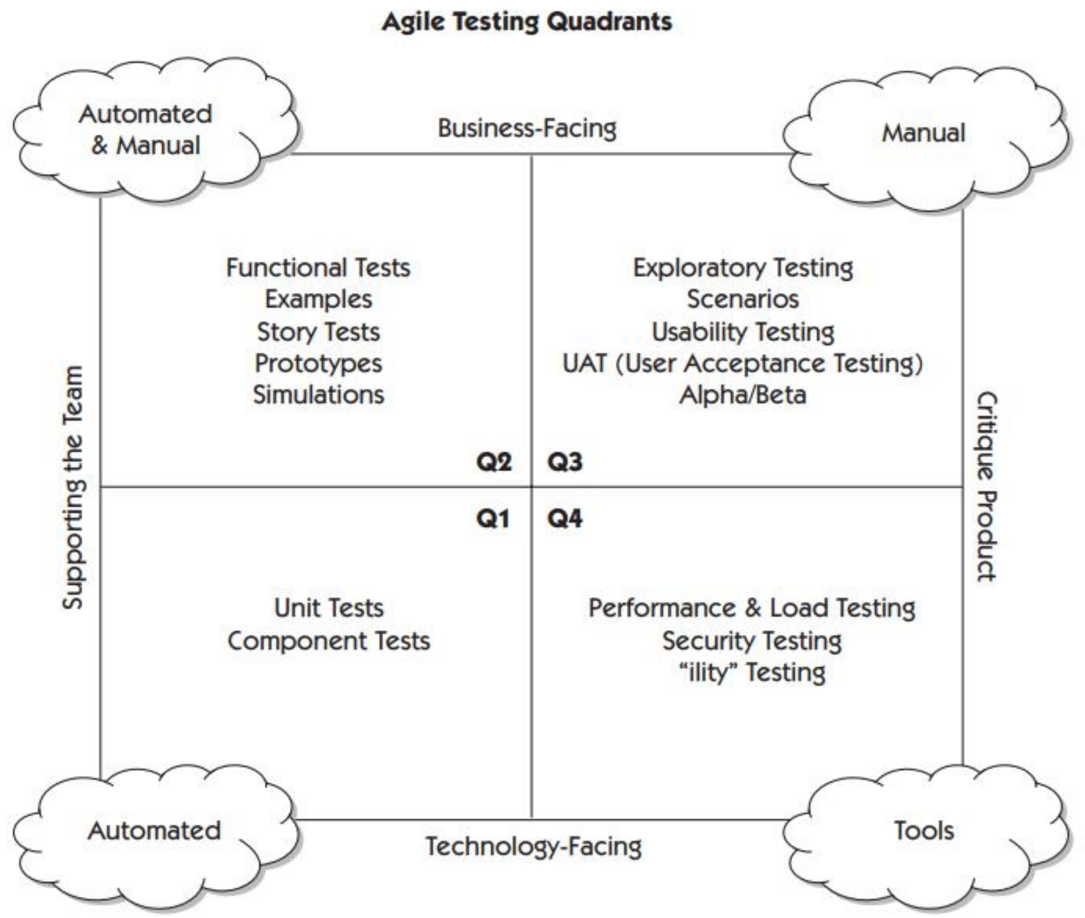


Figure 6-1 Agile Testing Quadrants

•https://learning.oreilly.com/library/view/agile-testing-a/9780321616944/ch06.html

Performance testing

Tools and metrics

Why performance testing?

Non-functional requirements

- Performance, latency
- How far can you load the system ensuring error-free behavior?

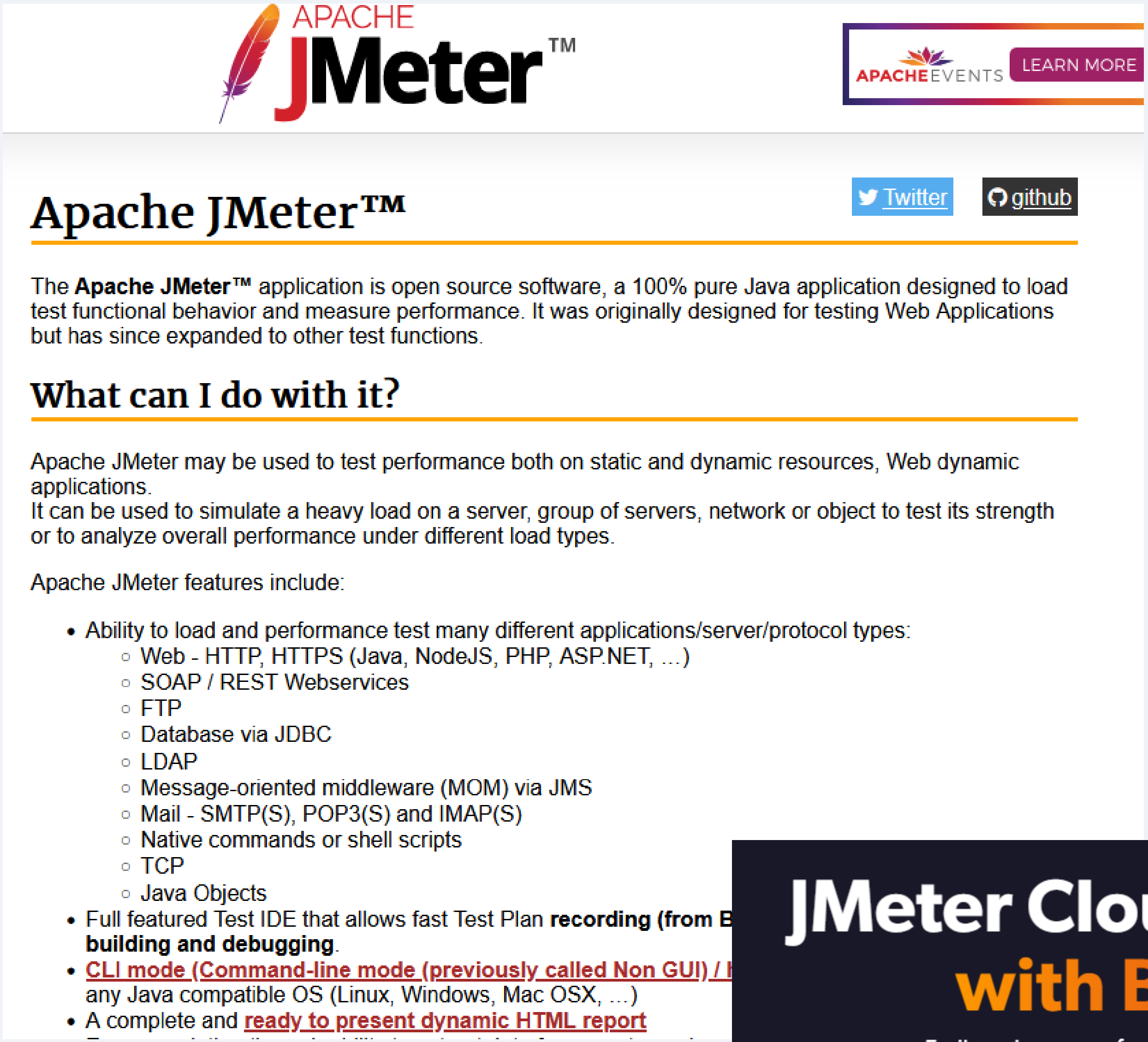
How?

- Synthetic load generation
  - simulate user actions (functional)
- Measurement & reporting instrumentation

Mind some differences

Performance testing	Stress testing	Load testing
Testing to determine the performance of a software product.	A type of performance testing to evaluate a system or component **at or beyond the limits of its anticipated or specified workloads**, or with reduced availability of resources such as access to memory or servers.	A type of performance testing to evaluate the **behavior of a component or system with increasing load**, e.g., numbers of parallel users and/or numbers of transactions, to determine what load can be handled by the component or system.

https://istqb-glossary.page/



Apache JMeter™

The **Apache JMeter™** application is open source software, a 100% pure Java application designed to load test functional behavior and measure performance. It was originally designed for testing Web Applications but has since expanded to other test functions.

What can I do with it?

Apache JMeter may be used to test performance both on static and dynamic resources, Web dynamic applications.
It can be used to simulate a heavy load on a server, group of servers, network or object to test its strength or to analyze overall performance under different load types.

Apache JMeter features include:

- Ability to load and performance test many different applications/server/protocol types:
  - Web - HTTP, HTTPS (Java, NodeJS, PHP, ASP.NET, ...)
  - SOAP / REST Webservices
  - FTP
  - Database via JDBC
  - LDAP
  - Message-oriented middleware (MOM) via JMS
  - Mail - SMTP(S), POP3(S) and IMAP(S)
  - Native commands or shell scripts
  - TCP
  - Java Objects
- Full featured Test IDE that allows fast Test Plan **recording (from B** **building and debugging**.
- CLI mode (Command-line mode (previously called Non GUI) / I any Java compatible OS (Linux, Windows, Mac OSX, ...)
- A complete and ready to present dynamic HTML report

JMeter Cloud Load Testing
with BlazeMeter
Easily scale your performance tests for continuous testing agility.
START TESTING NOW

Browser vs JMeter as HTTP clients

Browser lifecycle

User performs an action

Browser sends an HTTP request

Server processes the request and responses

Browser parses the response and executes scripts

JMeter behaviour

~~User performs an action~~

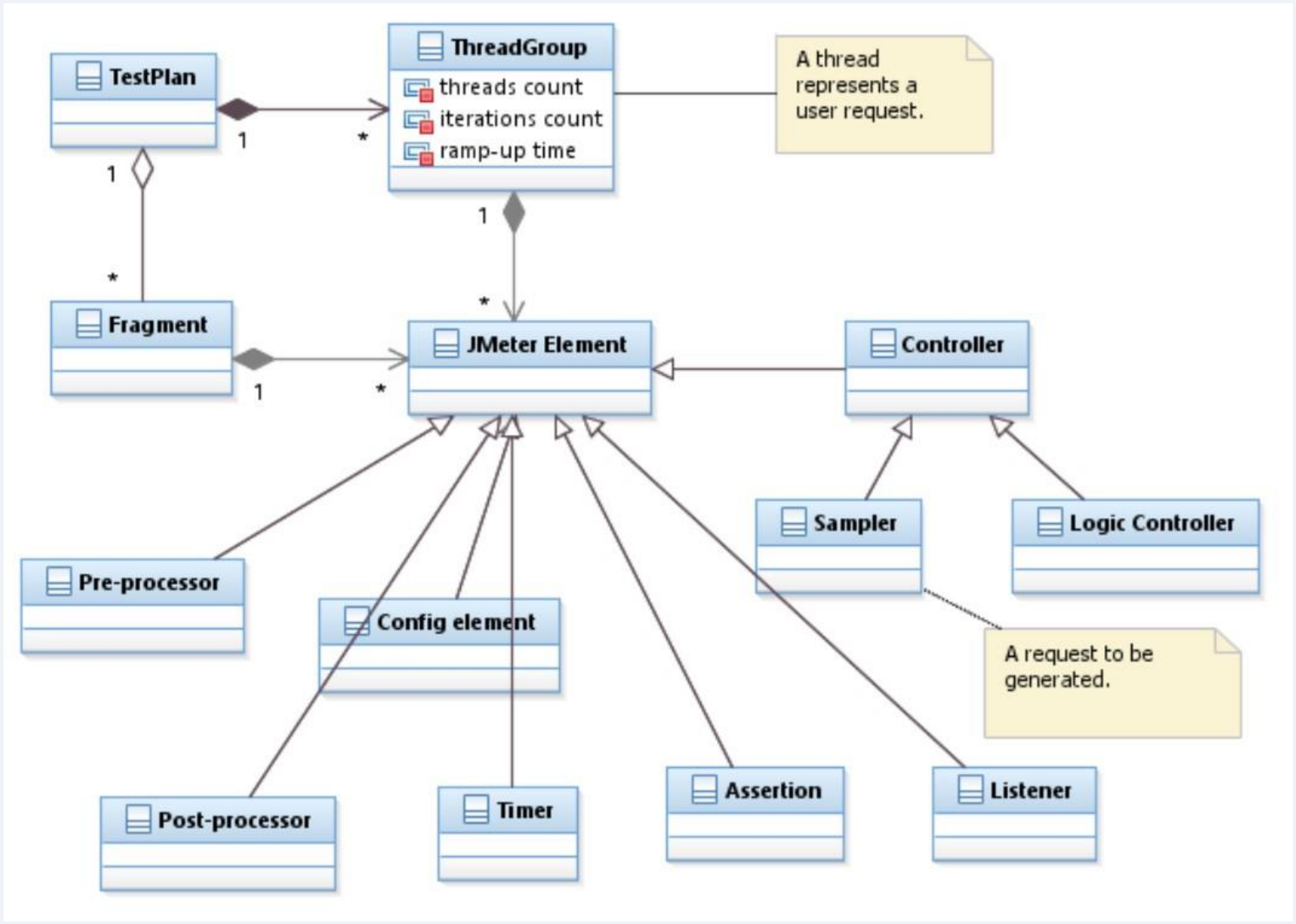
JMeter sends an HTTP request

Server processes the request and responses

JMeter parses the response ~~and executes scripts~~

Repeat

JMeter elements



JMeter elements

Element	Semantics
Test Plan	A JMeter script.
Thread Group	Simulates a group of users (request ~ user)
Sampler	An action that causes a request.
Config	Additional configuration.
Timer	Add a predefined delay.
Assertions	Error checking to evaluate responses
Pre-processor	Modify the request before it is issued
Post-processor	Modify the response
Logic controller	Control node (alternatives, looping,…)

Some useful Samplers

HTTP Request

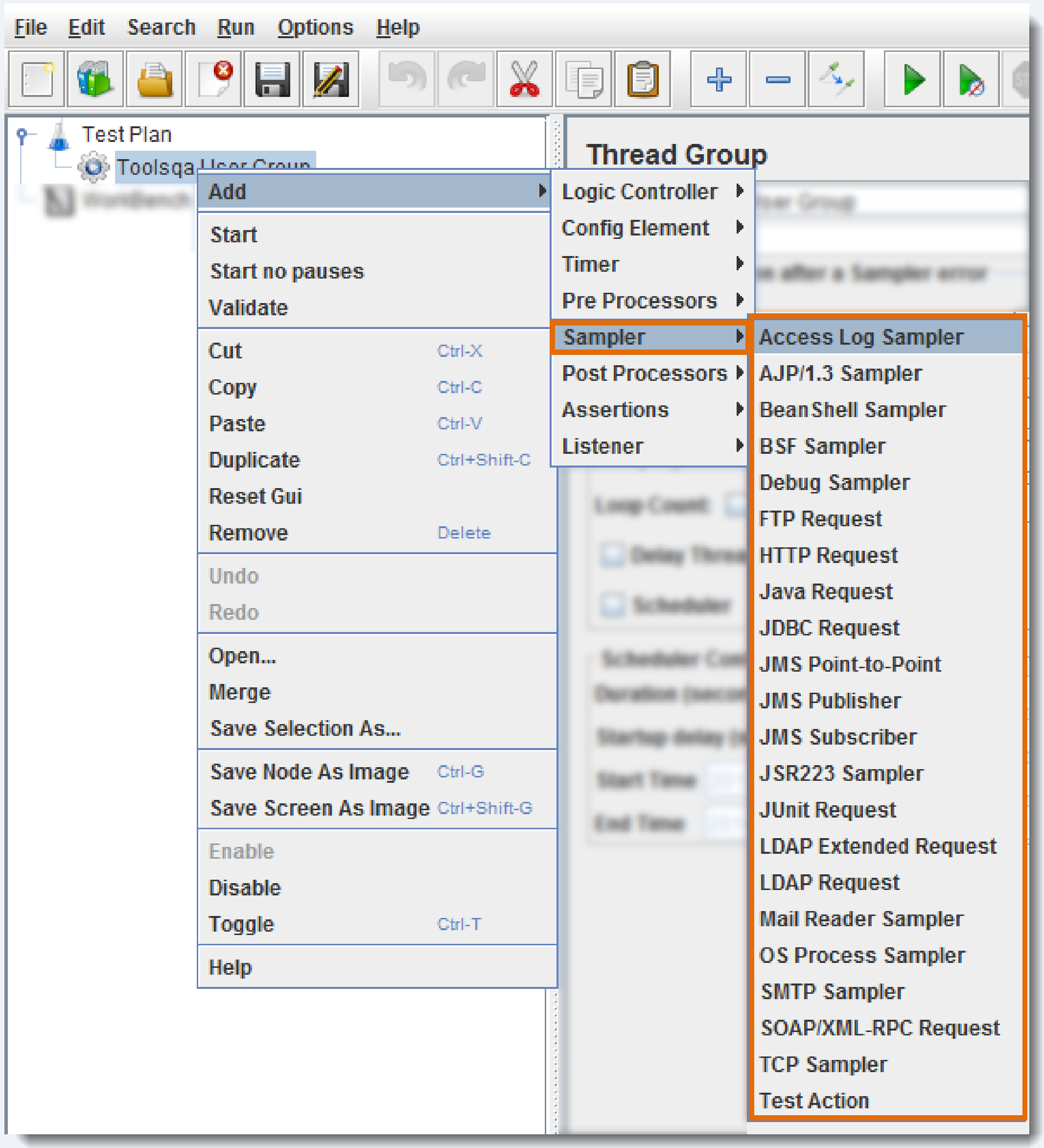
FTP Request

JDBC Request

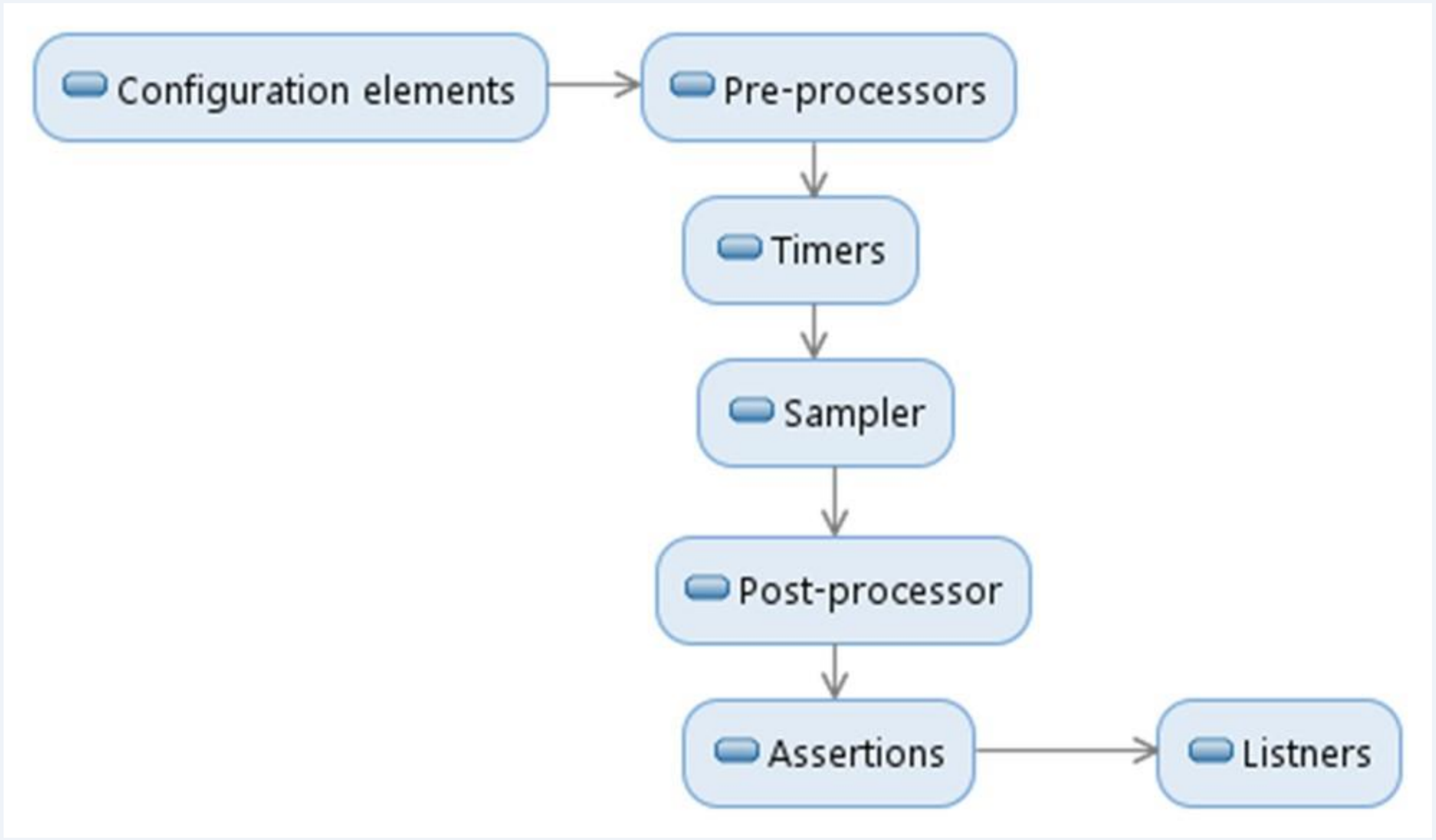
Java Request

SOAP/XML Request

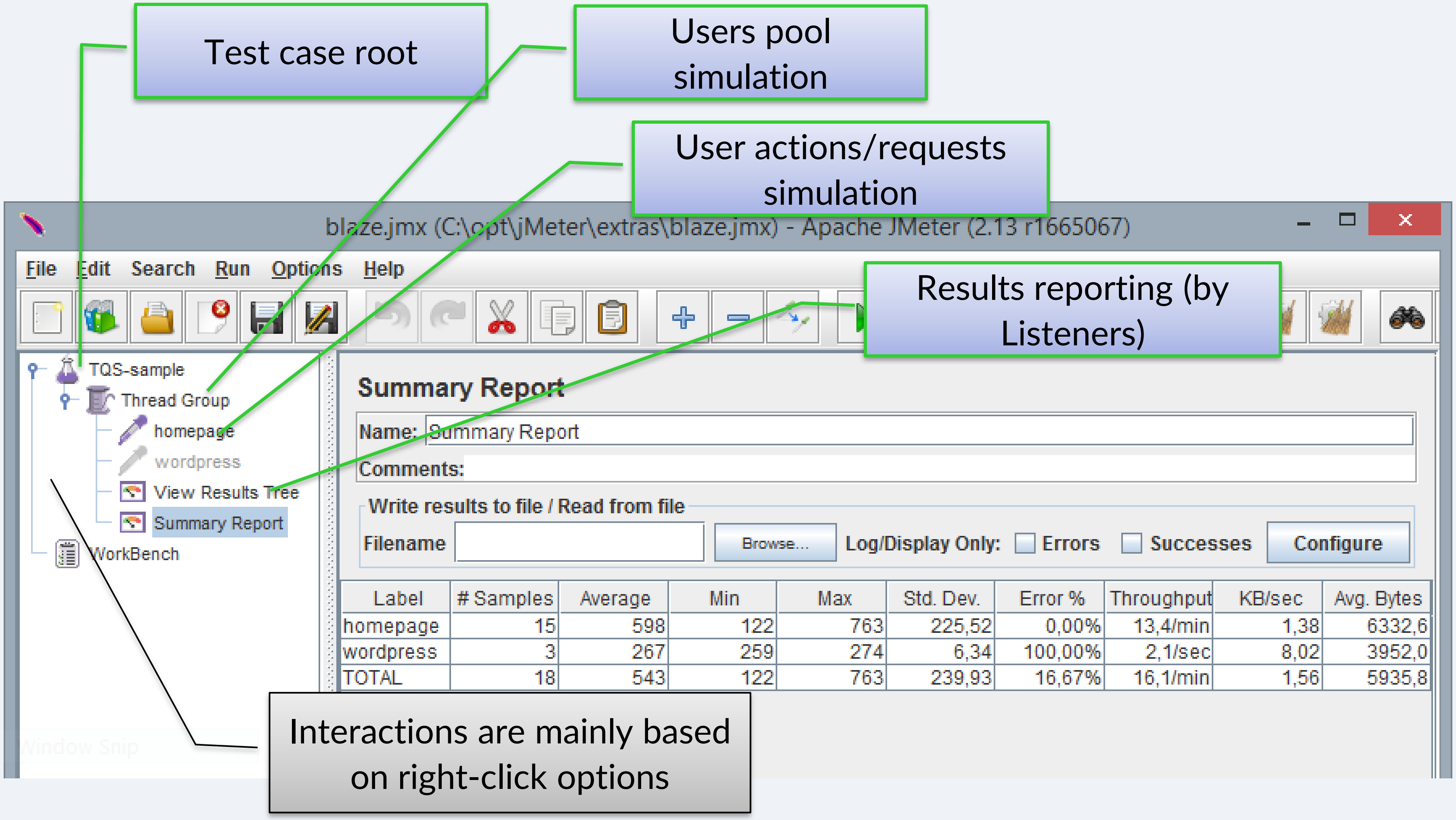
RPC Requests



Execution order of test elements



JMeter IDE


Test case root
Users pool simulation
User actions/requests simulation
Results reporting (by Listeners)
Interactions are mainly based on right-click options
blaze.jmx (C:\opt\jMeter\extras\blaze.jmx) - Apache JMeter (2.13 r1665067)
File Edit Search Run Options Help
TQS-sample
Thread Group
homepage
wordpress
View Results Tree
Summary Report
WorkBench
Browse...
Configure

Summary Report

Name: Summary Report

Comments:

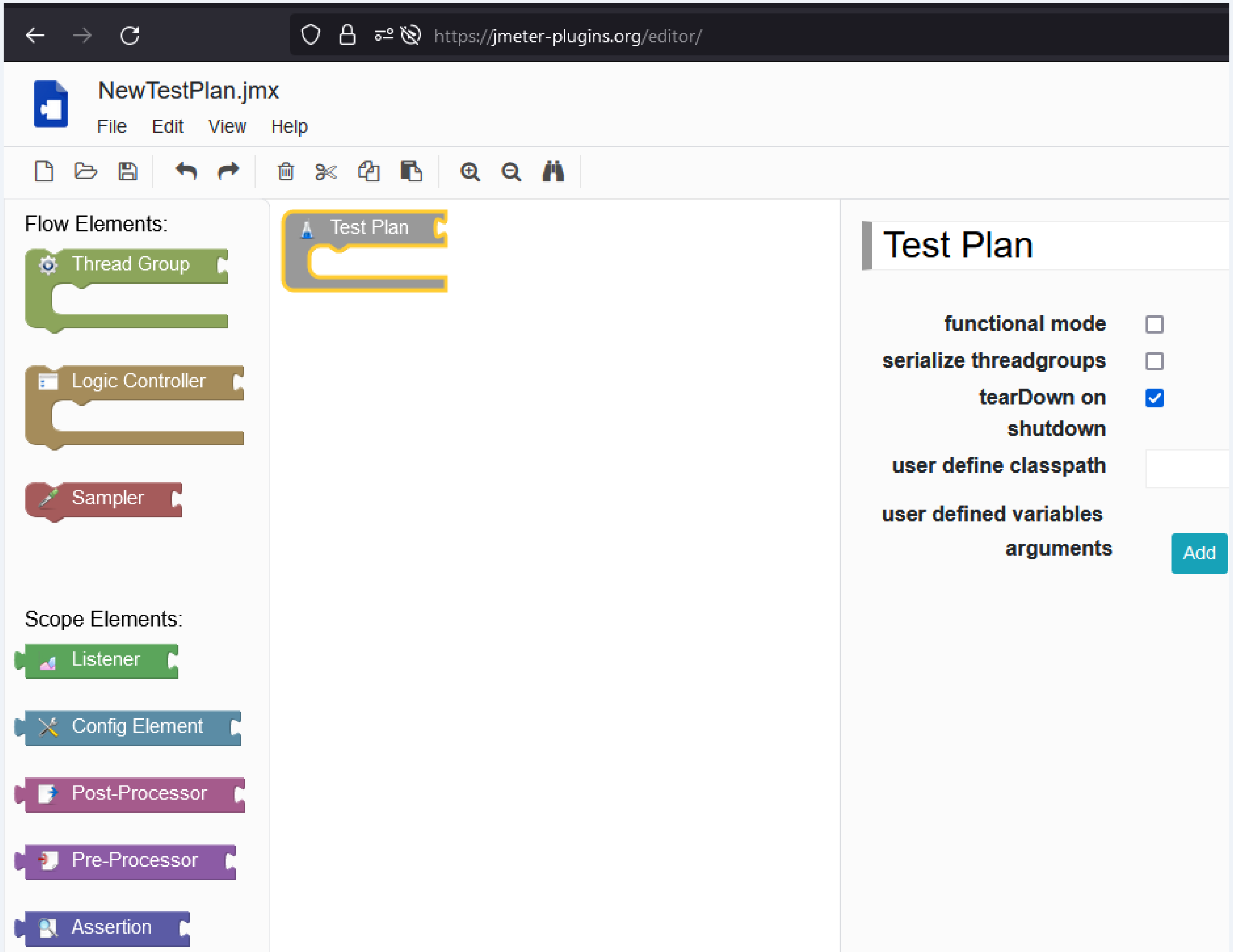
Write results to file / Read from file

Filename

Log/Display Only: ☐ Errors ☐ Successes

Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	KB/sec	Avg. Bytes
homepage	15	598	122	763	225,52	0,00%	13,4/min	1,38	6332,6
wordpress	3	267	259	274	6,34	100,00%	2,1/sec	8,02	3952,0
TOTAL	18	543	122	763	239,93	16,67%	16,1/min	1,56	5935,8

Web editor


https://jmeter-plugins.org/editor/

NewTestPlan.jmx

File Edit View Help

Flow Elements:

Scope Elements:

Test Plan

functional mode ☐

serialize threadgroups ☐

tearDown on shutdown ☑

user define classpath

user defined variables

arguments

Basic http request

New test plan, with descriptive name

Simulate

- 4 users
- 1 visit
- to UA’s home page (http request)

Display the results

- in Results Tree view
- in Summary report

http://www.tutorialspoint.com/jmeter/jmeter_web_test_plan.htm

Test a REST endpoint

- Add http request
- Provide details for GET
- Change the http-header to send json

http://www.testautomationguru.com/how-to-test-rest-api-using-jmeter/

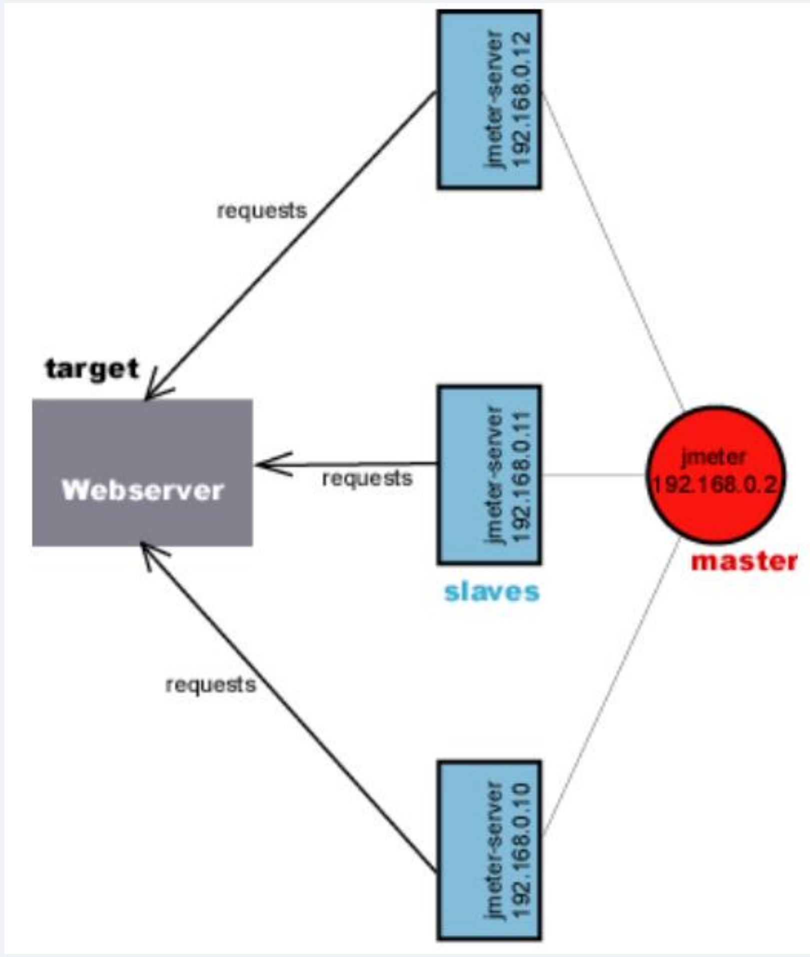
Collect metrics for an existing JUnit test

- designed for JUnit 4 ☹
- copy and paste the jar files into jmeter/lib/junit directory
- Add JUnit request

http://www.testautomationguru.com/how-to-test-rest-api-using-jmeter/

Distributed performance testing

Master/slave architecture



JMeter practices

Use multiple instances of JMeter if using many threads

JMeter can be run without GUI

- jmeter -n -t test.jmx -l test.jtl

Use as few Listeners as possible

- deactivate/activate

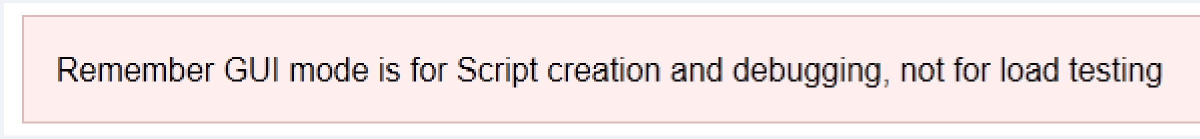
Prefer CSV over XML to save results

If the machine running the test case is resource-exhausted (e.g.: CPU 100%), the results will not be reliable!

Commercial solutions to run JMeter tests from the cloud

See also:

http://www.testautomationguru.com/jmeter-tips-tricks-for-beginners/



Remember GUI mode is for Script creation and debugging, not for load testing

See also:

* Tsung framework

Resources and references

Apache JMeter site

- includes demo tutorials

The JMeter Manual

Selected best practices