中山大學
SUN YAT-SEN UNIVERSITY

Performance Testing

SE-307 Software Testing Techniques

http://my.ss.sysu.edu.cn/wiki/display/SE307/Home

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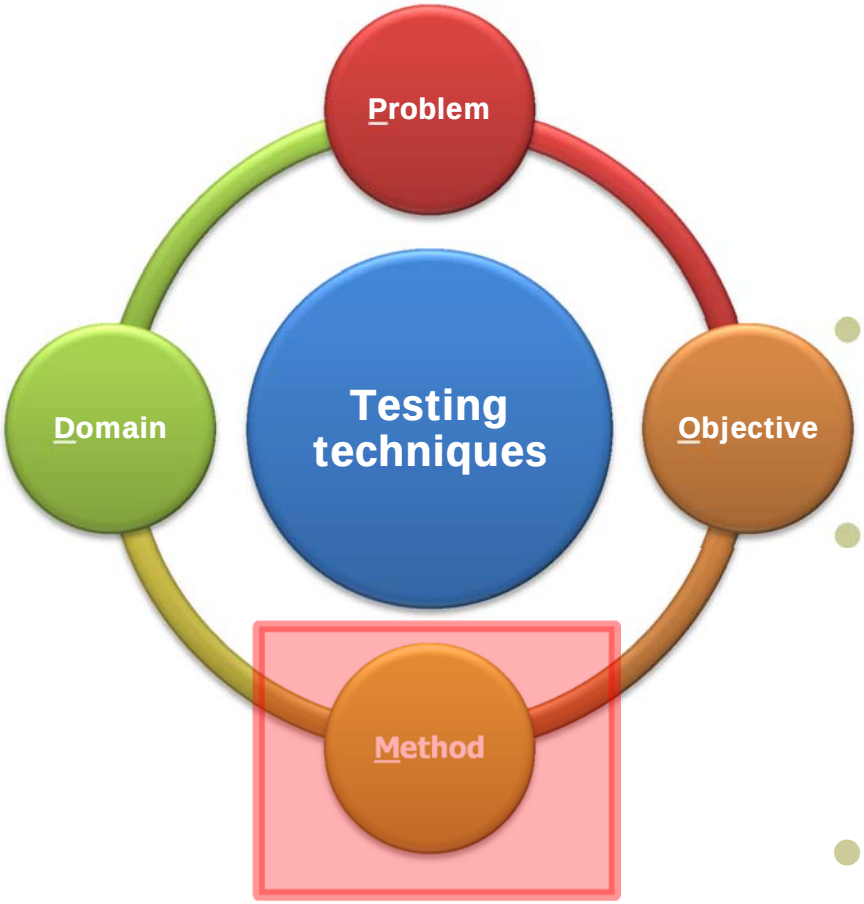
Review: Where are We?



- **Objective（目标）**
  - Validation testing (alpha testing, beta testing), functionality testing, performance testing, load testing (stress testing), reliability testing, regression testing, security testing, compatibility testing, ...
- **Scope（范围）**
  - Unit testing, integration testing, system testing, acceptance testing
- **Problem（问题）**
  - Fundamental problems: test adequacy, test oracle, test generation
  - Important problems: test automation, test selection
- **Method（方法）**
  - Exploratory method, black box method, white box method, model-based method

Agenda

- Warm up
- What's performance testing?
- Why do performance testing?
- Performance testing activities
- Performance testing tools
- JMeter demo

Warm-up

- What does client want us to do?
- Why do we perform such testing?
- How do we perform such testing?

Normal User Set of Browser Users	Potential load of 8,000-10,000 browser users and 2,000 concurrent browser users is anticipated
Maximum User Set of Browser Users	Potential load of 25,000 browser users and 5,000 concurrent browser users is anticipated
Normal User Set of Content Contributors	Potential load of 200 content contributor users and 20 concurrent content contributor users is anticipated
Maximum User Set of Content Contributors	Potential load of 600 content contributor users and 60 concurrent content contributor users is anticipated

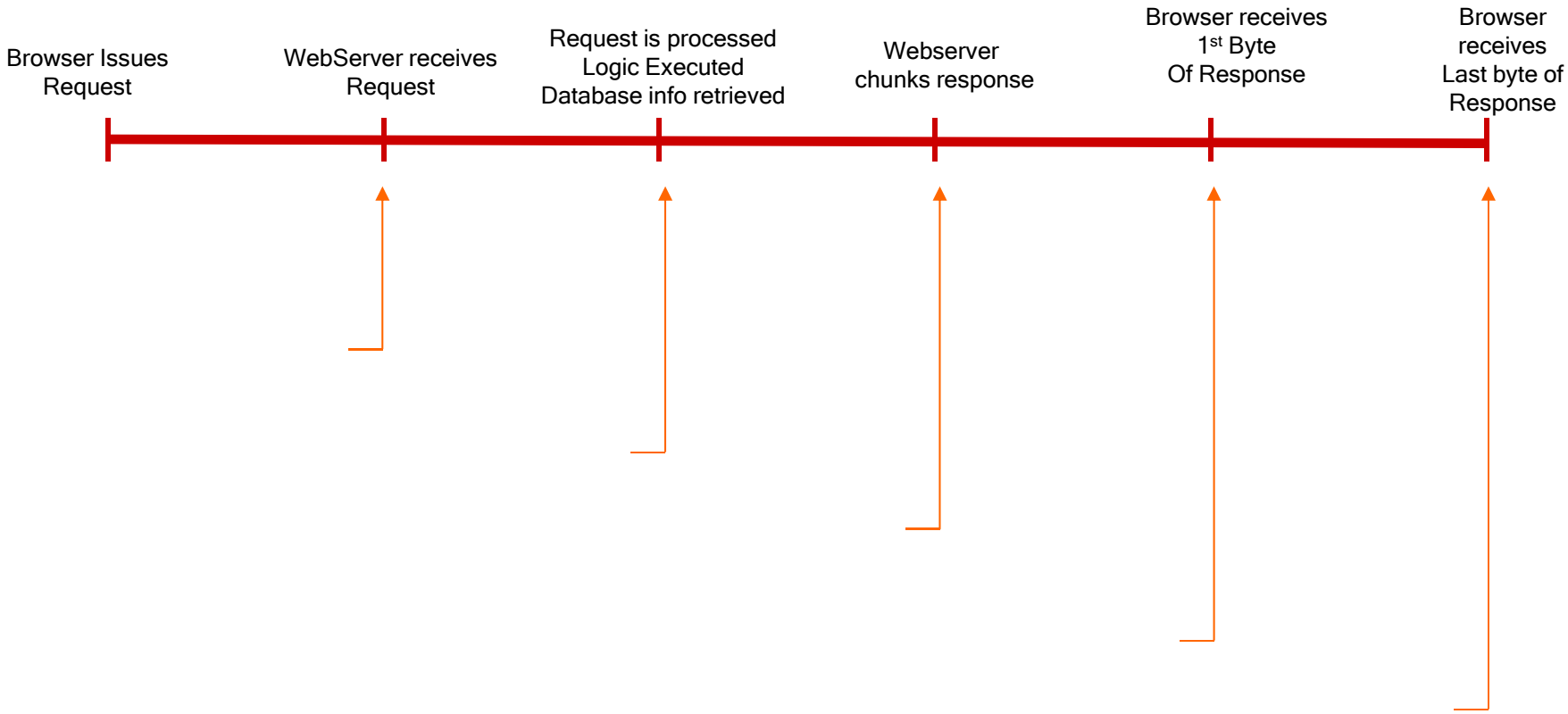
What is Performance Testing?

Glossary

- **Load:** Load is the stimulus applied to a system, application, or component to simulate a usage pattern, in regard to concurrency and/or data inputs. Load may refer to the total number of users, concurrent active users, data volume

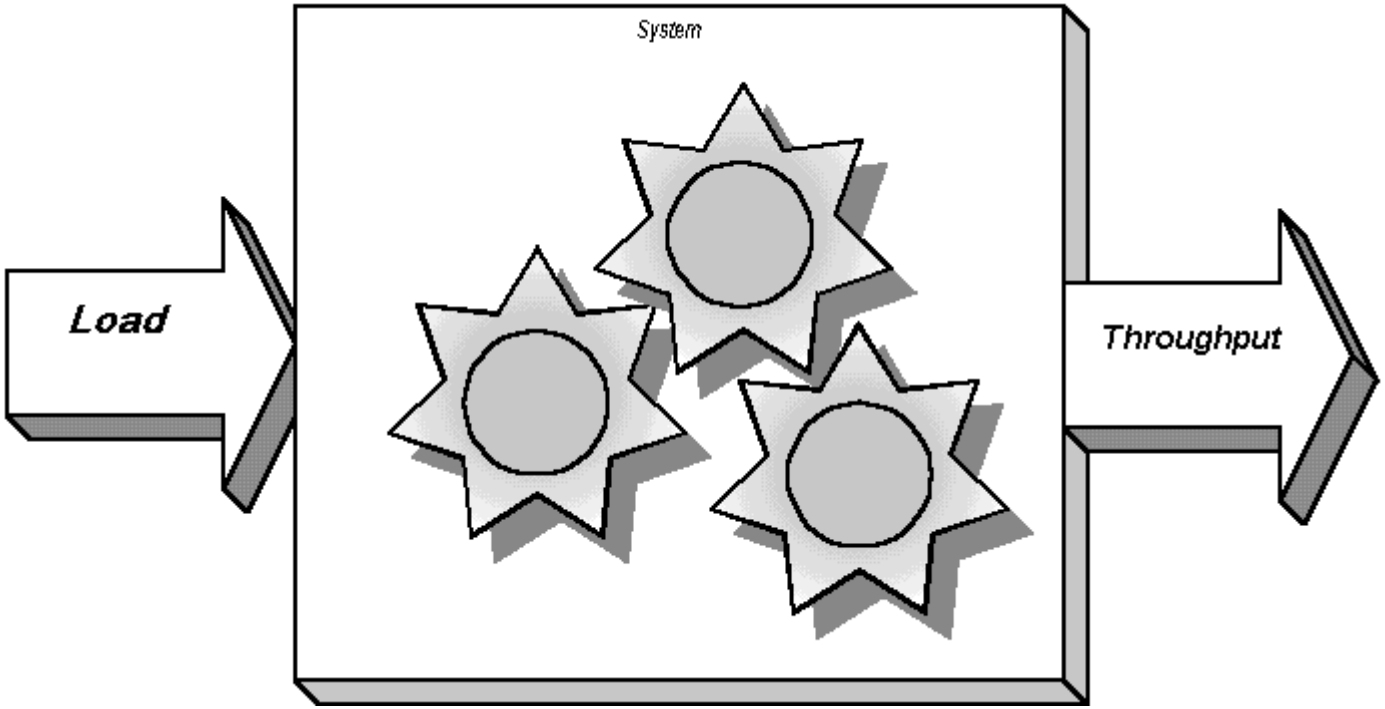
Glossary

Response Time: how long it takes for a system to respond



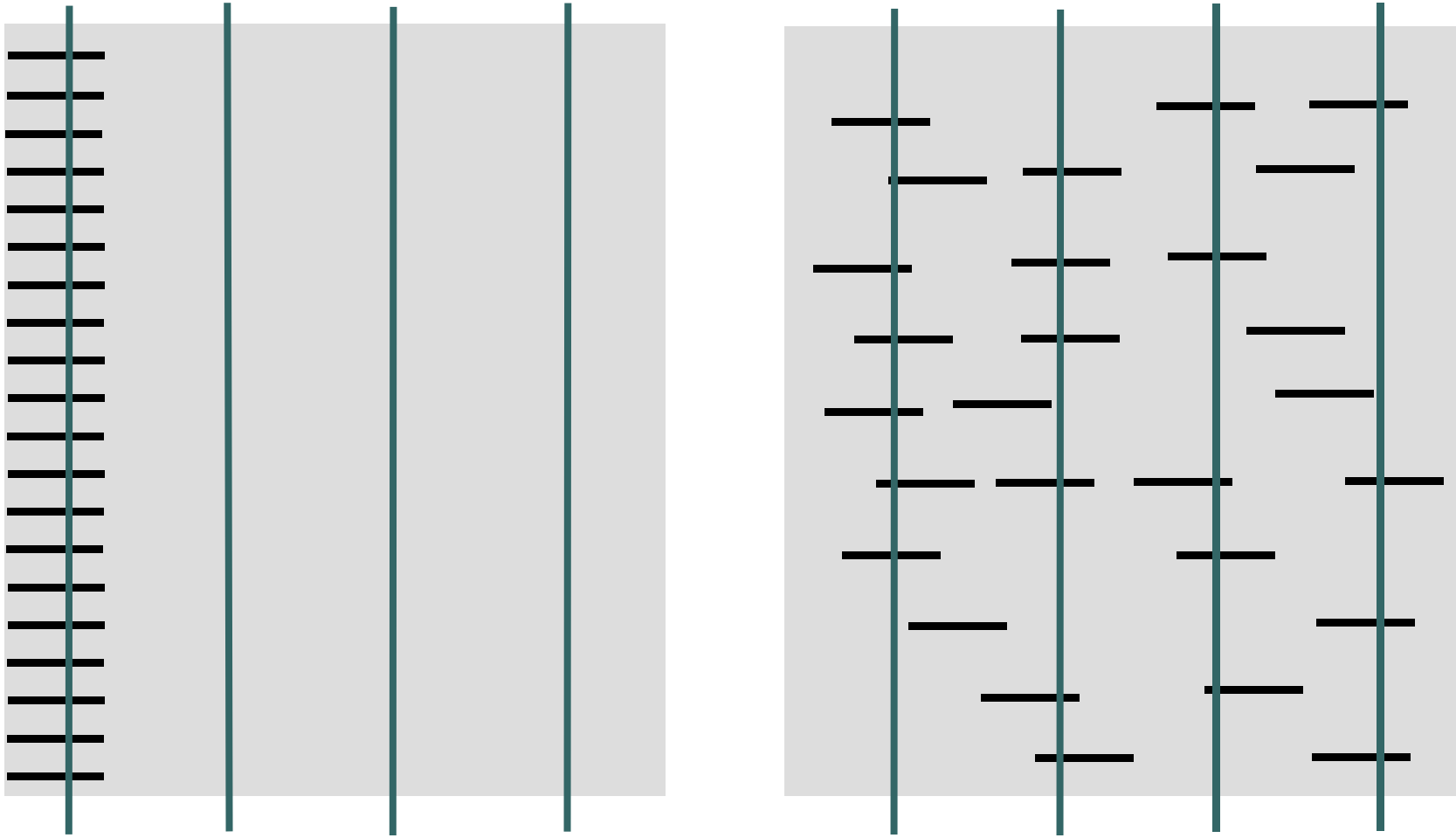
Glossary

- **Throughput:** Throughput is the number of units of work that can be handled per unit of time by a system; for instance, requests per second, calls per day, hits per second, reports per year, etc.



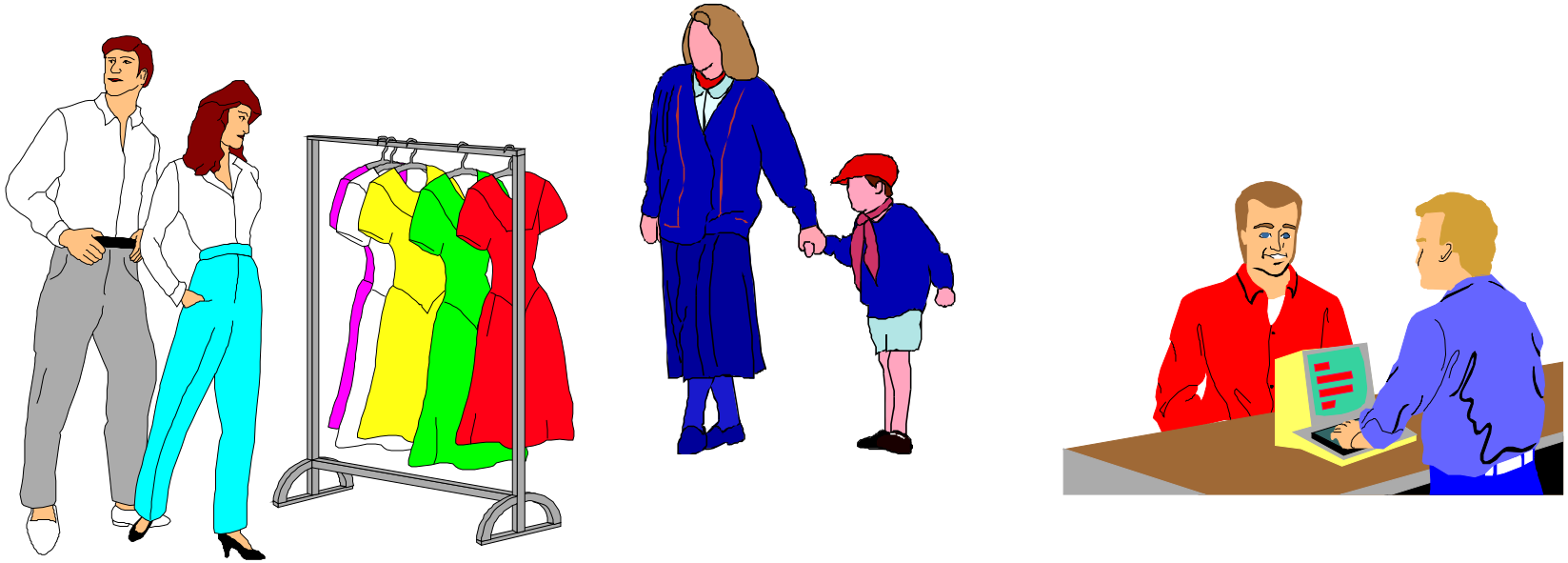
Glossary

- Concurrent: happening at the same time as something else



Glossary

- **Scenario:** A set of test cases that ensure that the business process flows are tested from end to end.



Browsers

Buyer

Why Do Performance Testing?

Capacity:

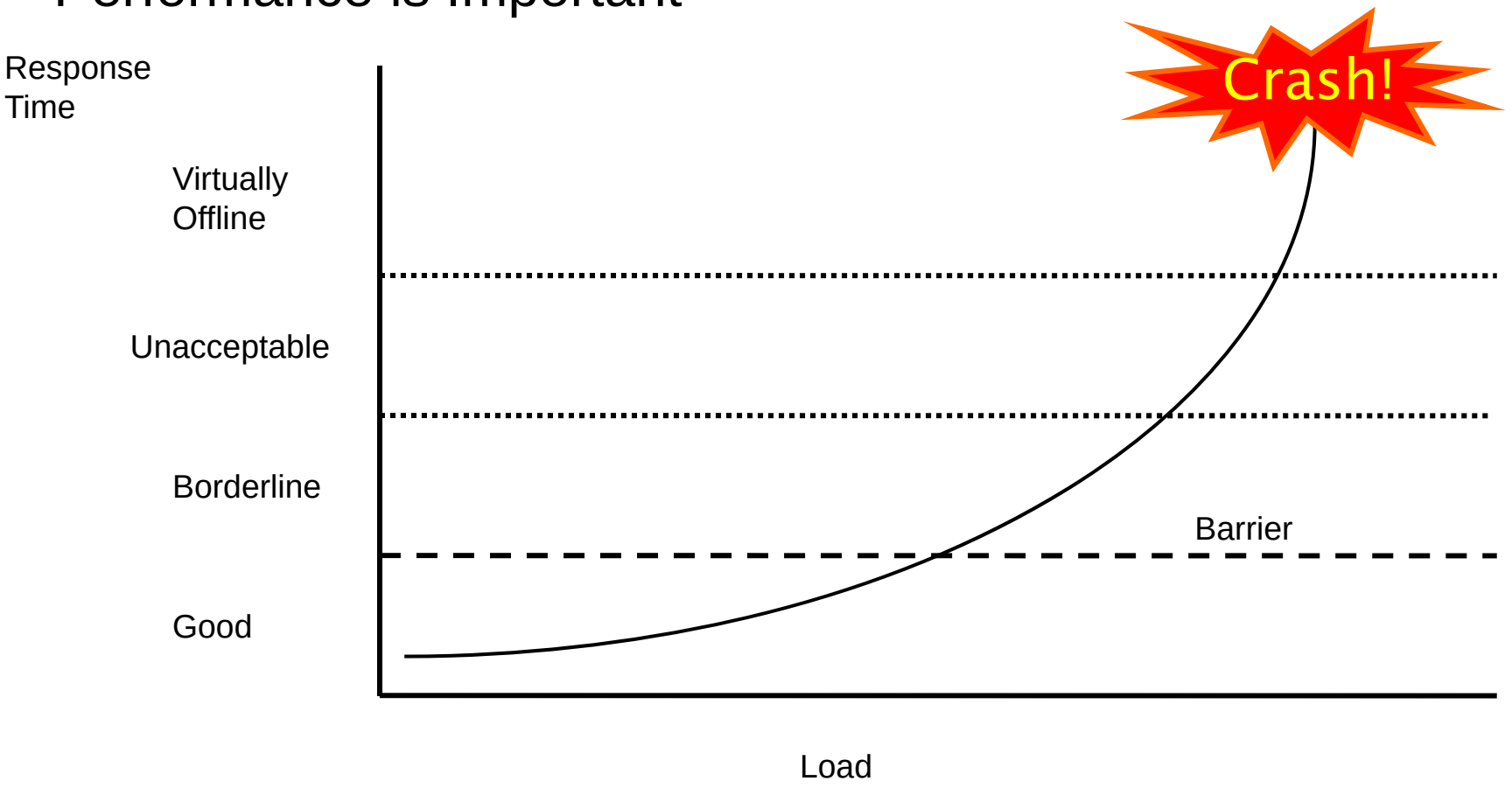
- 1 million hits an hour
- 150,000 tickets an hour

Real-world Load:

- 8 million hits an hour
- 200,000 ticket requests per second

Why Do Performance Testing?

Performance is Important



Benefits of Performance Testing

- Removal of serious functional flaws related to data volume and synchronization issues not identified by functional testing
- Using realistic data volumes and transaction rates enables identification of processing bottlenecks
- Identification and removal of serious performance issues before deployment
- Collection of performance metrics for the system under increasing load that enable system administrators to make and validate tuning decisions prior to deployment
- Formal load tests provide a high level of confidence that the system is capable of supporting critical business transaction flow in normal operation before deployment

Different Testing Types

- Load – identify maximum levels at which a system/application can perform successfully in terms of workload

- Performance – simulates expected load volumes while measuring the response of the system against predetermined performance levels

- Stress – test designed to cause system failure and determine the breaking point of the system

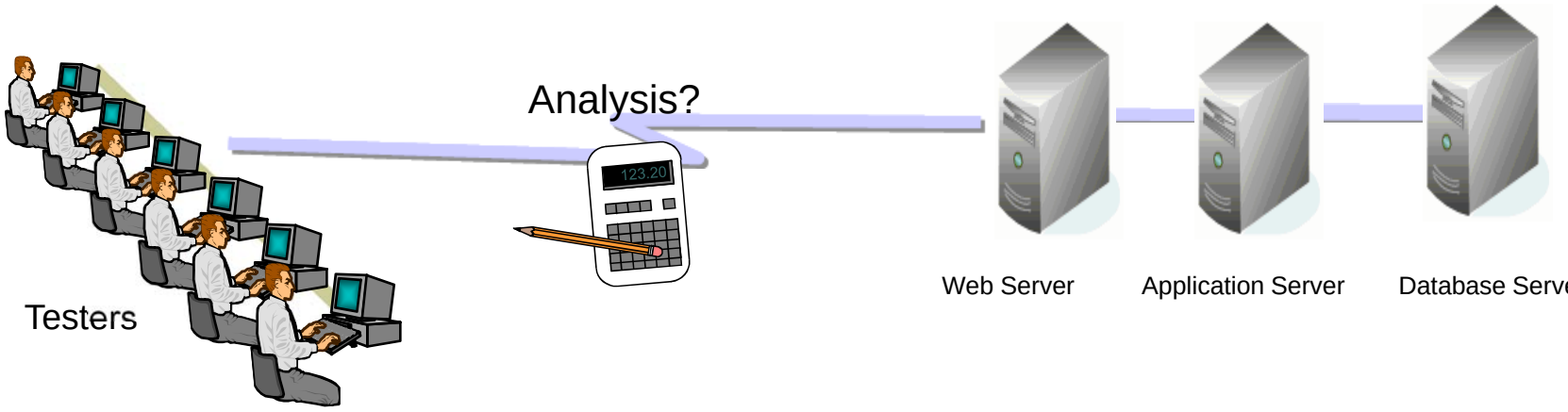
Different Testing Types

- Volume – test designed to identify the maximum throughput (total transactions/time) of a system
- Endurance – test designed to evaluate system performance under normal load conditions over an extended period of time
- Scalability – test designed to measure system performance while steadily increasing user load

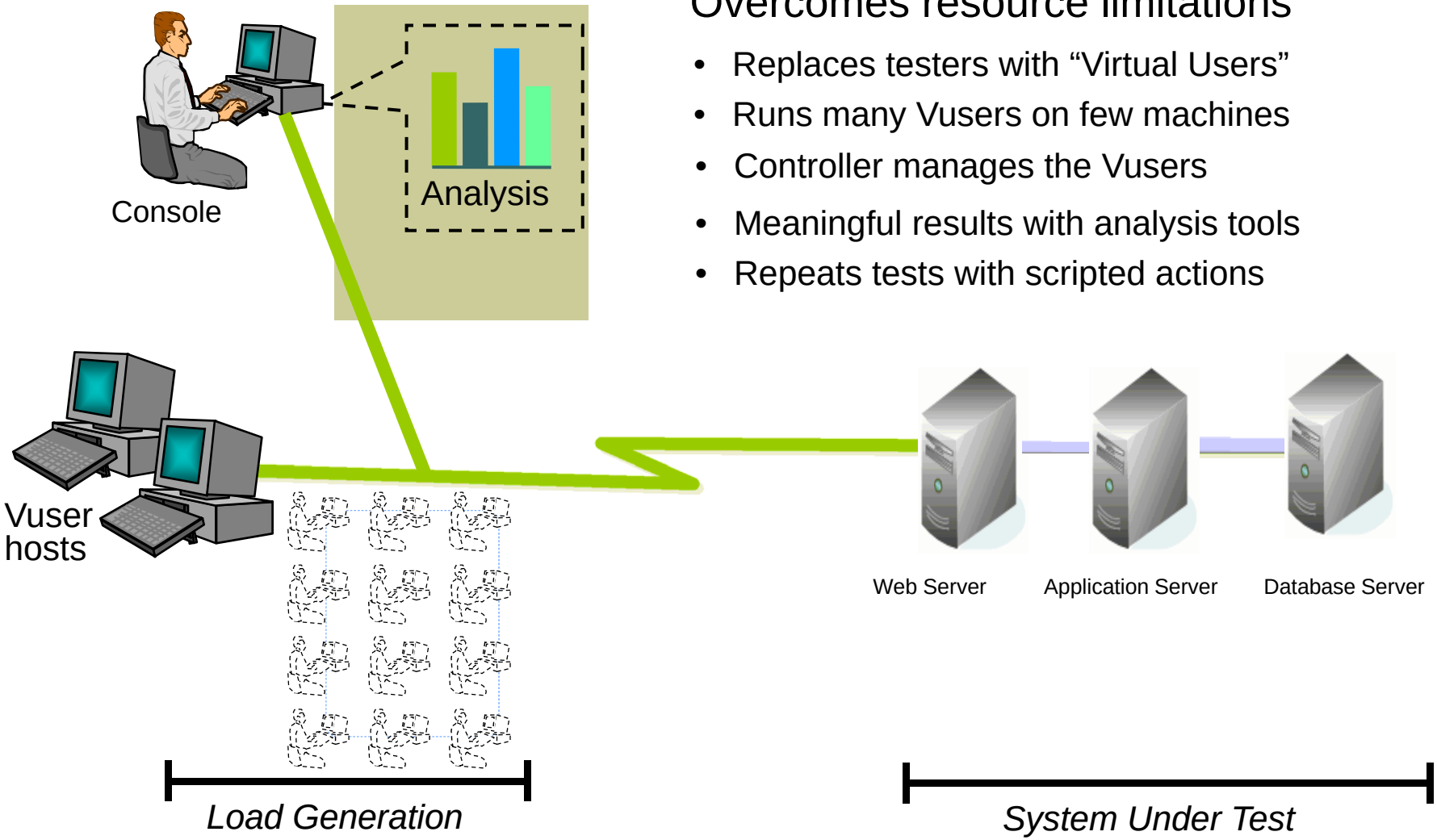
Manual Testing Solution

Challenges:

- Testing resources
  - Testing personnel
  - Client machines
- Synchronize users
- Collect and analyze result
- Reproducibility



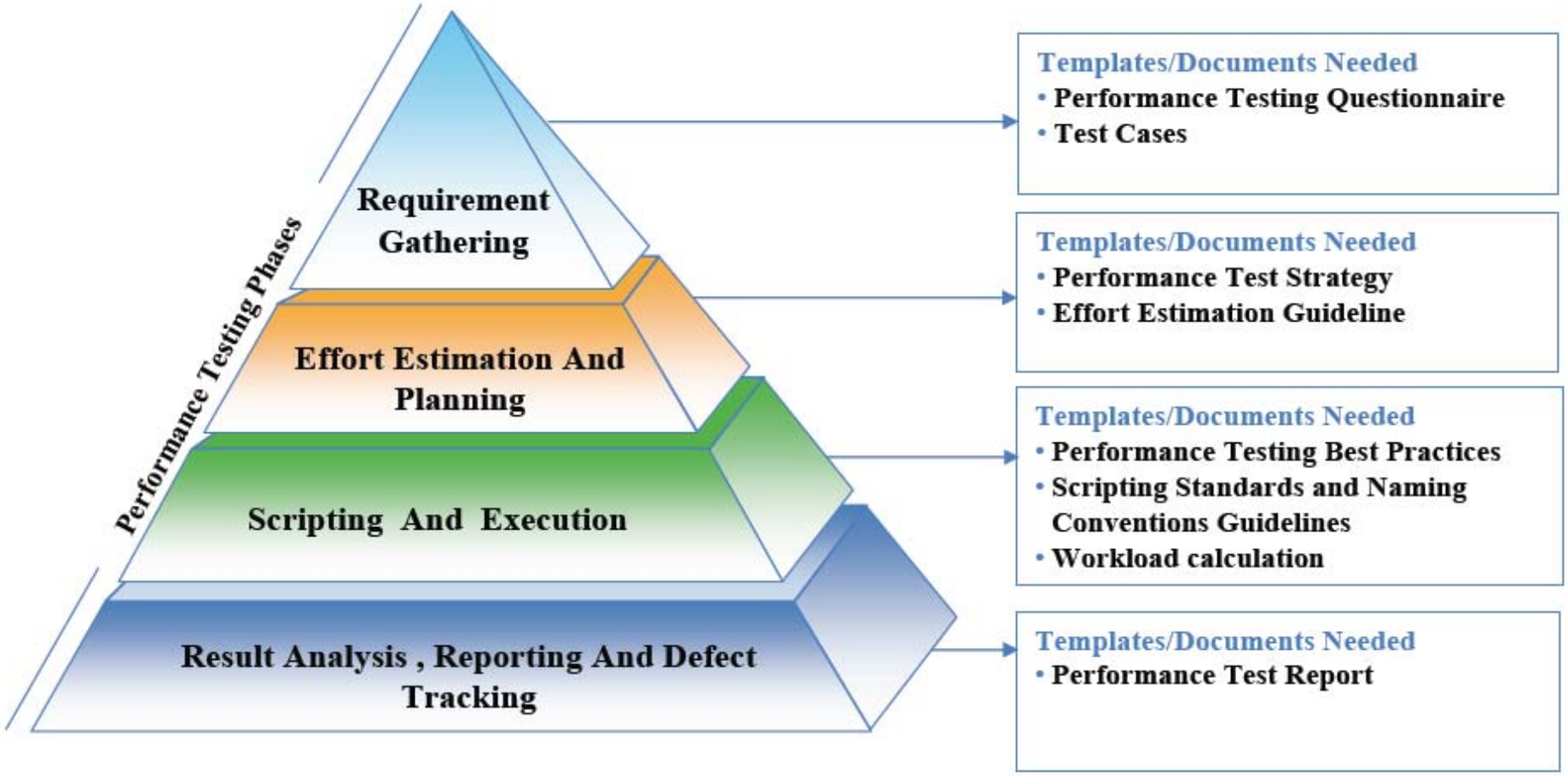
Automation Testing Solution



Overcomes resource limitations

- Replaces testers with “Virtual Users”
- Runs many Vusers on few machines
- Controller manages the Vusers
- Meaningful results with analysis tools
- Repeats tests with scripted actions

Performance Testing Steps



Performance Test Tools

- Commercial Tool
  - LoadRunner (HP) – Avaya
  - SoapUI - Avaya
  - VSTS - Spotzer
  - Rational Performance Tester : IBM Rational
  - NeoLoad : Neotys
  - Silk Performer : Borland (Segue)
- Open Source Tool
  - JMeter - PSI
  - OpenSTA
  - Database Opensource Test Suite (DOTS)
    - DBMonster

JMeter Introduction

- **Apache JMeter** is open source software, a 100% pure Java desktop application designed to load test functional behavior and measure performance

- Different server types supported:
  - ✓ Web - HTTP, HTTPS
  - ✓ SOAP
  - ✓ Database via JDBC
  - ✓ LDAP
  - ✓ JMS
  - ✓ Mail - POP3(S) and IMAP(S)

JMeter Demo

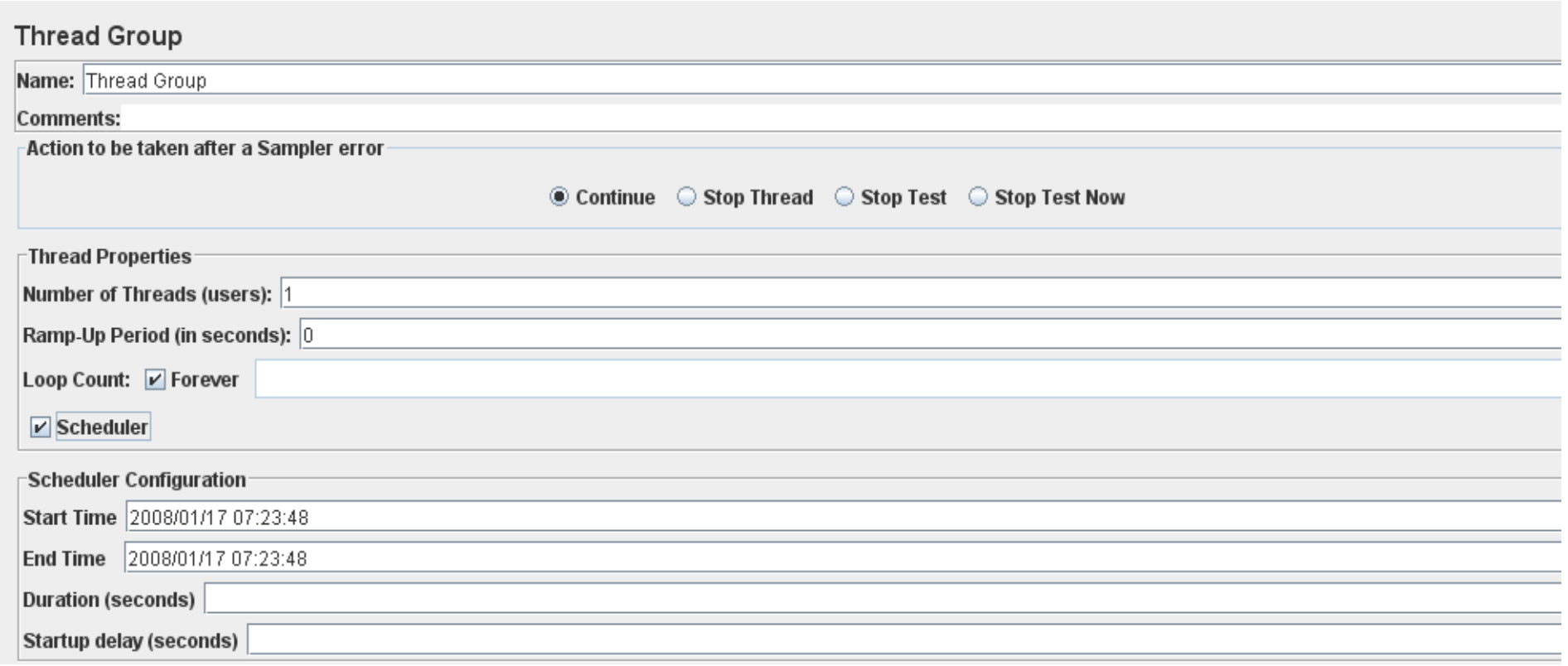
1. Plan and Design:

Scenario ID	Function	% User Distributi	# of Users	Owner	Date
Common_01_LoginToSharepoint	Login	20.00%	400	Amy	2009-3-27
BrowsingSharepointHomePage	Browsing - Navigate to Sharepoint Home Page	18.00%	360	Bob	2009-3-27
BrowsingCAOHomePage	Browsing - Navigate to one organization page CAO	18.00%	360	Bob	2009-3-27
Blog_01_BrowsingBlogHomePage	Browsing - Navigate to Blog page	14.00%	280	Alice	2009-3-27
Wiki_01_BrowsingWikiHomePage	Browsing - Navigate to Wiki page	14.00%	280	Amy	2009-3-27
SearchOnHomePage	Searching - Search on Home Page	1.00%	20	Bob	2009-3-27
SearchOnCAOHomePage	Searching - Search on one organizatio	1.00%	20	Bob	2009-3-27
Blog_06_SearchOnCAOBlogHomePage	Searching - Search on Blog page	2.00%	40	Bob	2009-3-27
Wiki_04_SearchonWikipage	Searching - Search on Wiki page	2.00%	40	Bob	2009-3-27
Blog_02_CreateBlogPost	Creating -Create a Blog Post	3%	60	Alice	2009-3-27
Blog_03_EditBlogPost	Editing - Edit a Blog Post	1%	20	Alice	2009-3-27
Blog_04_CreateComment	Creating- Create a Blog Comment	1%	20	Alice	2009-3-27
Blog_05_EditComment	Editing - Edit a Blog Comment	1%	20	Alice	2009-3-27
Wiki_02_CreateWiki	Creating - Create Wiki page	3%	60	Amy	2009-3-27
Wiki_03_EditWiki	Editing - Edit Wiki Page	1%	20	Amy	2009-3-27

Test Plan

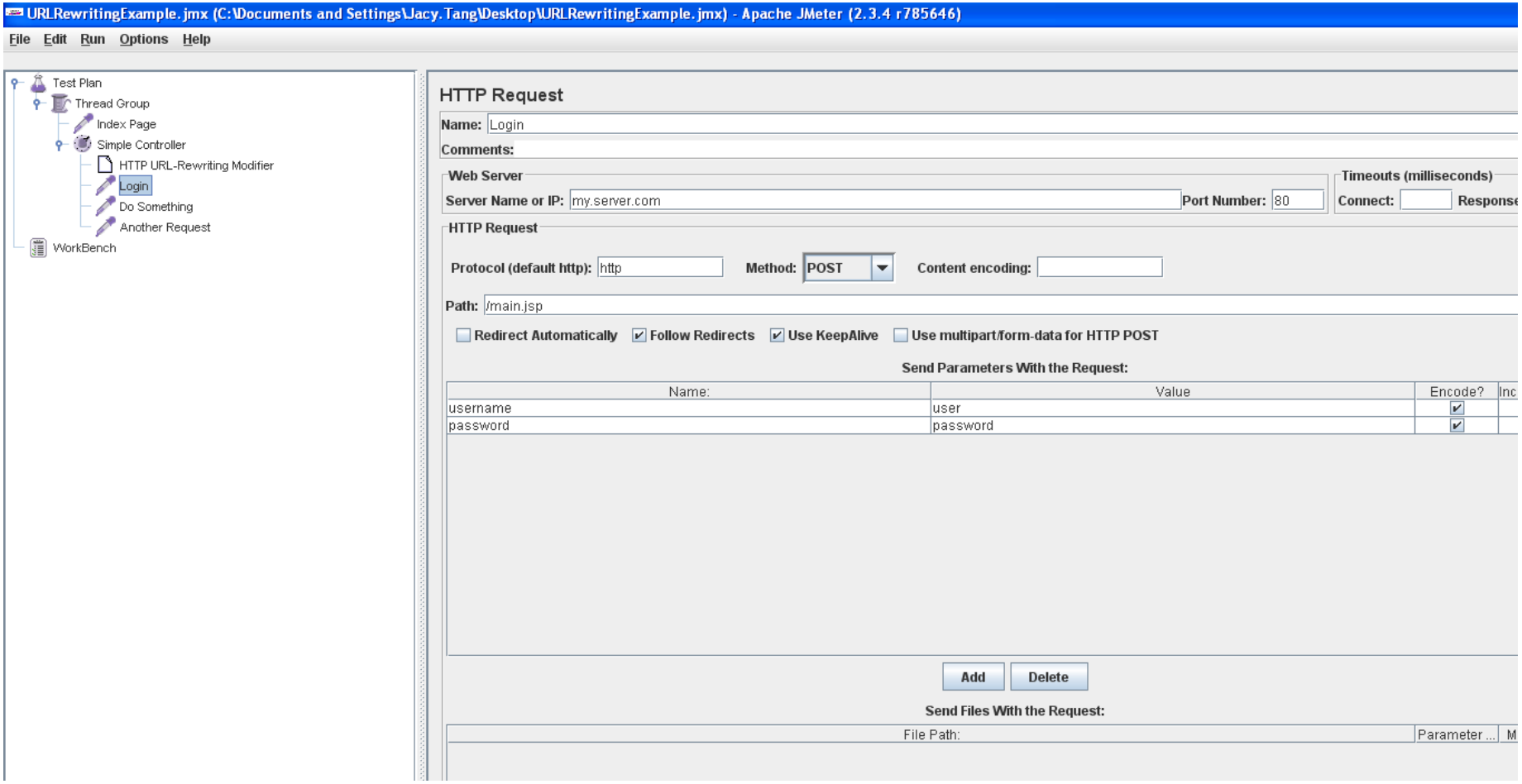
JMeter Demo

- **2. Scenario Creation :**



JMeter Demo

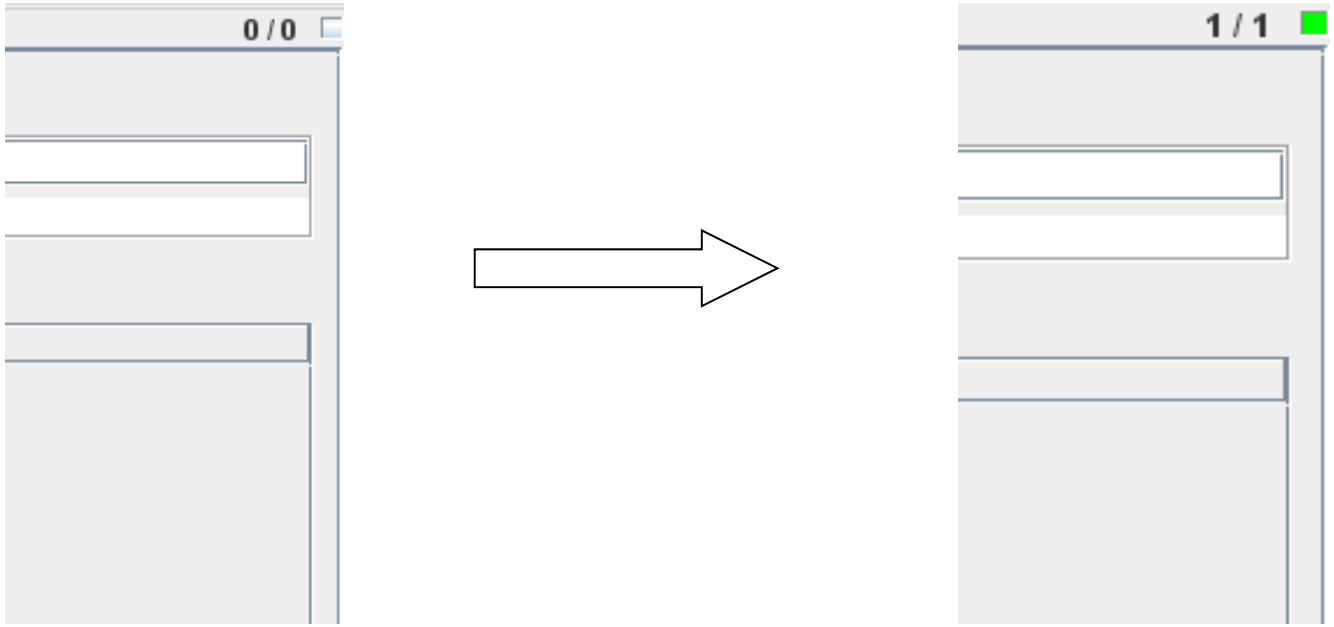
3. Develop script:



JMeter Demo

4. Scenario Execution :

- Run -> Start
- CRTL – R



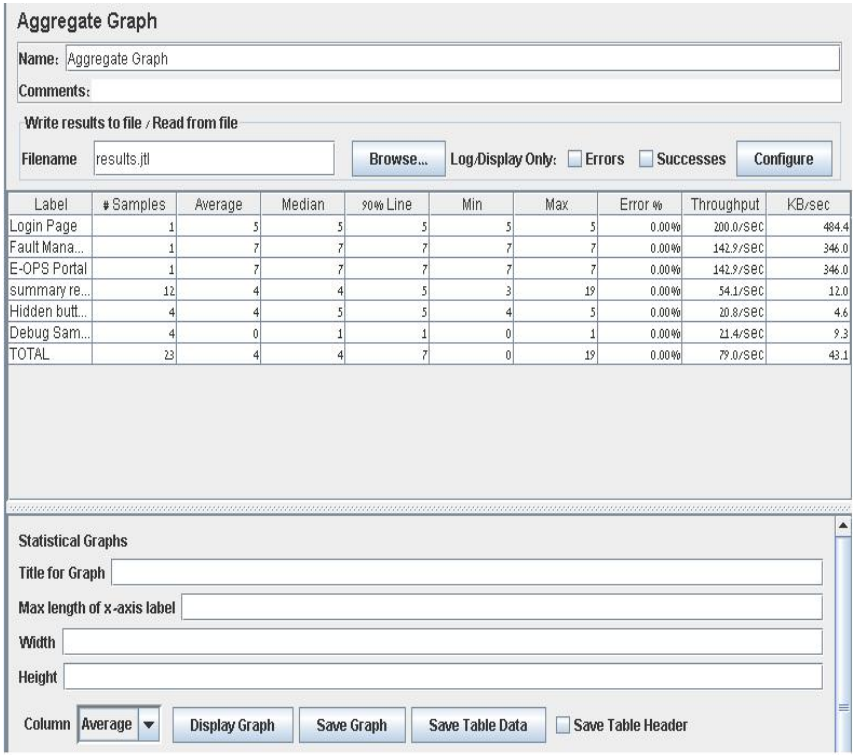
Not Running

Running

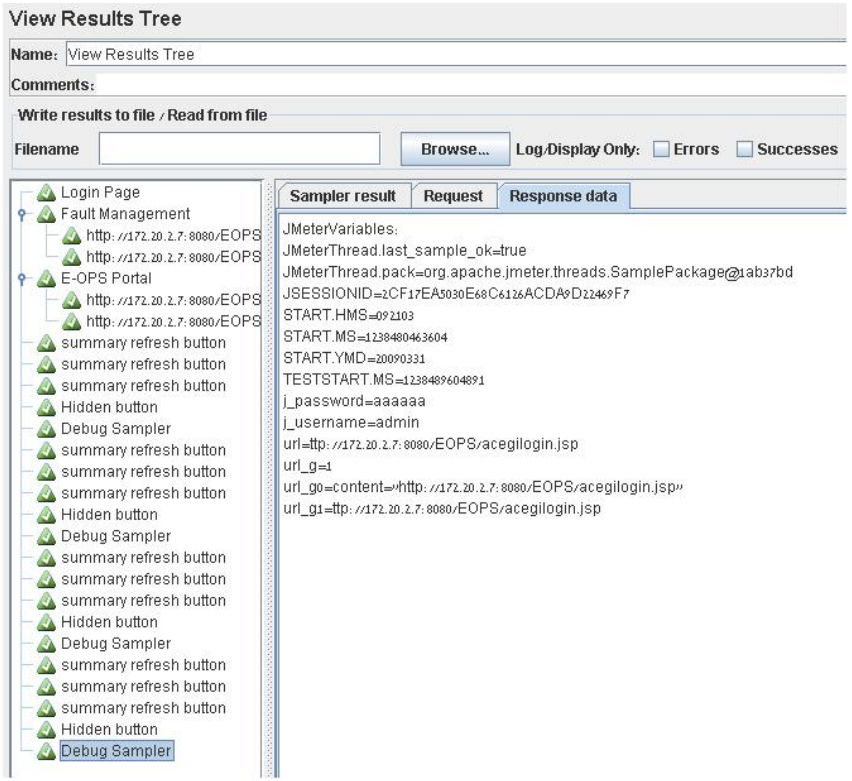
JMeter Demo

5. Analysis:

Aggregated graph



Result tree



Review

- What's performance testing?
- Why do performance testing?
- Performance testing activities
- Performance testing tools
- JMeter demo

Reference

Test COE:

https://wiki.perficient.com/confluence/display/china/Testing+CoE

Performance testing:

http://msdn.microsoft.com/en-us/library/bb924375.aspx

JMeter

http://jakarta.apache.org/jmeter/usermanual/index.html

https://wiki.perficient.com/confluence/display/china/JMeter

Open Source Tool

http://www.opensourcetesting.org/performance.php

Load testing

- **load testing**: Measuring system's behavior and performance when subjected to particular heavy tasks.
  - often tested at ~1.5x the expected SWL (safe working load)
    - testing a word processor by loading large documents
    - testing a printer by sending it many large print jobs
    - testing a web app by having several users connect at once

- Differences between performance and load testing
  - performance testing looks for code bottlenecks (which are often the same at any level of load) and fixes them
  - in load testing, *level of load remains fixed*
  - load testing measures performance at a given level of activity so that you can make decisions about allocating resources

Goals of load tests

- Expose bugs that don't show up during normal usage
  - memory leaks / memory management problems
  - buffer overflows
  - concurrency problems / race conditions

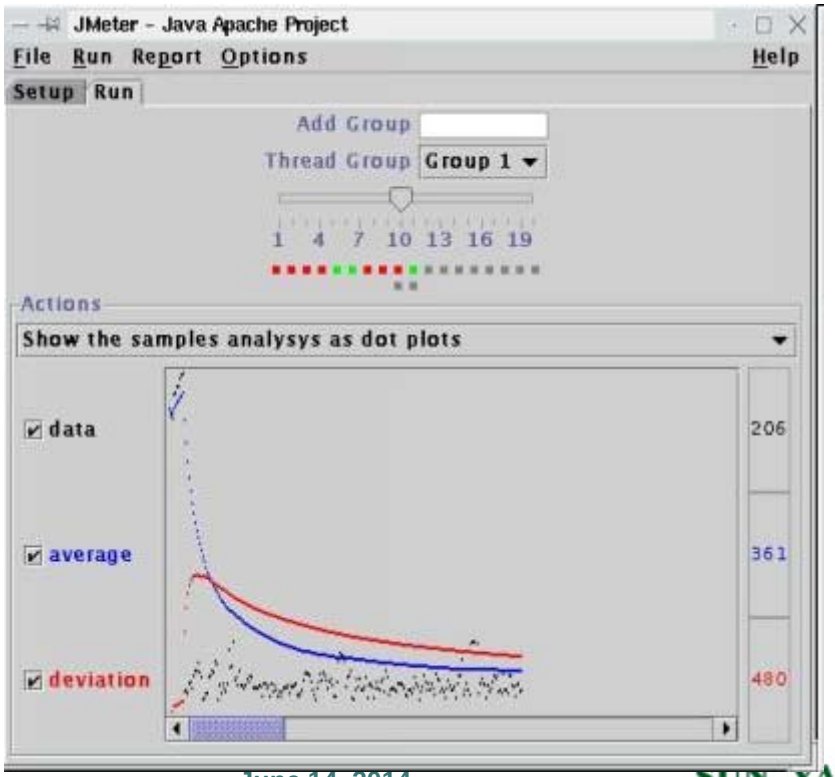
- Ensure that system meets performance requirements
  - load tests can be done repeatedly as regression tests to make sure system retains required performance

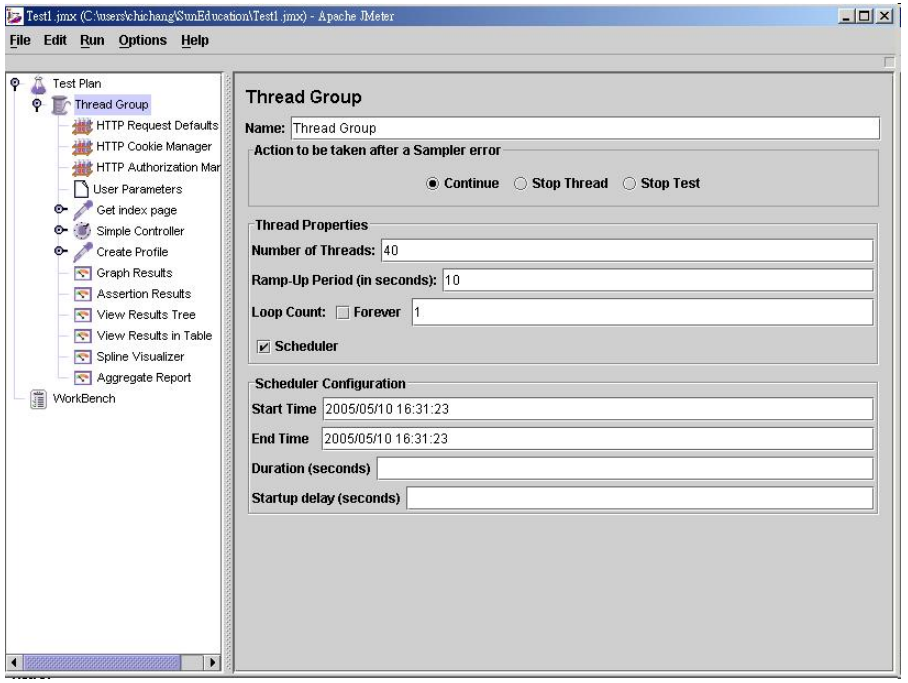
Stress testing

- **stress testing**: An extreme load test where the system is subjected to much higher than usual load.
  - often an error (timeout, etc.) is the expected result
- Goals of stress testing
  - see how gracefully the system handles unreasonable conditions
  - discover any data loss or corruption problems when under load
  - test recoverability and recovery time
- Difference between load and stress testing
  - stress testing often runs at a level of load far beyond load tests
  - stress tests are meant to break things
  - there's no clear boundary between a load test and stress test

JMeter

- Apache's JMeter software performs load tests on a web server
  - Youtube Video: Getting Started with JMeter





Thank you!