

Audience

- Who should be interested in Load Testing?
 - Do you know you need to test?
 - Do you recognize you *ought* to test?
 - Do you think you need to *bother* testing?
 - Have you never even considered testing?
- · All web application developers should be
 - You may have reasons to have dismissed it
 - Many common challenges have been overcome

Why Should I Care?

- · Even if your application doesn't expect high load
 - · How it will perform under light load?
 - How will some programming or configuration change effect performance under *current* load?
 - How many users can be sustained, if load does increase?

Just the Facts

- Most developers are familiar with the "concept" of load testing, but very few actually do it!
- Most common reasons for not testing are time, complexity & cost (can be very expen\$ive)
- Sites can run into performance problems with only a few users
- Performance problems are usually discovered too late to address the issues effectively

What does it mean for your site to perform or scale well?

- Delivers page views to users in 3-8 seconds or less (varying industry standards)
- Performs consistently throughout a visitor's session
- Response times scale linearly as user load increases, as opposed to exponentially

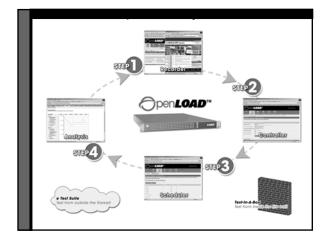
What is a Load Test?

- Simulates multiple users to measure, define, validate and maintain optimal application performance, scalability and reliability
- Serves as a compass for understanding the limits of any Web-enabled application and, subsequently, for managing its performance and growth

Virtual User Simulation

- You don't need to gather users together to do a test!
- · Load testing tools can create "virtual users"





Load Testing over the LAN vs. the Internet

LAN Testing:

Eliminates network variability due to the Internet
Saturates system rather than the network

Internet Testing:

- Uncovers hidden delays due to Internet "weather"
- Exercises your pipe, routers, firewalls and load balancers in addition to the system under test
- · Ensures Service Providers are meeting SLAs

Creating a Real-World Load Test

Customer Case Study:

- Set up a User Scenario
- Configure a Load Test Controller
- Schedule a Load Test Run
- Analyze Test Results



Step 1: Recorder

- · Setup a "User Scenario"
 - This describes how a user might browse through your site
 - Literally, like turning on a VCR, you'll record your steps through the site
 - Record/stop/pause/resume
 - No scripting required!



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Step 2: Controller

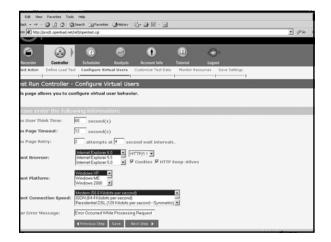
- Configure a Load Test "Controller" ٠
 - · This describes the characteristics of the virtual users you want to simulate
 - Number of users/duration of test
 - Browser type/connection speed to simulate

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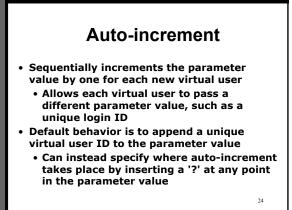
- Get varying form input data from a file
- Set server-side monitoring
- And more

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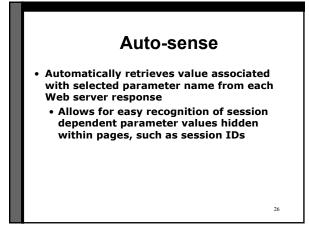




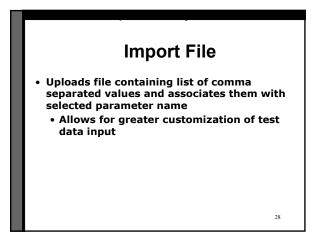
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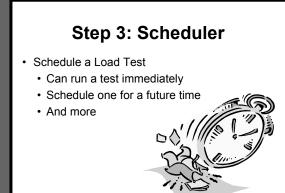


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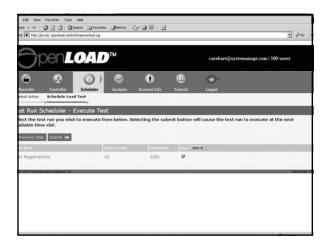
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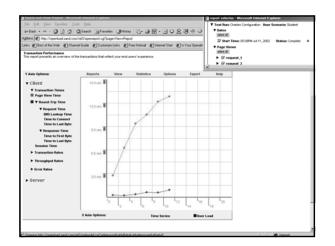
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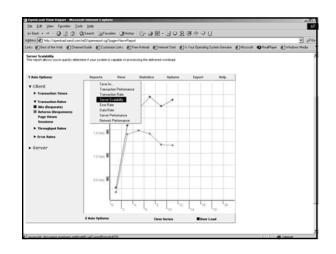
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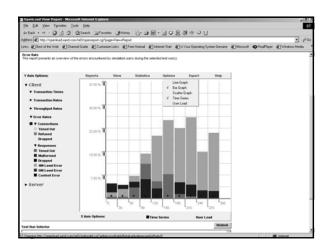




- · Analyze Test Results
 - · View the performance of your web app
 - Provides multiple graphs for review
 - Each graph offers variations of how/what data is presented
 - Can graph multiple types of data at once
 - Can even graph multiple test runs at once







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Additional OpenLoad Features

- · Supports cookies, sessions, HTTPS/SSL
- Supports web/Windows Authentication
- Supports Frames JavaScript, Java, Flash Planned Enhancements:
- Even more intelligent analysis
- · Broader server-side monitoring
- Much more

Key Benefit for Java Developers

- · Easy to use
- · No software installation required
- Puts testing into developers hands
 No longer the province of "the test team"
- Allows you to perform testing throughout application life-cycle
 - · Load test from development to deployment

Maybe High "Load" Isn't a Problem You Foresee

- · Can load testing still be useful for you?
- Can certainly look to common performance tuning opportunities as sources of bottlenecks in high or even low load situations



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Common Tuning Opps

- Determine impact of various opportunities:
 - Coding changes
 - Database design/config/coding changes
 - JDK tuning and/or version upgrade
 - App server configuration changes
 - Web server configuration changes
 - System architecture changes
 - HTML coding changes

Common Tuning Opps: "Classic" Coding Issues

- Certain classic tuning questions may not be that
 important compared to many others we will discuss
 - · Using StringBuffer rather than String
 - · Minimize number of synchronized methods in loops
 - · NULL objects for garbage collection
 - · Local variables are faster than class variables
 - · Wrap session beans around entity beans

Common Tuning Opps: DB Design/Config

- Database processing is usually large contributor to poor performance
- While some have benefit of a DBA, many do not
 - · Starts with choice of right DBMS for the job
 - Proceeds to good database design
 - Proper use of indexing can have big performance impact
- · Use DBMS options to test/tune your SQL and DB design
- · Use and tune connection pooling
- · Consider stored procedures if supported by DBMS

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Common Tuning Opps: DB Coding

- Biggest goal is to avoid unnecessary DB I/O

 Avoid SELECT *
 - Consider SELECT count(*) to get table count
 Test for your database. Not always best.
 - Use aggregate functions, inner and outer joins; unions
 Versus coding to achieve same result in app server
 - · Avoid sorting (ORDER BY) where possible
 - See Ben Forta's "Teach Yourself SQL in 10 Minutes"
 If new to SQL or only know basic SELECTs
- Don't do in servlet/JSP what can be done better in the DBMS/SQL

Common Tuning Opps: JDK Tuning and/or Version Upgrade

- Tune size of JVM, JVM parms for application profile
 Small/large footprint apps have different needs
 - See vendors usage guides for specific JVM tips
- Consider alternate JVM
- Sun's HotSpot
 - java.sun.com/products/hotspot/index.html
 - BEA's JRockit www.bea.com/products/weblogic/jrockit/index.shtml
 - · acquired from Appeal Virtual Machines
- · Consider upgrade to latest JDK

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Common Tuning Opps: Web Server Config

- Web server limitations (IIS on Win2k Pro supports only 10 users by default, for instance)
- Don't use SSL pages where they're not needed
 - Ok for credit card/privacy info request processing
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 - But don't put whole site or section under SSL if not needed
- Consider hardware level encryption and decryption

Common Tuning Opps: System Architecture

- Consider benefits of scaling hardware/software
 - Vertical scaling: adding memory, CPU power, multiple CPUs per box
 - Horizontal scaling: S/W vs H/W load clustering, round robin DNS
- Consider tiered server configuration
 - Separating database server from web/app server
 - Possibly creating separate image server
 - Possibly sharing a single file/template server for multiple clustered app servers

Common Tuning Opps: HTML Coding

- · Beware of page "weight" (graphics: too many, large)
- Consider pre-load scripts to load images before they are needed
- Validate on the client whenever possible (JavaScript or ActionScript)

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Performance Opportunity: Monitoring

- Each app server may offer its own monitoring features
 Look for slow requests, excessive queue lengths & wait times
- · Things you can monitor with O/S tools
 - Memory contention issues (paging)
 - Heavy disk I/O (high service times)
- · Other possible monitors
 - Network latency (packet collisions & lost)
 - · Database monitoring (excessive IO, locking, etc.)
- OpenLoad has added integration with such monitoring
 More will be added

Improving Apparent Response Time

- · Leverage browser caching where appropriate
- Consider gzipping output
 - · Can set at web server level, can also program

More Tuning Opportunities

- These have been just a few of the more common tuning opportunities
 - · Not all will make sense for all sites/apps
- · There are still more
 - Many of which may not be obvious but may be valuable
- · Planning to create a benchmark site
 - To be published showing impact of various changes
 Using a standard application suite
- · Still need to test/tune these things for yourself

Leverage Knowledge of Others

- · Perform design and code walkthroughs
- · Keep up on, apply industry best practices, coding stds
- · Participate in user groups
- Read Java Developers Journal, Java Pro magazines
- Watch sites such as TheServerSide.com. etc.
- Join email mailing lists



Resources for Learning More

- JavaWorld Performance Tuning Channel
 - javaworld.com/channel_content/jwperformance-index.shtml
- Java Performance Tuning
 - javaperformancetuning.com/resources.shtml
- Use JDBC for industrial-strength performance
 - javaworld.com/javaworld/jw-01-2000/jw-01-ssjjdbc.html

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Test your app for FREE

- Register at http://www.opendemand.com/java/
- Test for FREE. Choose either:
 - up to 25 virtual users for one hour
 or up to 5 virtual users for a currently unlimited time period
- Obtain online copy of this presentation
- Try-out performance tuning tips
 Test again and compare results to your baseline

