



Load Testing 2.0 for Web 2.0

Simplifying performance validation for Rich Internet Applications

White paper



Table of contents

Executive summary	2
Web 2.0: delivering a better customer experience	3
Enabling technologies for Web 2.0	4
Performance testing challenges and requirements	4
Performance testing with HP Software solutions	5
Test the performance of Rich Internet Applications	5
Break down the page to specific components and isolate performance issues	6
Test performance for complex web operations	6
HP Software solutions and products	7
HP LoadRunner software	7
HP Performance Center software	8
HP Software differentiation	8
Getting started	8

Executive summary

The arrival of the Web 2.0 wave has far-reaching implications for web applications, web users and for companies that do business over the Internet or use web-enabled business applications in enterprise environments. In short, Web 2.0 is a huge technology trend that will revolutionize the way users interact with the web and the way enterprises use and manage web-enabled applications.

But what is Web 2.0? While the name suggests a new version of the World Wide Web, that's not the case. Instead, Web 2.0 is a loosely defined term that can refer to a second generation of web-based applications and the technologies that support them. The term can also refer to the transformation of websites into computing platforms that support thin client computing and the enablement of greater sharing of information, including sites built around user-generated content.

Under any definition, Web 2.0 applications leverage advanced Rich Internet Application (RIA) technologies (such as Ajax and Adobe® Flex), along with enablers (such as RSS and blogs). From an end-user perspective, these technologies allow a richer, faster, more interactive experience with browser-enabled applications and services. From an enterprise perspective, these RIA technologies help companies deploy new, customer-friendly application functionality in less time and at a lower cost.

Today, RIA technologies are making dramatic inroads in corporate environments. Industry analysts expect that by 2010, the majority of new application development projects will include RIA technology, and a large percentage of those projects will rely primarily on RIA. Here's one example of how fast RIA is moving: By 2008, an estimated 20 percent of banks will deploy at least one channel using RIA client technology.

One of the big reasons for the growth of RIA technologies is a better user experience. This stems from the asynchronous nature of server requests from clients using Web 2.0 applications. Unlike a conventional web application, the Web 2.0 approach refreshes only what is updated on a web page, instead of refreshing the entire page. In this sense, the application acts like a thick client—but without client software other than the web browser.

By avoiding the time lags associated with interactive web applications, these next-generation applications deliver a faster, easier and smoother user experience. They essentially turn a sluggish click-and-wait process into a streamlined workflow, similar to the experience of using desktop productivity applications (such as the Microsoft® Office system).

But this enhanced experience isn't a given. While these rich next-generation applications promise a radically different customer experience, they also have the potential to overwhelm the servers and networks that deliver the content to client browsers. Both the promise and the potential pitfalls stem from the unique ability of RIA technologies to continually exchange small and granular amounts of data with a server. When thousands of users are interacting nearly continuously with an application, the strains on the back-end servers can be enormous.

The same type of issue holds true if your company is deploying mission-critical applications that use RIA technologies. As evidenced by recent surveys, many large enterprises are considering or already implementing these technologies. And major providers of enterprise applications, including Oracle® and SAP, are updating their application portfolios based on a Web 2.0 technology stack. So clearly, Ajax is here today.

Given the potential peak demands of these next-generation applications, it's wise to approach the Web 2.0 wave with caution. For example, how do you know how well these applications will perform? And how do you know whether they will collapse under the weight of certain loads? This is very different from a web application in which a user click results in an immediate transaction with the server. So before Ajax or other RIA technologies can be ready for prime time in your business, you need to verify that they can deliver enterprise-scale performance.

All of this points to the need for sophisticated tools to test the performance of Web 2.0 applications and services in a pre-production environment. In short, when you're rolling out these next-generation applications on an e-commerce site or a mission-critical enterprise application platform, you need to be confident that your systems can handle the loads. Yet with conventional performance testing solutions, this is easier said than done. There are many unknowns in stress testing Web 2.0 applications.

The world of load testing has changed. Ajax is here today, and it has the potential to overwhelm your servers and networks. Are ready for it?

At HP, we understand this critical gap in your ability to deliver the next generation of applications, and we offer a unique set of tools to help you cross this chasm. Our performance validation tools, which are already well established in enterprise and service provider environments, now bring you the tools and technologies to measure and optimize the performance of your next-generation applications. Whether you are considering RIA technologies for test projects or mission-critical applications, HP offers tools for performance success.

Web 2.0: delivering a better customer experience

Web 2.0 adds a layer of Rich Internet Application technologies that enable a richer, faster user experience. These new technologies build on the underlying capabilities of the World Wide Web to make web pages more responsive to the needs of users and to enable greater interactivity. They allow users to post content and to see updates to web pages in a fraction of the time required with conventional web technologies. This is one of the key business drivers for Web 2.0 applications: a better customer experience, whether that customer is a shopper buying a book on the web or an enterprise employee updating customer data in a mission-critical business application.

To understand how Web 2.0 changes the user experience, it's helpful to step back and consider a common experience in today's web environments. To make a purchase online, a customer clicks through a website, going from page to page. With each click, the customer watches one page disappear and waits for another page to appear. The wait at each step in the process might be a few seconds, several seconds or much longer, depending on many variables that are largely a mystery to the user.

If, for example, a website is experiencing extremely heavy traffic, a page might take 30 seconds or more to load. That amounts to a bad customer experience. It can also be bad for the company that's doing business online. The longer a page takes to load, the more likely it is that the customer will abandon the transaction in midstream and take his or her business to a competitor. Today, an untold amount of business revenue is lost every day to this problem.

The same sort of issue arises with the use of many web-enabled business applications used in today's corporate environments, such as Oracle and SAP. With these enterprise resource planning (ERP) applications, users click from page to page, waiting at each step for pages to populate with requested information, such as the names of employees within a particular division of the company, and then perhaps a particular subset of that division. In these cases, the lag times cause lost productivity and can lead to employee frustration with day-to-day work.

Ajax, Flex and other RIA technologies respond to this challenge. In essence, these technologies allow web-based applications to behave like desktop applications. Take, for example, today's widely used word-processing programs. As the user interacts with a document, changes appear immediately. When a user changes the fonts in a section of the document, the result of the change is immediately apparent. The user doesn't have to watch one page go away and wait for a page to reload with the new fonts showing. Instead, it all happens instantaneously.

With the arrival of RIA technologies, there are many new, more granular performance questions. If you can't answer these questions, you can't expect success with Web 2.0 applications.

The data in different sections of pages is continually populated and updated in the background. A user making an online purchase or updating employee information in a corporate database doesn't have to wade through a sluggish process with distinctly different steps, each with its own page-load times. Or, say, a user who has a home page open doesn't have to refresh it periodically to check for updates to stock quotes. Changes like this happen automatically, in the background, without the need the need to reload entire pages.

Enabling technologies for Web 2.0

Two of the major technologies that enable the capabilities in Web 2.0, including the ability to continuously update content on web pages, are Ajax and Flex. These technologies offer different approaches to the implementation of Rich Internet Applications.

Ajax is an acronym that stands for "Asynchronous JavaScript and XML." This open-source, client-side technology enhances JavaScript to enable the creation of next-generation interactive web applications. In particular, it allows web browsers and servers to exchange small amounts of data behind the scenes, without requiring web pages to reload entirely with each exchange of data. This capability is meant to increase the interactivity, speed and usability of web pages.

For a relatively young technology, Ajax has enormous momentum. Already some 1.7 million developers are using Ajax, and another 3 million developers are evaluating the technology.¹

¹ Evans Data. Live From AJAX World – Report 2 – John Evans, Evans Data

Flex, in turn, builds on the enhanced multimedia capabilities of Adobe Flash software to make it faster and easier to develop multimedia-rich applications. Flex helps application developers bring web pages to life for a richer, more interactive user experience. It reduces the animation challenge by providing a workflow and programming model that is familiar to application developers.

Flex has tremendous momentum in the Flash development community. Adobe is making major investments in Flash-enabled Flex to make it a new ubiquitous client. The company recently announced plans to release source code for Flex, moving the framework into the open-source arena.

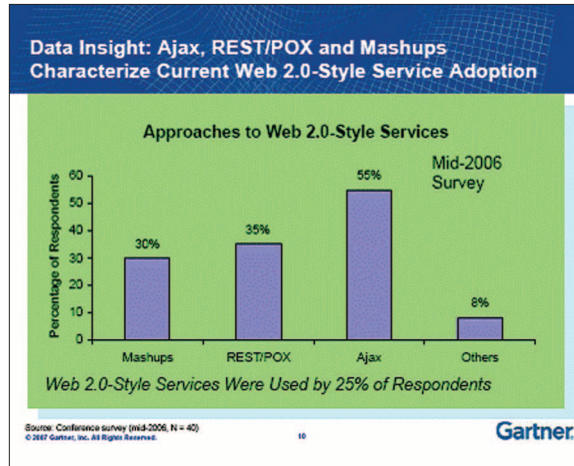
While they don't change the underlining web infrastructure, Web 2.0 technologies create a new set of performance management challenges. In short, with the arrival of Ajax, Flex and related technologies, performance management enters a new, more challenging realm.

Performance testing challenges and requirements

In a Web 2.0 world, performance testing becomes more complex. With today's standard web applications, performance is measured primarily in terms of round-trip times between the client's web browser and the server that delivers the data to the browser. When Ajax is put to work, it can cause dramatic increases in the number of browser-to-server HTTP calls made in the background. This increase in traffic, in turn, can have a dramatic effect on performance.

Figure 1.
Web 2.0 service adoption.

A Gartner study found that Web 2.0-style services were in use by 25 percent of respondents. Of those working with Web 2.0 technology, 55 percent were using Ajax technology.



While users might not be aware of these round-trips between the browser and a distant server, they are sure to notice performance problems if a server, application, network or client-side browser bogs down under the weight of the increased load. This situation makes performance management all the more important in a Web 2.0 world.

If you're developing or deploying applications in this new environment, you need to think about performance testing in new ways. A few examples: You now need to test the times required for multiple web page HTTP calls. You need to test the rich user experience in terms of the time required to complete common actions, such as dragging-and-dropping elements and viewing or deleting web-based e-mail. And you need to test application responsiveness to client activity, including the speed of data updates and changes.

These are hard things to do with existing solutions for performance testing. Among other limitations, most of the solutions in use today are not able to record and replay multiple HTTP calls per page. This is an essential capability for testing Web 2.0 applications. Web applications that have hundreds of HTTP calls must give these calls a context to link them to page elements, provide logical sequencing and create automatic transactions. What's more, most existing solutions do not isolate slow calls that affect the user experience versus slower cache calls. And they have no support for specific frameworks—they use the same terminology for reports and higher-level abstraction.

These challenges point to three key requirements for Web 2.0 performance validation:

- Test the performance of Rich Internet Applications.
- Break down the page to specific components and isolate performance issues for each component.
- Test performance for complex web operations, such as drag-and-drop web mail.

HP is uniquely positioned to help your organization meet all of these requirements.

Performance testing with HP Software solutions

Test the performance of Rich Internet Applications

Web 2.0 services can use Ajax, Flex and various other RIA and next-generation programming technologies. To validate the performance of services, you must be able to test these advanced technologies.

HP performance testing solutions give you this. For example, HP offers:

- Built-in record and replay capabilities for Rich Internet Applications
- Ajax framework solutions based on Click and Script technology that reduces the scripting process to a few mouse clicks; this includes generic Ajax support and leading framework support (such as Microsoft, Google, etc.)
- Performance testing for Flex
- Performance testing for web services
- Client-side breakdown

“By 2008, the Web 2.0 vision will be adopted as the mainstream Web and will disappear as a separate category (0.8 probability).”²

—Gartner

Break down the page to specific components and isolate performance issues

With Web 2.0 applications, it is no longer enough to test the amount of time that it takes for an entire page to load. Instead, you need to test the amount of time that it takes for different components of a page to be updated. To do this, you need to break down a page into specific components and then isolate the performance for each.

How fast does the skeleton of the page load? How much time does it take for stock quotes to appear on a user’s home page? And how does that compare with the load times for business news headlines and the local weather. Or how much time does it take for an updated list of employee names and numbers to appear in an ERP application?

These are the types of granular performance questions that need to be answered before you roll out Web 2.0 services. If you can’t answer these questions, you don’t have the view you need to deliver a first-class customer experience.

HP performance testing solutions allow you to answer these questions by emulating the actions of hundreds or even thousands of users and then capturing the response times for key processes and transactions. This type of information gives you the view you need to optimize your applications for better performance.

² “Web 2.0: Structuring the Discussion,” Gartner research publication G00142450, Oct. 31, 2006.

Test performance for complex web operations

With Web 2.0 applications, there are fewer web-page refreshes but much more interaction with back-end servers. While some changes to pages might not require interaction with a server, many user actions trigger interactions with back-end servers.

Take the case of a simple drag-and-drop function, such as moving an employee name from one category to another or deleting a web-mail message. This type of function would typically require an exchange of data with a server. This means there are more variables in the performance equation, and more places where performance can be a problem.

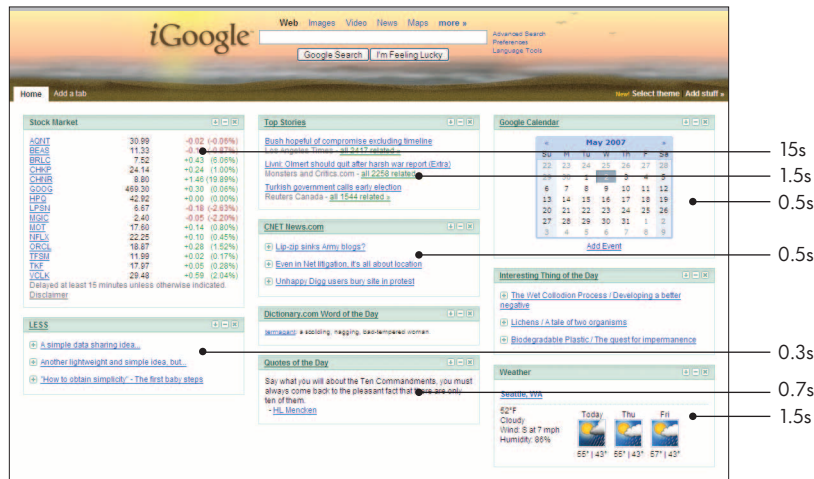
To validate performance under these circumstances, you need to be able to test the end-user experience under different loads. For example, what happens when one user completes a drag-and-drop action? How much time does it take for the page to reflect the action? And then what happens when a thousand users complete the same action at the same time? Does performance go from a fraction of a second to an unacceptable 15 seconds? Does it take 30 seconds to delete 10 e-mail messages?

To understand how your applications will work in a Web 2.0 production environment, and to optimize them for higher performance, you need be able to simulate not just the actions of one user, but the actions of many users, perhaps even thousands of users. These are among the capabilities that are inherent to the HP Performance Center suite.

Figure 2.

Testing page components.

With Rich Internet Applications, the web page is viewed in terms of individual components, each of which must be tested and managed from a performance standpoint. In this example, load times for different page components range from 0.3 seconds to 15 seconds.



HP offers unique capabilities for load testing Web 2.0 applications. Our test solutions allow you to emulate the actions of hundreds or even thousands of users, and then capture the response times for key processes and transactions.

HP Software solutions and products

The HP Software organization offers key capabilities needed for performance validation of Web 2.0 applications. These capabilities are delivered through individual software products and bundled offerings that bring together multiple products and capabilities, including performance validation for applications that use Ajax, Flex and other advanced technologies.

Key HP product families for Web 2.0 performance validation include HP LoadRunner software and HP Performance Center software. These are both part of the broader HP Performance Center suite, which scales from project-based performance testing solutions to a 24x7 globally accessible solution for performance centers of excellence (CoE).

HP LoadRunner software

Using relatively few hardware resources, HP LoadRunner emulates hundreds or thousands of concurrent users to apply production workloads to virtually any client platform or environment. It stresses an application from end to end—applying consistent, measurable and repeatable loads—and then uses the data to identify scalability issues that would impact real users in production.

HP LoadRunner allows you to drive load, diagnose problems and deploy Web 2.0 applications with greater confidence. As it drives load against the system, it captures the end-user response times of key business processes and transactions to determine if service-level agreements (SLAs) can be met.

Non-intrusive, real-time performance monitoring features obtain and display performance data from every application tier, server and system component, and diagnostic probes gather code-level data to isolate bottlenecks down to the SQL or method level. This combination of end-user, system-level and code-level visibility dramatically reduces time-to-problem resolution.

HP LoadRunner supports performance testing for a wide range of enterprise environments. It can test web, web services, client-server, legacy, Citrix, Java™, .NET, and all ERP/CRM applications, including PeopleSoft, Oracle, SAP and Siebel. It has more than 40 non-intrusive monitors tailored for these systems, and provides diagnostics for J2EE, .NET, Siebel, Oracle and SAP.

In addition, HP LoadRunner includes game-changing technology that reduces the script-creation process down to a few simple mouse clicks. This feature, Click and Script, now supports Ajax-based interfaces. It enables you to record scripts at a higher presentation layer, making the scripting process much easier. It automatically captures the most valuable scripting information to create succinct, intuitive and self-explanatory scripts, reducing scripting time and maintenance by an average of 80 percent. These scripts are also much easier to maintain, allowing anyone to look at the scripts and quickly see what is going on in each statement.

HP Performance Center software

HP Performance Center software enables your performance engineers and performance testing teams to optimize application performance in pre-production. HP Performance Center software helps you verify that your Web 2.0 applications will scale to support the right number of users, transaction volumes and performance levels.

The center combines integrated software, services, best practices and a business dashboard for key performance optimization activities, including load-testing, performance tuning, and diagnostics across complex, heterogeneous computing environments. These features and capabilities help you validate and analyze the performance of your applications against business requirements—and mitigate the risk associated with application deployment and upgrades.

This integrated performance validation solution emulates hundreds or thousands of concurrent users to apply simulated production workloads to virtually any client platform or environment. Using HP Performance Center, your testing teams can stress an application from end to end—applying consistent, measurable and repeatable loads—and then use the data to identify scalability issues that could impact users.

Collectively, the products in the HP Performance Center suite provide a complete, on-demand optimization solution for your Rich Internet Applications. This suite gives you the capabilities that you need to validate and analyze the performance of your applications against business requirements—and mitigate the risk associated with the deployment of next-generation applications and services.

HP Software differentiation

HP is ideally positioned to deliver your performance optimization solution. We offer:

Market leadership

HP is the industry leader in load and performance testing, in terms of both market share and numbers of customers. We offer the broadest environment coverage in the industry for load testing and monitoring applications. Today we are building on this heritage of leadership by providing solutions for Web 2.0 load testing and performance validation.

A single platform

We offer the market's only performance platform that includes performance validation, optimization and diagnostics capabilities that scale from simple projects to testing centers of excellence (CoEs).

A proven solution

The products in the HP Performance Center suite have extremely high brand recognition and acceptance. Thousands of companies are currently using these products to validate and optimize the performance of business-critical applications and services.

Getting started

To gain a first-hand look at the load-testing capabilities in the HP Performance Center suite, you can test your Web 2.0 applications using a trial version of HP LoadRunner software. To download the software, or to check out a demo, visit: www.loadrunner.com or contact us at 1-800-TEST911.

To learn more about HP Software products for performance validation, visit www.hp.com/go/software or contact your HP representative.

To learn more, visit: www.hp.com/go/software

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