

**WHITEPAPER**

## Web Performance Management

### *How's My App? Five Best Practices for Web Performance Management*

Use of the Internet to enable critical business activities has grown exponentially, and along with it, the need for improved management of the performance of web applications. Application performance affects not only IT, but the business, and so business decision makers need better insight and data about the performance, availability and health of those services.

The performance of Internet-enabled business services impacts an organization's customer loyalty and employee productivity as well as its financial picture. As the use of handheld devices proliferates and users move beyond traditional PCs and laptops, the operational environment grows more complex and the result is increased business risk.

In a recent global survey of 474 business and IT decision makers, conducted by IDC on behalf of Compuware, respondents offered insights about their needs for effective operation of Internet-enabled business activities. Key findings include:

- ▶ the majority of organizations surveyed use the Internet for a variety of business activities including marketing and advertising; recruiting and hiring; customer support; employee HR; sales force and CRM; collaboration and online billing
- ▶ information on end-user experience and business service performance from the "First Mile" (your data center) to the "Last Mile" (your end users) is of vital importance; unfortunately performance reports often fail to deliver this sufficiently in business context
- ▶ 31 percent of decision makers feel their IT organizations are not well-equipped to help the business understand the impacts, risks and opportunities arising from increased use of the Internet and handheld devices
- ▶ improved, real-time information on the end-to-end performance of Internet-enabled business activities is the top priority for these decision makers for the foreseeable future.

As these survey results indicate, IT's prime objective should be providing actionable information to business decision makers to help them understand performance issues. What are these issues and how are they affecting the business? This requires a look at performance and end-user experience from the "First Mile" to the "Last Mile," not just what's inside the data center, but all the way through to real users at the edge of the Internet. In addition, service level agreements (SLAs) need to be aligned with the goals of the organization, both those of IT and the business. Further, IT must understand the effects of a multi-device, multi-browser world on performance management and how to face these new challenges.

## THE BUSINESS IMPACT OF APPLICATION PERFORMANCE

In research done by Microsoft and Google, A-B testing was used in some cases to purposely slow down web pages and see what the impact was on end-user behavior and on the business. There were some insightful results which made a strong case for the direct connection between performance and revenue. In one instance, a two-second slowdown for Bing equated to a 4.3 percent reduction in revenue per user. In another example, even a 400-millisecond delay for Google meant a severe decrease in terms of searches per user.

So, how does that impact your business?

Taking a broader view of the impact of performance on business results and end-user behavior, observing about 500 million end-user interactions with a few hundred different web sites in a variety of verticals — retail, media and financial services; the discovery was a direct correlation between the performance of the individual pages and then hard abandonment of those pages; where people simply click on their browsers' stop button or browse away without continuing to the next logical page in a workflow or a sequence. This correlation was immediately visible and consistent across all the different verticals.

If a page load time were to speed up by two seconds, a decrease in page abandonment of 8 percent would occur. Applied to real-world, real-user interactions, an increase of eight seconds in terms of performance would yield a decrease of 38 percent in page abandonment. If you could reduce page abandonment to that extent and keep customers on your site, the result would ultimately be a significant impact on your organization's revenue.

To ensure your organization is prepared to confront issues like these, this paper will explore five key best practices for managing the performance of your applications across the entire application delivery chain, from the browser on the user's computer or mobile device, across the Internet or a corporate WAN, across third-party and cloud providers, to the complex infrastructure inside data centers.

### BEST PRACTICE 1: EXTEND INSIGHT BEYOND THE FIREWALL

Many organizations still look at application delivery as no more than what's going on inside the data center. If one examines the infrastructure of all servers using traditional systems management and monitoring, and if systems management says everything is working, all servers are running and the local network is doing fine, one could draw the conclusion that end users are satisfied. But the reality of web application delivery is that even if your systems management tools say everything is working, the experience for your end users can be very different.

Applications could be loading slowly or users in different geographies could be experiencing varied load times (or worse, unavailable pages). Further, transactions could be fine on one browser, but fail in another. Those issues are not going to be reflected in traditional internal systems management tools; they're still going to show that the system is working and available.

In some cases, you may have transactions that are not displaying fully across multiple browsers. The experience could be different for your end users at the consumption point, be it their desktops, laptops or smartphones. Why is that? The issue is that many things are happening between your data center, your firewall and the end users. There is an entire delivery chain where a number of issues could arise and various elements can fail. This web application delivery chain includes your data center, major Internet service providers (ISPs), cloud services or any myriad of third-party elements that send content straight to your end users' browsers.

All of the pieces in the application delivery chain — from the first mile (your data center) to the last mile (your end users) — have to work well and in unison for the user to have a quality experience, which is what they're expecting, every time. And if a third-party element along the delivery chain fails, it's going to fail under your name, your brand; it's your reputation at stake. It doesn't matter if an ad provider, a content delivery network (CDN) or a piece of web analytics slows down your page. As far as end users are concerned, your brand failed to deliver for them.

In addition, because the browser is quickly becoming an integration platform — grabbing so much content and running so much code locally with the proliferation of Ajax and JavaScript — it becomes increasingly important to measure your availability and response time from your end users' perspective, not just from your infrastructure's perspective. The availability and success rate of transactions can be incredibly different, depending on which of those perspectives you measure.

The only way to truly understand your end users' experience is to approach performance management from their perspective. To achieve this insight, it's important to find a solution that will help you measure response times for key transactions from the outside-in, from the end user to the data center, as well as from several locations, spanning all geographies from which users access your site. You also need monitoring capabilities that are precise enough to differentiate between where problems are coming from when they are happening outside the firewall and determine which particular element of the delivery chain — the Internet, ISP, third-party CDN, cloud provider or browser/device — has broken down.

## BEST PRACTICE 2: PROVIDE ACTIONABLE INFORMATION TO THE BUSINESS

When you see a problem from your end users' perspective, you need to determine where the problem is, how big is the problem, and how soon should it be fixed. The problem could be an internal data center issue, a general Internet problem, related to various vendors or cloud service providers or even within a particular browser. Users on Internet Explorer 7, for instance, might not experience any problems, while users on Internet Explorer 8 or Firefox do. Therefore, it's necessary to establish as quickly as possible where the problem resides, before you can begin to establish a specific recourse and determine who should fix the issue.

Netmagic's WebSmart solution monitors web performance for more than 4,000 different companies. In evaluating that performance data, it discovered that the average transaction on the web includes more than 10 different hosts being called, and those hosts were delivering content straight to end users' browsers. For a typical transaction on the Internet, a browser talks to eight different fully qualified domains and eight different servers — very few of which actually reside inside your firewall. What is the contribution of these hosts to the overall response time? How much are they slowing down your site and affecting the end-user experience?

The next step is providing actionable information: What is the impact of that problem on the business? Does it impact your conversion rate? How many people and web pages does it impact? How high should you prioritize the problem? This information will help you take appropriate remediation steps. It's important to always make your business customers aware of problems and to measure the impact of those issues. A user-friendly dashboard that displays unified performance status across the entire application delivery chain will allow you to easily translate technical information into business-focused insight.

Plus, by quickly identifying problems, you help ensure accountability and fast remediation.

### BEST PRACTICE 3: FOCUS ON THE END-USER EXPERIENCE

Compuware collected 360 million different page views over 30 days across a few hundred web sites — users around the world connecting to the Internet via a broadband connection — to understand exactly what these users were seeing. Looking at their experiences by browser, it varied broadly from just about two seconds if they were on Google Chrome 4 to almost 10 seconds if they were on Internet Explorer 6.

Clearly, a user's browser has a significant impact on overall performance.

However, understanding simply how long it takes to deliver all that content to the browser may not be enough. Web performance is really about understanding perceived performance. How long did it take for pages to look like they loaded? There is a big difference between raw page load times (how long it takes to deliver or load content) versus the perceived render time (how long it took for the page to look like it loaded). However, it requires visibility into what users are seeing versus what they are perceiving. Without a change in infrastructure or huge changes to architecture, certain changes can be made to a layout and design to improve the appearance of performance simply by making elements that appear above the fold load first.

By starting from the end-user experience, you are able to foster a more collaborative approach to problem-solving, as opposed to a bottom-up, siloed approach, which typically results in war rooms and excessive finger-pointing. By getting visibility into your end users' experiences, you can identify and prioritize issues and pinpoint the source of those problems. Also, better understanding of the end-user experience helps you find ways to optimize the delivery of web applications.

There are several ways to gather information on the end-user experience:

- ▶ **Monitor synthetic transactions:** Identify your most critical transactions and create scripts that can be used to repeatedly execute those transactions with a "synthetic" user. This helps provide proactive indication of problems, potentially before real users experience them. Two different points that you should run synthetic transactions from:
  - 1) Internet backbone: This removes all variability caused by location, local ISPs, etc.
  - 2) Last Mile: This lets you know what the performance is from any location and real-world devices.
  
- ▶ **Monitor real users:** See the actual experiences of real users. This helps to identify problems and understand the business impact of those problems (e.g., how many users are affected at what locations). Two approaches for doing real-user monitoring:
  - 1) Browser-based real-user monitoring: Collects real-time performance data from users as they browse your web site. Helps to understand technical performance across browsers, geographies and devices and perceived render times.
  - 2) Data center real-user monitoring: Looks at real transactions as they traverse the network. Helpful for identifying bottlenecks within the data center and quantifying business impact.

### BEST PRACTICE 4: PLAN FOR A MULTI-DEVICE, MULTI-BROWSER WORLD

Another important element of the delivery chain is the smartphone. Organizations need to make sure the use of smartphones will yield just as good an experience as that of PCs and laptops. What is the performance people are seeing with a variety of smartphones or handheld devices, such as the BlackBerry or iPad or iPhone or netbooks?

While you can't influence whether people are coming in via a WiFi or a wireless connection, you can influence their overall perceived performance. You need to understand specifically what it is they're seeing so you can act upon it and get your optimizations going. Research shows most mobile users are still expecting sites to load as quickly as they do on their home or business computers.

And so it becomes essential to always test your web applications across multiple browsers and devices before putting them into production. Some sites will load well in a particular browser, operating system or device but will render in a less satisfactory way — or even fail to load — in other browsers or devices. With so many different possibilities for consumption points, it is essential you know exactly how your application is going to look to your end users, regardless of what device or browser they're using.

### BEST PRACTICE 5: SET AND MONITOR SLAs WITH THIRD-PARTY PROVIDERS TO MATCH YOUR GOALS

The final best practice covered here is setting and monitoring SLAs, both internally and externally with outside vendors. First and foremost, you need to have a solid understanding of your organization's goals. To be effective, SLAs should be service- and performance-based and not based upon technical metrics. For example, ensuring you have a good transactional success rate. That means how quickly people can go through the most typical transactions on your web site, whether it's making a reservation or searching for a book or buying a coat. Users don't want to run into any issues. Then you need to set a certain performance goal. What would be an acceptable performance and transaction rate for your organization? Are you hitting your goals or not?

Also, end users can be anywhere. Are you a U.S.-focused company, North American-based or worldwide? Be sure you're actually measuring the experience of those end-to-end critical transactions from all those locations around the country or around the world that are important to you because the Internet and latency can impact overall performance. For example, on the East Coast, there could be a sub-second response time for a two- or three-step transaction while that same transaction on the West Coast takes 10, 11 or even 12 seconds. You need to understand how many users clicked away within a certain period of time.

Also, the geographic factor is extremely important to take into account. For example, you want additional capacity at peak times during the holiday shopping season.

Are you going to be guaranteed that capacity from your vendors or are they going to fall apart as the load on their systems increase? Whether you're outsourcing your entire site or you're using one of these services to augment your own capabilities — whether it's an ad, a shopping cart or ratings and reviews — if any one of those is not implemented correctly, it can slow down or even prevent your site from loading. So at peak times, are outside vendors able to handle that capacity? You need to be certain your vendor delivers the performance that allows you to meet your goals.

It's important to define your organization's goals, whether they are performance, additional capacity, elasticity or stability and make sure you're setting your performance monitoring and your SLAs to match those goals. Performance monitoring helps you establish a baseline for your goals and to define anticipated needs. Then, work closely with third-party vendors to ensure they can not only meet your current needs, but will be able to ramp up and address future needs.

### HOW NETMAGIC CAN HELP

When it comes to providing actionable business insight, the Netmagic's WebSmart solution can help you quickly identify the root cause of an issue, as well as the impact on the business and your end users. We can extend your view beyond the firewall by giving you a true end-to-end view from your data center to wherever your end users happen to be in the world. We can allow you to focus on that end-user experience by monitoring the performance and the availability of your key transactions from the end users' perspective.

And when it comes to that outside-in visibility from the WebSmart Performance Network, we provide the most comprehensive monitoring on the market.

Through Netmagic - Compuware alliance, you get to actually test from an entire network of data center locations where we've got servers that are carefully calibrated and consistently accurate. We have more than 150 of these backbone locations are in Tier 1 data centers around the world, and these agents actually reside in over 150,000 different locations in 168 countries, covering about 2,500 different ISPs.

These are not server grade machines that have been throttled down to simulate user machines, but rather real end-user laptops and desktops in businesses and homes that are connected to consumer grade ISPs. It's key to understand how applications are going to perform for all your end users — regardless of geography, browser or device — before you go into production and, of course, afterward.

WebSmart Real-User Monitoring (RUM) solutions capture every dimension of application performance from the eyes of you end users, and provides crisp insight into the business impact of poor performance. WebSmart Browser and Mobile RUM solutions measure performance directly from your users' browsers and mobile devices, allowing you to analyze performance by geography, browser, ISP and device. WebSmart is the only solution that unifies real-user and synthetic monitoring. Web application performance is correlated with the number of users and page views so you can prioritize problems by business impact. With WebSmart First Mile, you can immediately identify whether the root cause of a problem is inside or outside of the data center.

If you're really trying to prime your organization for a multi-device, multi-browser world, we provide a virtual test bed running in the cloud that lets you automatically test your web and mobile application on over 500 combinations of browsers and operating systems and over 5,000 mobile devices. This helps you ensure compatibility and performance without the cost of maintaining your own extensive testing infrastructure.

Our unified dashboard brings together that entire application delivery chain, both enterprise and Internet, giving you visibility very quickly, as well as allowing you to see the impact on your business. The data provided by our dashboard helps you answer key questions about the performance of your applications.

Whether it's reducing down time or saving costs on staff and fees, or increasing revenue or reducing revenue loss, managing the overall experience for your end users and understanding the impact of performance problems on those end users can yield significant benefits.

## ABOUT NETMAGIC

Netmagic Solutions, an NTT Communications Group company, is India's first and largest pure-play managed IT Hosting Services Provider. Netmagic Solutions is ISO 27001, ISO 9001:2008 and ISO 20000-1 certified and its processes are designed as per the ITIL framework. Netmagic Solutions delivers mission critical hosted applications for over 1200 of the world's best-known enterprises from multiple locations and has been awarded the 'Datacenter Service Provider of the Year 2011' by Frost & Sullivan. Netmagic's Chennai Datacenter is the only Gold LEED certified datacenter by the USGBC in India. Netmagic has 7 carrier neutral, state-of-the-art datacenters located in Mumbai, Bangalore, Noida (Delhi-NCR) and Chennai with over 2,00,000 sq. ft. floor space. As part of the NTT Communications group, it also has access to leading global tier-1 IP network, Arcstar Universal One™ VPN network reaching over 150 countries, and over 130 secure data centers.

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