Solving the Application Performance Dilemma in the Hybrid Enterprise

An ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) White Paper
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Executive Summary
The mainstream adoption of web-based applications, whether internally hosted, cloud hosted, or software as a service (SaaS), is transforming the ways in which enterprise-class applications are built, deployed, and consumed. While the evolution brings new levels of cost efficiency and flexibility, it also introduces new and unique visibility and control challenges for IT organizations, which must meet performance and user experience expectations in addition to basic availability. IT teams must adopt a two-pronged approach to meeting this challenge, combining performance visibility with proactive optimization technologies. This ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) whitepaper examines the scope of challenges for assuring web-based and SaaS application performance, and reviews a solution offered by Riverbed that is designed to meet these new requirements.

The Evolving Application Landscape
Tracking and understanding application activity and performance starts with understanding what types of applications make up the mix. While traditional client-server architectures still exist in many places, a significant (and growing) majority of today’s business applications utilize web-based front ends, using browsers to host the working sessions. This shift can be seen largely within the newest generation of internally developed and hosted applications, and where web-based front ends have been added to legacy applications in order to reduce the technical challenges of maintaining and supporting thick clients. This approach also helps to accommodate endpoint evolutionary trends such as mobility and BYOD (bring your own device).

In parallel, options regarding where and how to host web-based applications are expanding. While most enterprises will start by focusing upon internal hosting within the datacenter, SaaS has become a viable and popular alternative—particularly for applications that must be accessed by a mobile workforce. Another early, emerging approach is hosting applications, including web-based front ends, in a third-party cloud, either in whole or on a dynamic, as-needed basis for accommodating variable levels of use and load.

The result of all of these changes, from general “webification” of applications to expanded hosting choices, is part positive and part negative. On the plus side are broader options for controlling costs and improving IT’s ability to respond to and accommodate business change and new demands. But on the downside, new technologies and new platforms introduce new risks to operational integrity, performance, and end-user experience. In order to capture the value of the upside, new strategies and techniques are needed to establish and maintain full visibility into application behavior and activity, so that optimization techniques can be applied to improve predictability and performance. The combination of visibility with control is the only hope for organizations to move away from reactive firefighting modes of operations towards protecting and assuring quality of experience on a proactive, preventative basis.

Effective Management of Web and SaaS Applications
The advent and mainstream adoption of web-based applications hosted internally or by SaaS creates a whole new realm and range of operational monitoring and optimization challenges. While the enabling technologies themselves are fairly well known and mostly mature, their use creates new points of abstraction, risk, and uncertainty within the end-to-end path between user and application.
And while some of the resulting challenges cannot be mitigated, many can, so long as the proper adaptations are made in management practices, backed up by the right types of enabling management tools and technologies.

Some aspects of the new performance challenges are so variable that it is better to simply expect little or no control. Such is the case with the user/customer endpoints. IT organizations are faced with end-user devices ranging from laptops to tablets to smartphones, with the diversity explosion fueled by consumerization and ignited by BYOD programs. Endpoint variability may be somewhat less drastic for internally hosted enterprise web applications, where standard devices or configurations are more likely possible. But when dealing with SaaS, mobility and diversity are part of the core appeal, and thus should be expected at all times.

So how can IT truly understand and protect the performance of internal and SaaS web-based applications? The two-part answer involves establishing visibility in parallel with applying optimization and controls. By tracking and understanding application performance fully, from both the infrastructure perspective as well as the end-user experience lens, IT operations can more readily assess whether or not performance issues exist, what the source of those issues might be, and the scope of impact of any service-affecting problem or incident. Application performance optimization techniques seek to protect and assure application performance by directly controlling the ways in which applications are delivered across the network from server to end users, whether those servers are in an enterprise datacenter, a cloud provider datacenter, or a SaaS back end. Both visibility and control techniques are most effective when deep, rich, discrete details can be gathered in terms of how each component of complex, multi-object web sessions are assembled and delivered.

Establishing Visibility

You cannot fix what you cannot see, so truly effective management starts with making sure that you have deep, rich, and complete visibility into web application activity and behavior. Further, it is important to gauge and track both the ways in which applications are performing from the infrastructure perspective as well as the quality of end users’ experience as they access and use those applications to complete their work tasks and conduct business. There are many techniques that can be used to determine how well an application is performing in these ways, such as:

- **Tracking all components of web-based applications** – When dealing with web-based applications it is critical to understand the discrete details of multi-object web pages in order to understand where performance issues might present themselves. The makeup and load sequence of web objects can be long and complex, and will commonly involve many steps and network exchanges to fully complete. This knowledge will improve operators’ ability to troubleshoot performance problems when they happen, while also helping development teams design more efficient web-based applications.

- **Measuring application response times** – Implementing metrics that document how quickly an application is responding to end-user requests can reveal both overall performance and likely user experience. Measures can range from how long it takes for a complete web page to load, how each component object is responding/performing, or even how often a user has encountered HTTP page errors.
• **Tracking SLA/SLO violations** – Putting other measurements in place to track and monitor performance versus service level agreements/objectives (SLAs/SLOs) with third-party content or hosting providers can help to provide direct evidence of whether or not levels of promised or expected performance are in fact being provided.

• **Assessing “environmental” conditions** – In many cases, performance issues arise because of resource conflicts or contention in the hosting and delivery network portions of the infrastructure. By recognizing the surrounding contextual situation during which a performance issues arises, it becomes much easier to understand if the application of interest is the source or the symptom of the underlying root cause. For internal web applications, this means recognizing what else is sharing hosting and LAN/WAN connectivity. For SaaS applications, this means figuring out what else is visibly sharing the inbound/outbound Internet connection.

**Applying Optimization Controls**

One area that offers a clear opportunity for proactively improving application performance is the network used to access and deliver application sessions and transactions. While network delivery issues can and do sometimes arise within corporate LAN environments, the greatest sustained operational performance risks, and thus the greatest opportunity for making a difference via optimization, are within the remote/extended network links such as site-to-site WAN and the Internet. Capacity and efficiency constraints in these links are a regular source of negative application performance impacts, due to effects such as latency, congestion, and packet loss. While this is certainly true of WAN links such as MPLS, even greater levels of challenge exist with SaaS and cloud-hosted applications where the public Internet will be part of the delivery path.

Traditional optimization techniques cannot be readily applied to SaaS and cloud, since control of the datacenter infrastructure where the applications reside is ceded. Further, access to SaaS and cloud can require a complex, multi-hop network path for those employees working in remote facilities, whose app may have to first traverse a WAN link to a corporate datacenter where a secured/authorized Internet connection point exists. Even organizations allowing direct Internet connections from remote sites, which provides some simplicity and improved performance, can suffer from the lack of control over general Internet connectivity quality.

The best bet for making an immediately positive, measurable impact on web-based application performance is to focus optimization technologies on the places where they can have the greatest influence over application activity. In the case of internal web-based applications, this will be on/around WAN links that connect remote users and sites to the web-application servers. This will also be helpful if SaaS and cloud applications are being accessed via WAN links back through a central Internet point of presence (POP).

For those settings where applications are SaaS-based, or remotely hosted, emerging techniques do exist for improving the control side of the equation. Virtualized versions of network optimization solutions can sometimes be deployed into cloud hosting environments to help improve performance. And in a few very unique cases, such as one that Riverbed and Akamai offer as a joint technology solution (see more details below), optimizations are available in a way that will help with Internet-based SaaS performance.
Bringing Visibility and Control Together

The best of all worlds involves combining deep, rich visibility for all types of internally hosted, cloud-hosted, and SaaS web applications with a broad range of optimization control options. Ideally, this means using a common set of performance monitoring measures for all three settings, so that mixed/hybrid combinations can be consistently supported. Even better is having a common set of optimization techniques that work for all three types of configurations. And even better still is when the visibility tools can inform and reveal the impact that optimization technologies are having, so that closed-loop tuning can be undertaken on a regular basis.

The Riverbed Solution

Riverbed has been delivering application performance infrastructure solutions for over ten years, and in that time has become the acknowledged worldwide leader in WAN optimization technologies. The company has continuously expanded and adapted its technology and solutions portfolio via development and acquisitions to achieve an ever-increasing, comprehensive coverage of both visibility and control sides of the application performance equation.

Specific to monitoring and optimizing internally-hosted and SaaS web-based applications, Riverbed brings to bear two key sets of technologies from across its product portfolio. From a visibility perspective, the Riverbed approach leverages the detailed web application performance analytics and visualizations of SteelCentral AppResponse. From the control perspective, Riverbed offers the application-aware WAN optimization technology of the SteelHead family, including the Virtual SteelHead, Cloud SteelHead and SteelHead SaaS variants. These two product groups can be deployed individually or together to support hybrid environments that are hosting and delivering web-based applications.

Performance Visibility with SteelCentral AppResponse

SteelCentral AppResponse is a highly functional web and non-web application performance monitoring and troubleshooting solution that uses passive techniques to capture and inspect packet flow data gathered using a network SPAN/mirror port, tap, packet monitoring switch, or SteelFlow Web Transaction Analysis (WTA) polling. AppResponse analyzes HTTP and HTTPS protocol traffic, generating actionable insights via the WTA module. Using this approach, AppResponse can provide deep and rigorous visibility into web and SaaS application performance. For instance, AppResponse can:

• Reveal extensive details regarding how each element of complex web applications are performing. A web application can be divided down into all its component parts and monitored so that poorly performing web page objects can be identified.

• Track and trend performance metrics over time.

• Group metrics and data sets by a wide range of measures, including by specific web-applications, region, platform or type of browser, for easier recognition of overall health and activity.

• Plot geographic heat maps to visually show which pages are underperforming, at what times, and which users are experiencing impacts.

• Apply simple, meaningful names to translate complex page addresses into usable/workable forms that are understandable both within and beyond the IT team.
Performance Control with SteelHead
Riverbed’s SteelHead products provide the means for taking control and optimizing web-based application performance across a wide range of deployment settings both inside and outside the enterprise, including private cloud or internally hosted web-based application deployments as well as SaaS applications. All SteelHead solutions offer a combination of TCP optimization, application-level protocol optimizations, path selection, and patented scalable data referencing.

- For private cloud or internally hosted web applications, the SteelHead EX provides traditional WAN optimization services for branch offices.
- Cloud SteelHead provides similar types of network-based application optimizations for hybrid cloud deployments, including Amazon Web Services, Microsoft Azure, and VMware ESX-based clouds.
- SteelHead SaaS extends WAN optimization techniques to places where it is not possible to insert SteelHead products directly, combining the optimization features of SteelHead with the Akamai Intelligent Platform for optimizing performance across the Internet.

While this covers a broad slice of third-party providers that are most likely to be in use, Riverbed plans to continuously expand support for other cloud and connectivity providers.

Connecting Visibility and Control
The true power of the solution comes from deploying both SteelHead and SteelCentral AppResponse. Recently, Riverbed added support for the SteelFlow WTA protocol across the full SteelHead portfolio, so any instance of SteelHead, Virtual SteelHead, Cloud SteelHead, or SteelHead SaaS can act as a source of web transaction data that can be channeled into AppResponse for analysis and presentation. Further, AppResponse can identify and quantify the impact that SteelHead optimizations are having on web application performance, presenting the results in ready-made dashboards and reports. For example, figure 1 shows a case where AppResponse reveals a web-based application called WebMail that took almost 96 seconds to download.

![Figure 1. SteelCentral AppResponse Web Transaction Analysis waterfall view.](image)

It’s clear from the waterfall chart that a significant network issue is being experienced with the third and sixth objects (neither of which are being optimized by the SteelHeads in place). In Figure 2, AppResponse shows that the very same WebMail application is running 9.3x faster at the branches that are optimized (NY and PA) than those without SteelHeads (NJ).
Solving the Application Performance Dilemma in the Hybrid Enterprise

EMA Perspective
The advent and mainstream adoption of web-based and SaaS applications require new management approaches, because previous methods are insufficient to ensure that IT organizations can meet performance objectives. Prior practices have disconnected monitoring from controls, but in the age of rapid application development and deployment, coupled with continuously rising user experience expectations, this can no longer be considered ideal if there is any hope of proactively ensuring quality results. IT teams need to look for techniques to establish and connect deep visibility with direct action in the form of optimization controls. Riverbed’s approach is designed to do just that—enable IT departments to get a handle on more effectively managing web-based and SaaS application performance from both sides of the fence, adding rich visibility while taking control of performance through flexible optimization.

About Riverbed
Riverbed, at more than $1 billion in annual revenue, is a leading provider in Application Performance Infrastructure, delivering the most complete platform for Location-Independent Computing. Location-Independent Computing turns location and distance into a competitive advantage by allowing IT to have the flexibility to host applications and data in the most optimal locations while ensuring applications perform as expected, data is always available when needed, and performance issues are detected and fixed before end users notice. Riverbed’s 25,000+ customers include 97% of both the Fortune 100 and the Forbes Global 100. Learn more at www.riverbed.com.