Application Performance Management:

The Challenge for Enterprise GIS

January 2009
Executive Summary

Most businesses and organizations cannot survive without the applications and services their IT infrastructure delivers. Reliance on web-based information systems continues to increase. A majority of organizations are using web applications to support their employees; communicate with customers, prospects and partners; and generate revenues. Geographic Information Systems (GIS) is now a business-critical application within this complex IT environment.

Aberdeen Group surveyed 206 organizations to examine best practices for monitoring and managing application performance. This paper draws on Aberdeen’s research and that of others to show the business context for managing GIS application performance.

Top Performers

The Aberdeen investigation evaluated application performance management of each organization based on three performance criteria: 1) average improvements in application availability; 2) average improvements in application response times; 3) improvements in success rate in preventing issues with application performance before end-users are impacted.

The top performers in application performance management reported:

♦ 106% average improvement in application availability
♦ 11.4-times average improvement in response times for business critical applications
♦ 85% improved success rate in preventing issues with application performance before end-users are impacted

Benefits to the Enterprise

Best practices of application performance management delivered the following benefits to top performers:

♦ Five-times more likely to report improvements in preventing application performance issues before end-users are impacted as compared to other organizations.
♦ 80% better than poor performers in correcting application performance problems when they do arise.
♦ Five-times more likely to report improvements in the quality of end-user experience as compared to other organizations.
♦ Three-times more likely to reduce the time to troubleshoot application performance issues as compared to poor performing organizations.

Strategic Actions for Application Performance Management

To improve application performance, including GIS applications, organizations must:

♦ Deploy tools for testing, monitoring and optimizing the performance of web applications.
♦ Develop capabilities for measuring quality of end-user experience
♦ Deploy tools and capabilities for measuring and analyzing application response times for each transaction.
Setting the Bar for GIS: The Application Performance Environment

Enterprise Geographic Information Systems (GIS) do not exist in a single application performance environment anymore. Mainstream information technology involves a technology stack of interacting infrastructures and applications that need competent and on-going orchestration to achieve high performance levels. Application performance management involves monitoring and managing the performance of software applications. With applications increasingly vital to business, it is important to manage and improve—not simply measure—application performance.

GIS has moved into mainstream IT systems, and the high performance requirements of IT now apply directly to GIS performance. The addition of GIS technology needs to be a positive addition in the overall value that IT brings to the enterprise, not a performance sink.

Businesses and organizations are reporting that they are planning to increase the number of business-critical applications by 67% over the next two years. Many of these new applications will be some form of GIS. However, these same organizations are reporting that they are not satisfied with current performance levels and have major concerns about IT challenges in the next 12 months.

The purpose of this paper is to describe the business and organizational environment of which GIS is now a part, industry-wide challenges in application performance, what actions organizations are taking, and how performance monitoring benefits the continued success of enterprise GIS. This paper borrows heavily from research conducted by the Aberdeen Group in 2007 and 2008 as well as other information technology research groups.

Research by Aberdeen Group of 206 organizations surveyed in 2008 found that:

♦ 58% of organizations are not satisfied with performance of their business critical applications.

♦ Issues with application performance are impacting overall corporate revenue by up to 9%.
Figure 1 shows four of the top reasons why more than half of these organizations are not happy with their current enterprise applications.

geoXMF’s experience with business and government organizations confirms the findings above:

**Inability to identify issues before end-users are impacted (57%)** - geoXMF clients report experiences where mission-critical applications have been down for hours before end-users notify IT departments of failed or lagging service(s) performance. As a result, productivity and confidence in applications both take a negative hit. In other cases, such as DOT road conditions information, web application service interruption initiates immediate and large call response causing IT fire drills to get applications back up.

**Increase in complexity of applications (51%)** – Enterprise applications are becoming more complex to implement and maintain. Additionally, geoXMF clients find higher value when some applications are integrated - shortening work processes and increasing productivity. However, integration of enterprise applications increases dependency between applications and raises the bar on performance, making application monitoring and management even more important.

**Inability to measure Service Level Agreements (SLA’s) around application performance (37%)** - Many businesses and local and regional governments have performance goals for customer service. Some examples (including GIS services) of current service level goals and key performance indicators (KPI’s) include:

- New York City, Mayor’s Office of Operations, Citywide Performance Reporting (CPR) initiative. This online tool collects performance data from over 40 city agencies and reports in an online snapshot format. One indicator goal from the Department of Information Technology and Telecommunications is percent uptime of all key systems – 99.9%. This includes all key systems managed and operated by DoITT (mainframe, Sun/Unix, or Wintel).
Baltimore County has formalized service level agreements between the Office of Information Technology/Geographic Information Systems (IT/GIS) and Baltimore County agencies that address agency support, database support and application support. The Incident Management Response goal for Priority 1 (Urgent) incidents is to have a response within 1 hour and incident resolution within 1 day.

Tallahassee/Leon Co., Florida Government Fiscal Year 2008 budget – Tallahassee/Leon Co. predicts and plans to support 20% year to year growth in demand on GIS Internet applications, services and downloadable files; and estimated 23% growth from 2005 to 2007 in number of desktop/laptop users.

Inability to test performance in pre-production stages (34%) – Many organizations cannot forecast impacts of changes to or additions of applications to the overall IT and business performance. Within this scenario problems arise and are addressed in a production or operational environment leading to inefficient solutions, lower performance and loss of confidence across the board. As enterprise GIS is added to the application mix, IT/GIS managers must have a way to test and measure performance of stand-alone or integrated applications prior to pushing them out to the production environment.

Drivers for Application Performance Management - including GIS

Adoption of new enterprise applications for business and organizations have to demonstrate benefits for increased productivity and efficiency, better decisions and better customer service. This is true for the value of any enterprise-level applications – including the value proposition of enterprise GIS.

Based on Aberdeen Group’s work, the top drivers for adoption of application performance management solutions are:

![Figure 2: Top Drivers for Application Performance Management](Aberdeen Group, 2008)
Improve employee productivity (54%) - Today, company and organization staff is more and more “connected” in space and time and therefore more dependent on application performance. In fact, Aberdeen Group’s research shows that sixty-two percent (62%) of organizations use web applications to support their employees. Remote, mobile employees are testing the limits of application and data delivery and enhanced communication across the enterprise. The increasing value of and need for remote, real-time access to information has encouraged organizations to implement steps to:

♦ centralize internal data management activities
♦ develop mobile applications to support field staff
♦ improve application performance
♦ improve work processes, data collection and decision-making

All these activities focus on improving employee productivity - to do their job more effectively and efficiently wherever and whenever they are at work.

GIS has led information technology into the field where employees can benefit from access to map and related data to help manage and maintain a broad spectrum of assets and natural resources including oil and gas pipelines, water and wastewater utilities, real estate, forests and river systems.

Improve responsiveness to external customers (53%) - The majority of organizations want to improve their responsiveness to external customers as well. This includes providing current and accurate services and information via online communication, responses to product or information requests and follow-up on sales, service or warranty calls. These business processes are supported by various integrated applications including ERP, CRM and WMS. WebGIS, Service Oriented Architectures and “cloud” computing are all targeted by GIS providers to help business and organizations deliver more value to the customer.

As shown in Figure 3, application performance issues create related impacts affecting businesses and organizations across the board. As application performance lags in the absence of application management tools and processes, IT staff effectiveness falls. A corresponding decrease (58% of businesses report) in employee satisfaction fosters lowered productivity organization-wide. This cascades into decreased responsiveness to external customer needs (47% reported) and losses in revenue (50% businesses reported) as customers react to poor quality and service.
Effective Strategic Actions for Success

Being proactive about managing application performance is no longer optional. Whether you are a Fortune 500 company, an electric utility or a local/regional government application performance affects your level of service and your bottom line.

Aberdeen Group’s research shows that issues with application performance are impacting overall corporate revenues by up to 9%. Top management in any business or organization is keenly interested in anything that drives or stops dollars to the bottom-line. Using the information in this white paper and other research can help IT and GIS managers make the case for adding the resources for better application management.

Aberdeen Group categorized the 206 businesses and organizations into three groups based on performance metrics: Laggards, Industry Average and Best-in-Class. Within each group they recommend strategic actions best suited to raise application performance.

<table>
<thead>
<tr>
<th>Laggard Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop capabilities for predicting and analyzing application response times prior to deployment</td>
</tr>
</tbody>
</table>
Develop capabilities for measuring and analyzing application response times for each transaction. | Increased complexity of enterprise applications and network traffic are two top challenges for many organizations. Having the ability to separate application response times into application, network, server and end-user segment is important for root cause identification and correction.

Deploy robust capabilities for visibility into application performance | You can’t manage what you can’t see (measure). Application performance tools give you insight into GIS application performance so you can make better IT management decisions.

### Industry Average Organizations

#### Develop capabilities for measuring the quality of the end-user experience

In similar research results by NetForecast, laggard groups learn about application performance problems using automated systems a mere 14 percent of the time, compared to a whopping 86 percent of the time in which they learn about problems from user calls. Once performance is so degraded that users reach for the telephone, user productivity and satisfaction are already diminished—not a desirable outcome.

Source NetForecast, Inc., 2007

Aberdeen Group finds that sixty-eight percent (68%) of industry average organizations do not have the capability to quantify the end-user experience.

When all’s is said and done, it is the user’s experience with an application that really matters and the performance functions that users care about most are application availability and response time. Creating this capability is important for the adoption and long-term success of internal and customer-facing applications.

#### Develop tools for testing, monitoring and optimizing the performance of web applications.

The majority of organizations are using web applications to serve key areas of business: to support staff; provide information to and communicate with clients, prospects and partners; and generate revenues. However, more than half of the industry average organizations do not have tools in place to monitor web applications.

Deploy a unified

As described earlier in the case of the City of
<table>
<thead>
<tr>
<th>Platform for monitoring all aspects of application performance.</th>
<th>New York’s Citywide Performance Reporting tool, the best organizations use a single platform for monitoring all aspects of application performance. Not only does a single platform require higher levels of communication and therefore cooperation between departments it allows the organization to see cause/effect relationships between different applications in a service oriented architecture.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Best-in-Class Organizations</strong></td>
<td><strong>Best-in-Class organizations reap the benefits of a holistic approach to application performance management. They correct problems faster, experience faster application response times, experience better application availability, are more likely to find that application performance meets their needs, and are more likely to discover problems proactively rather than reactively from users' help desk calls.</strong></td>
</tr>
<tr>
<td>Incorporate all aspects of application performance management into the overall IT strategy.</td>
<td>Further improve usability of information of application performance to prepare for the future.</td>
</tr>
</tbody>
</table>
Benefits of Enterprise GIS Performance Management

Real-time, 24x7 event monitoring and threshold alerting capabilities helps the IT team efficiently manage by exception and proactively solve issues before they affect end-users and customers.

Key benefits include:

♦ Consistent end-user/customer experience across the enterprise, resulting in improved user confidence and productivity
♦ More problem discovery by management systems versus user complaints
♦ Improved IT staff productivity through exception based alerting and less crisis escalation
♦ Better mean time to repair (MTTR) problems via higher visibility of applications to quickly isolate root causes of problems and expedite corrections
♦ Resource shifting to more strategic IT initiatives, helping fuel business innovation and growth
♦ Significantly fewer service outages
♦ 24x7 monitoring without incurring the cost of extra employment resources.

When to Deploy Application Performance Management Software for GIS

When is it important to deploy an application performance monitoring and management for GIS?

Based on Aberdeen Group’s findings, GIS application performance management software can add value at anytime in your enterprise IT/GIS environment, however, particular initiatives or instances may offer the best opportunities for integrating GIS performance management software, including:

When you are implementing an enterprise GIS

Implementation of enterprise GIS is a perfect time to add GIS application performance tools. This kind of high-profile, business critical implementations can benefit from GIS application performance monitoring at pre-launch to test performance during development, at launch to be able to quickly respond to any exceptions in the new technology system and for the long term monitoring and management of the enterprise system.

When GIS is linked to business-critical IT systems

Many enterprise applications (WMS, ERP or CMMS) use GIS data for various location, mapping and analysis functions that users rely on for business critical work flows and processes. Having GIS application performance monitoring in place ensures that your users are experiencing high up-time and quick application response time.

“We have measures to demonstrate our service availability, placing greater confidence in our systems to deliver what is expected. By only being notified in the event of failure, we can spend time adding more services to the offering; knowing that what is in place is operating as expected. In the event of system failure, we are able to notify the right person at the right time to restore a component or service.”

~ GIS Data Coordinator, Information Technology
**When rolling out new GIS applications to internal staff or customer-facing services.**

Expanding the use of GIS in the enterprise internally or externally to customers or the general public raises performance expectations. IT/GIS managers need to make sure that these new services are readily accepted and offer productivity and efficiency gains for the organization not a frustrating user experience.

**When GIS services are part of emergency response or public safety operations.**

Emergency response and public safety response personnel must have reliable information delivery in wired and remote, wireless conditions. GIS is revolutionizing the way governments and other agencies manage emergencies. The development of wireless technologies and Web-based GIS applications has also enhanced the coordination of response efforts. GIS value in emergency situations is its ability to integrate and update in real-time multiple sources of information (imagery, tabular, CAD) for quick and clear decision-making. Application performance management software and processes are key to maintaining reliable information that helps save lives.
geoXMF

XMF Alerter: Enterprise GIS Performance Monitoring & Management

♦ **Ability to test GIS application performance**
  XMF Alerter allows IT/GIS managers to easily monitor ArcIMS,
  ArcGIS Server, ArcSDE services and general system performance.

♦ **Ability to track individual GIS service performance**
  XMF Alerter tests of individual enterprise GIS services can be
  configured by type, maximum response time, black-out periods and
  tolerance. XMF Alerter even finds the existing service information and
  presents it to you in an easy to configure GUI.

♦ **Ability to measure application response times**
  XMF Alerter allows individual services to be tested for response time.

♦ **Ability to see service performance history**
  XMF Alerter gives you the ability to generate color charts in a calendar
  format showing individual application performance over time.

♦ **Ability to receive immediate exception notification**
  If a GIS service fails or exceeds the tolerances you’ve set you are
  immediately notified via cell phone text message, email and/or on the
  display monitor. Multiple contacts can be configured so that particular
  alerts go to particular individuals on the contact list.

♦ **Ability to make GIS performance visible in the overall IT dashboard**
  XMF Alerter includes an application performance interface (API) to
  allow an enterprise GIS performance summary status to be embedded
  within an IT management dashboard display.

“Since this (enterprise GIS) is a critical business system for our
client, we wanted a real-time monitoring system in place from the start. XMF Alerter will be
monitoring map services, as well as the SDE connections.”

~ GIS Consultant, Information Technology
References:

*Application Performance Management: The Lifecycle Approach Brings IT and Business Together*, Aberdeen Group, June 2008


*Monitoring Your Spatial Enterprise: How IT/GIS Managers are Improving System Reliability with XMF Alerter*, December 2007
NOTICE
The information in this publication is subject to change without notice. THIS PUBLICATION IS PROVIDED “AS IS” WITHOUT WARRANTIES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT. geoXMF LLC. (“geoXMF”), SHALL NOT BE LIABLE FOR TECHNICAL OR EDITORIAL ERRORS OR OMISSIONS CONTAINED HEREIN, NOR FOR DIRECT, INCIDENTAL, CONSEQUENTIAL OR ANY OTHER DAMAGES RESULTING FROM THE FURNISHING, PERFORMANCE, OR USE OF THIS PUBLICATION, EVEN IF geoXMF HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES IN ADVANCE. THE USE CASES IN THIS PAPER ARE PROVIDED ONLY AS POTENTIAL EXAMPLES AND YOUR ACTUAL COSTS AND RESULTS MAY VARY.

About geoXMF: geoXMF LLC is a leader in enterprise GIS performance software and services. geoXMF’s industry leading technology integrates with ESRI® Internet mapping software and is used by business and organizations including transportation, agriculture, water and wastewater utilities, power distribution and local/regional governments. geoXMF provides products that enable GIS professionals to effectively manage their spatial enterprise and proactively monitor and enhance the key components of their GIS technology stack.

The company’s XMF Alerter and XMF Accelerator software responds to the growing need for organizations world-wide to maximize GIS reliability, usability and performance. For more information, please visit our website: www.geoxmf.com

©2009 geoXMF LLC. All rights reserved. geoXMF™ and XMF Alerter™ are trademarks of geoXMF LLC and maybe registered in the United States Patent and Trademark Office. ArcIMS®, ArcGIS® and ArcSDE® are registered trademarks of ESRI® in the U.S. and/or other countries. All other trademarks and registered trademarks are property of their respective owners.