

# **Meeting Tomorrow's Internet Performance Requirements Today**

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**ENTERPRISE MANAGEMENT  
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# Table of Contents

- Executive Summary ..... 1
- Service Quality and the Internet..... 1
- Service Level Management to Guarantee Your Online Activities .....2
  - Demystifying the Terminology: SLM, SLO, and SLAs?.....2
  - SLM Lifecycle and Levels of Management .....3
  - Strategic, Tactical, and Operational Goals .....3
- How Keynote Supports the SLM Process .....5
  - Keynote and the SLM Lifecycle of a Web Application .....5
  - Strategic SLM: A Focus on Business Success.....6
  - Tactical SLM: A Focus on Web Application Improvement .....7
  - Operational SLM: A Focus on IT Services and Site Performance .....9
    - Keynote’s Mobile Quality Test and Measurement Products.....10
    - Keynote’s VoIP and Streaming Test and Measurement Products .....10
  - The Keynote Advantages .....10
- EMA’s Perspective .....11
- About Keynote .....12

# Meeting Tomorrow's Internet Performance Requirements Today

## Executive Summary

Few, if any, businesses can operate effectively today without an online presence. Web-based applications provide essential links with customers, partners, and employees, and can be the determining factor for business success or failure. With the bottom-line at stake, companies are taking measures to ensure the quality of the experience on the Internet and Intranet alike. Companies doing business online must compare their application portfolio and its performance against their competitors, measure their customers' end-to-end experience, and manage their infrastructure and underpinning contractors to optimize the online experience. Buyers have choices today and the key is to do all that you can to keep users on your site and happy about being there.

Complicating matters is the ever-expanding list of technologies comprising the online platform. Wireless connections, cell phones, and PDAs must now be considered as alternative or at least complementary channels for delivering application content. In the consumer market, Voice over IP (VoIP) is working its way into the already established streaming audio and video technologies as a component of a typical Website. While most IT shops have well-established processes for managing their own network and server infrastructure, the additional technologies required to support today's Web applications are beyond the experience of most. To stay competitive, companies must plan to augment their traditional IT portfolio with skills, processes, and tools that are focused on creating and delivering successful Web applications.

Service Level Management (SLM) is one way of managing the customer experience. While services are ultimately made up of components such as networks, systems, applications, and security, customers look at the business from a more holistic perspective. How easy is it to place an order? Or resolve a complaint? Or check on inventory? It is these very basic tasks among others that will determine how positively or negatively an enterprise is perceived, and this perception comes directly from the experience of doing business online.

SLM is a best practices approach to IT quality that defines the processes, IT roles, and organizational structures needed to create standards for performance, measure actual performance, and keep services meeting

the standards. A lifecycle approach can be used to create a service that has SLM built into it, whether the services rely on third-party providers and the Internet, or are entirely controlled by the organization. Steps in the SLM lifecycle include setting objectives, defining metrics or key performance indicators, taking measurements, assessing service capabilities, ongoing monitoring and exception handling, and improving the service.

Keynote Systems, Inc. (Keynote) provides a comprehensive suite of on-demand test and measurement products for mobile communications, VoIP, Streaming, and Internet performance. Keynote's focus is assisting companies to know precisely how their Websites, content, and applications will perform on actual browsers, networks, and devices throughout their lifecycle. Through its independent multi-site research, site readiness testing, site and application performance monitoring, and SLM consulting services, Keynote can facilitate the design, development and delivery of complex, multi-layered services that meet performance targets.

## Service Quality and the Internet

The IT manager has checked the monitoring systems on his high-profile Web applications and made sure that everything is running smoothly. He's just about to head out to lunch when there's a call from the CEO—she's getting a "system unreachable" message when she tries to download her calendar onto her PDA at the airport through the company's employee portal. She demands to know how long this outage has been going on, and what the problem is. The manager has to admit he doesn't know the answer to either question. While not a mission-critical example, it does point to the problems faced by IT in this age of Internet applications. For the CEO, this was a critical service that was not available to her. For the IT manager, this example points to the mobility and variability with which users need to access these services.

New technologies, new standards, and new architectures are altering the way companies interact with their employees, customers, and partners. Many dynamics exist that are changing the way we conduct our personal and professional lives. For the Internet, three areas are rising up as dominant in the growth and exponential expansion of its use:

# Meeting Tomorrow's Internet Performance Requirements Today

- **Programmability.** The Internet today supports much more than a simple Website presence. Business-to-consumer (B2C) sales and business-to-business (B2B) portals to integrate companies across the supply chain are quickly becoming the way to streamline business. Large businesses like Wal-Mart are already requiring their partners to integrate into their online ordering systems. Web Services and Service Oriented Architectures (SOAs) are becoming the common denominator between companies.
- **Broadband and rich Internet content.** The Internet is nearly impossible to navigate with a dial-up connection. Rich Internet applications are becoming common—supported by broadband, DSL, or cable connections into many households. Voice over IP (VoIP) is moving into the mainstream as a communication vehicle for consumers as well as for enterprises, and that requires proactive management of user expectations that Internet telephony be as stable and high quality as telephone lines.
- **Mobile access.** Mobility has moved beyond remote employees and into the consumer market. From executives to preteens, everyone has a cell phone, videophone, or PDA. Cities lure businesses and consumers with entire downtowns that are wireless hot spots. Mobile devices still suffer from interoperability and usability problems, making management especially difficult.

The complexity and speed of technology innovation and convergence make it difficult for IT managers and management applications to keep pace. The online business infrastructure is becoming so complex and multi-layered that most existing monitoring systems just can't see all the problems experienced by customers. This inevitably leads to customer dissatisfaction. Web applications can be experiencing high-impact outages, but frequently IT managers don't know about it until the calls start to come in to the help desk. At the same time, the fierce competition in most online markets means that a few minutes of downtime can drive customers away forever. Every Website must perform at its peak 24x7x365. Anything less can mean lost customers, lost revenue, and lost jobs.

SLM is used in many IT organizations to ensure that services are delivered at peak levels. SLM is frequently defined as a set of processes for managing a service once it has been created. This Paper will discuss a lifecycle for SLM that can be used to develop and manage high-performing services, with a particular focus on Web applications. It will also highlight the unique capabilities of Keynote—a leading provider of on-demand test and measurement products for mobile communication and the Internet that helps companies create and manage their online applications, and keep pace with emerging Internet technologies. Enterprise Management Associates (EMA) interviewed a customer of Keynote to gain further insight into how Keynote helps his company achieve world-class Web presence and online ordering. His comments and EMA's perspective on Keynote are also included.

## Service Level Management to Guarantee Your Online Activities

Any discussion of SLM must begin by establishing what is meant by a service. Contrary to common supposition, the practice of SLM is not limited to IT and service-provider organizations. It applies anywhere a service is delivered, where a "service" is any task performed by one person or group for another person or group.

An IT service is a collection of technologies that together provides a business function or process. An online ordering service, for example, spans the Web application itself, Internet connectivity, any third-party Web Services that might be called, as well as the underlying application delivery infrastructure such as servers, databases, and networks. "IT service management" is meant to describe the tasks required to provide these high-level services, and goes beyond simply managing the uptime of discrete components or infrastructure that underlie the services.

## Demystifying the Terminology: SLM, SLO, and SLAs?

Despite its adoption as an essential practice among successful companies doing business online, service level management is not widely understood. The confusion is in no small part a result of a collection of SLM-related acronyms that, being so similar, is rarely used correctly. SLM is often used interchangeably with service-level

# Meeting Tomorrow's Internet Performance Requirements Today

agreements (SLAs) and service level objectives (SLOs), but the three are different.

To start with simple definitions of each: SLM is a process or program for monitoring, managing, and delivering services that consistently meet client requirements. SLOs are measurements or goals for the quality of a service. An SLA is an agreement (or contract) between the service provider and the client, which defines the service to be provided and specifies the level (or quality) of service that will be delivered.

SLM entails defining services, and then managing and improving the service levels. Every SLM program must involve defining goals (SLOs) and processes that work towards achieving them. SLAs make the SLOs contractual and usually specify penalties if service levels drop below those goals. It is sometimes said SLAs “guarantee” service levels, although more precisely, they guarantee a penalty if the SLA is broken. It is possible to have an SLA without a program for managing service levels, and conversely, an SLM program may be established without creating SLAs.

At the heart of SLM is a standardized set of steps, measurements, objectives, and goals. Standardization creates a repeatable procedure that can be optimized to deliver the best results or performance. In SLM, a good process can ensure that acceptable and achievable service targets are defined in SLAs and services are monitored, reported, and reviewed periodically. SLM also mandates proactively improving all services within the imposed cost constraints. In this way, SLM can help guarantee that services will meet both your and your customers' expectations.

## SLM Lifecycle and Levels of Management

SLM implementations and terminology differ from company to company. Effective SLM processes must include the four major activities common to all performance and service management cycles, and are illustrated in Figure 1.

Figure 1 also reveals another important aspect of SLM. While the process is inherently cyclic similar to most quality-centered management approaches, SLM is not just a single cycle of activities. In fact it comprises three concentric cycles, with the most frequently traversed cycle being the inner one reflecting the activities *Measure*

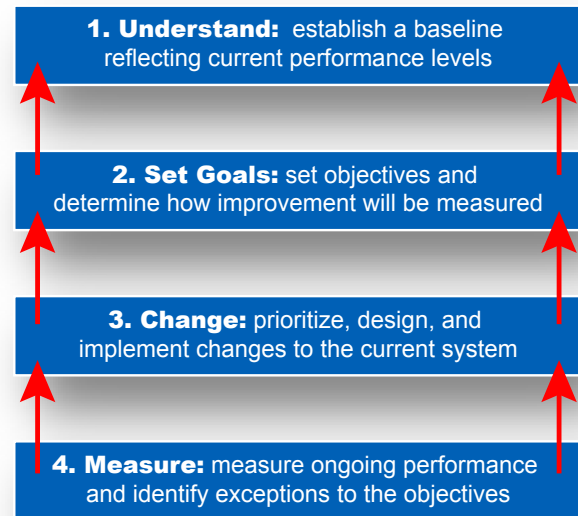


Figure 1: The SLM Lifecycle for an Internet Service

and *Change*, which are the essence of all day-to-day management. The outer cycles, which involve revisiting the activities *Set Goals* or *Understand*, are traversed less frequently. These three cycles are also mapped to three layers of management: strategic, tactical and operational, where strategic management evaluates the competitive and prioritization of service management, tactical addresses near-term activities required to manage effective service management, and operational being the day-to-day tasks necessary to keep services performing where they need to be.

## Strategic, Tactical, and Operational Goals

In practice, an SLM process inevitably crosses departmental boundaries, and the actual SLM activities differ widely according to level and focus of the participants and the timescales on which they operate. For example, if a business initiative (strategic) is to establish service level objectives in response to competitive pressures, the engineering (tactical) response may be to introduce a succession of infrastructure and Web application upgrades over a period of two years, each of which will in turn raise the efficiency (operational) of the site and require adjustments to the levels at which routine monitoring systems generate alerts and trigger diagnostic and maintenance actions.

Alternatively, if service level objectives are not being met, we might view the same set of relationships from

# Meeting Tomorrow's Internet Performance Requirements Today

the opposite perspective. A recurring outage or a persistent failure to achieve an operational objective will typically result in an application or system component being escalated to engineering for remedial action. And persistent service level exceptions that cannot be fixed without more (human or computing) resources will eventually be escalated to the executive level to justify additional funding or a change in priorities.

We can characterize how SLM is addressed at each level of management, why it is important, and how it can be applied.

## **The Strategic Goal – Stay Ahead of the Competition.**

The motivation for all SLM activity begins with business goals. Service management is needed to tie business needs together with technology and services that support the business. While some internal Web applications are seen only by company employees, the majority are created for use by customers and business partners, who frequently have other choices for service providers. If a competitor provides a superior experience, you can expect to lose customers. EMA research has found that ease of interaction is the most important criterion when business partners evaluate a relationship—highlighting the importance of a high-quality B2B portal. Unfortunately, there are few accurate ways to measure the performance of Websites as seen by users, making it difficult to set high-level goals.

So for a business owner or marketing executive, the SLM lifecycle involves setting, maintaining, and improving service levels to increase business efficiency and profitability, and stay ahead of the competition. Success is measured by improvements in business metrics such as revenue growth for a line of business, increased conversion rate from a Web application, greater revenue per customer, or improved customer loyalty. The SLM process will involve identifying the strategic actions required to move the organization towards these goals, determining the metrics or key performance indicators (KPIs) to be used to track and measure success, and the processes for reviewing progress and making adjustments along the way. At this level, the SLM lifecycle typically operates on a timescale that is measured in quarters or longer, with major strategic SLM initiatives sometimes taking several years to complete.

## **The Tactical Goal – Improve the Website or Application.**

Sorting through service priorities and mapping them to business needs lie at the strategic management layer. Once goals are established, tactical efforts are needed to make service objectives a reality. Engineering or development managers must design, build, test and launch new versions or releases of the Website or Web applications. IT architects and managers must maintain or upgrade the delivery infrastructure to provide the desired levels of performance. Applications, servers, databases, and networks must all be evaluated, both separately and as a system, to ensure that they can support the desired performance levels. If a key IT service requires additional resources to meet established SLOs, this fact should be uncovered and addressed before the service goes live, not later, during a period of peak demand.

Such changes can rarely be introduced in a single step. The process is more likely to require a multi-phase approach, achieving incremental gains in service level quality as each phase goes live. So the SLM process at this level involves repeated passes through an engineering cycle in which new application or platform releases are designed, built, tested, deployed, measured, and refined. Typically, each release cycle is treated as a separate project, with the cycle times being measured in months. Ideally, each new release also delivers improvements to the stability or responsiveness of the production environment, allowing operational monitoring thresholds to be raised a notch as a result.

## **The Operational Goal -- Keep Everything Running Smoothly.**

In the real world, engineering efforts do not always produce the results that were intended—new releases sometimes make things worse, not better, at least in the short-run. So no matter how rigorous the testing phase, after implementing and launching a new release of a Website or application, it must be monitored. To succeed in business online, companies need to know that they are actually meeting their intended service objectives, every minute of every day and for every type of user. This requires measuring and tracking the online experience of customers, detecting exceptions, and whenever possible, taking corrective action before customers are affected.

# Meeting Tomorrow's Internet Performance Requirements Today

Management Level	Person Responsible	Management Goal(s)	Process/Cycle of Activities	Time Scale
Strategic	Executive or Business Owner	<b>Business Success</b> (measured by business metrics)  <i>Stay ahead of the competition</i>	Set business goals, identify strategic actions, success metrics (KPIs), track progress, adjust	<b>Long Term</b> (6 months to years)
Tactical	General Manager, Site or Application Development Director	<b>Site and Application Improvement</b> (measured by site quality metrics)  <i>Improve the application or site</i>	Set performance goals, develop, test, deploy, measure result, refine or tune	<b>Medium Term</b> (1 to 6+ months, possibly containing several phases or iterations)
Operational	Web Operations Management	<b>Site and Systems Service Levels</b> (measured by availability and responsiveness metrics)  <i>Keep everything running smoothly</i>	Monitor against baselines, detect exceptions, prioritize problem, diagnose, assign and fix, verify	<b>Short Term</b> (minutes, hours, days, weeks)

Figure 2: The SLM Activities for Online Business

Figure 2 shows the activities required to create and deliver an online service, broken down into the three levels of management. A rigorous, integrated SLM process that moves through the four activities and sets process steps at each level of management can help IT to provide reliable, affordable, high-quality IT services. Because Web applications depend on so many interconnected technologies, managing the service levels demands a more holistic approach than can be obtained through simple “monitor and manage” tactics.

## How Keynote Supports the SLM Process

This section addresses the SLM lifecycle in more depth and also introduces the different products available from Keynote to support a company's SLM processes at each stage. EMA gained additional insight from an interview with the CTO of a top-ranked Internet retailer. He credits Keynote with helping him overcome problems in stability and availability that were plaguing the company's Website four years ago, before he began using Keynote's products. While this Paper focuses primarily on Keynote's Web Performance Test and Measurement products, some of Keynote's suite of

Customer Experience/UX products that perform behavioral and attitudinal analysis, real-world user testing, online surveys, and competitive and market intelligence are also noted.

## Keynote and the SLM Lifecycle of a Web Application

The foregoing discussion alludes to several requisites that are not readily available to the average company seeking to improve its online service levels. At the strategic level, business executives need access to competitive intelligence in order to settle on appropriate service level goals. At the tactical level, testers must simulate realistic traffic loads at all points of the delivery infrastructure to assure that an application will hold up during times of peak load—for example during the holiday season. At the operational level, monitoring and reporting systems must track the performance of the complete IT Service—the Web applications and all of the supporting infrastructure and component services, both inside and outside the firewall.

Keynote's entire focus is to enable companies to deliver the highest quality service levels and superior user experience of Websites, broadband services, and mobile

# Meeting Tomorrow's Internet Performance Requirements Today

communications. It does this by staying on top of the changing technology face of the Internet and offering products and services that address the performance nuances in this environment.

Keynote has four test and measurement businesses that support the SLM lifecycle: Web performance, mobile quality, VoIP and streaming, and customer experience/UX. This comprehensive suite of products provides companies with the ability to test and measure mobile communications and Internet performance at the application, transaction, network, and device levels. To get accurate insight into customers' experiences as well as competitors', Keynote offers innovative UX research tools and custom research engagements.

The company has chosen an on-demand model that helps companies reduce the costs of Internet service support, including lower capital costs and reduced need for highly Web-skilled labor. As a result, companies such as the one interviewed by EMA, a Fortune 500 retailer with a complete set of online applications, use Keynote to give them the customers' viewpoint, no matter where the customers are located around the world.

The following sections examine the SLM tasks necessary for each level of management, as they move through the SLM lifecycle.

## Strategic SLM: A Focus on Business Success

There are several needs to consider when assessing a company's Internet presence and how to create an SLM lifecycle to improve functionality and performance. The strategic goal is to identify new services that meet or exceed the functionality of those currently available and deliver them with outstanding quality. Planning must also include, at a high level, how to accomplish those goals.

**Understand the market.** How do executives know what their competitors offer? While it is possible to examine Websites and gather some information about their performance levels, this does not provide a thorough review. Post hoc analysis of the number of visitors and transactions to a Website is too little information, delivered too late in the lifecycle. Once a site is online, changes to processes and infrastructure can be very expensive and very visible to users. When determining what Internet services to offer, parameters include what functionality

should be incorporated and the performance levels that the site must maintain. These important planning decisions must be made with competitors in mind, as well as the potential cost associated with performance levels.

Keynote's Customer Experience/UX test and measurement products enable companies to perform behavioral and attitudinal analysis, real-world user testing, online surveys, and competitive and market intelligence. WebEffective is Keynote's on-demand software application for conducting customer experience research on Websites and across competitor and other industry sites. WebEffective captures user attitudes and behaviors as they engage in online scenarios that represent important business outcomes. Keynote manages its own research panel of more than 200,000 panelists who represent a broad range of demographics and psychographics. The Keynote Research Panel (KRP) is a true cross-section of the Internet population. Keynote's expertise in research and panel management deepens the reliability of customer feedback provided through the KRP.

**Set goals using market benchmarks.** Keynote publishes several performance indices and industry studies. Keynote Performance Indices are weekly, at-a-glance benchmarks of performance availability and responsiveness data for top business, consumer and government Websites. Keynote Industry Studies provide companies with insight into factors driving a comprehensive look at what drives online success and the steps that can be taken to achieve such success. These industry studies assess Websites from the ground up, focusing not only on the high-level business objectives of sites, such as customer acquisition and brand building, but also on the core essentials, such as usability, visual appeal, availability, and responsiveness. The industries currently covered include automotive, financial services, media/entertainment, retail, travel, technology, and voice.

This is important information for determining the required functionality and performance levels for your new initiative, and can be taken into the boardroom to increase support for new or upgraded infrastructure. The CTO interviewed by EMA regularly uses Keynote's competitive analysis reports on the retail market. The information guides his corporate strategy and helps him prioritize improvements to his company's Website.

# Meeting Tomorrow's Internet Performance Requirements Today

**Set overall competitive posture.** Beyond determining the functionality required, high-level decisions on the level of service to be provided for any given service must be made as a strategic decision. Executives decide their companies' posture in the market. Is the company a leading-edge, high-risk and high-return company; or does the strategic vision put it as a lower-cost, late-adopter company with lower risk levels? These basic decisions lead a company to meet or beat competitor's SLOs. Similarly, what type of SLAs to offer along with the particulars of an agreement can offer a competitive advantage when armed with knowledge of the competitive landscape.

Keynote's Competitive Intelligence products and benchmarks keep the discussion of performance firmly rooted in reality. Keynote can provide guidelines based on industry best practices and statistics on specific competitors. The company has created the infrastructure to capture detailed metrics, with 2,400 measurement computers and mobile devices (a growing number) in over 240 locations in 160 metropolitan areas around the world to provide a truly global measurement network. These computers regularly collect industry-specific information on the Website performance of many major players. Keynote's clients can access reports on their vertical industry via a Web portal.

**Change and improve SLM lifecycle processes.** Before beginning the development of an Internet service, managers at all levels will want to gain insight into the overall process of the SLM lifecycle. Executives must be sure they have the monitoring and recording incidents, tracking and reporting processes in place to keep a service running at high levels. Decisions at the beginning of an SLM program include whether SLAs should be developed, and at what levels of service, and whether current IT processes are adequate or need to be further developed.

Beyond its measurement and rating services, Keynote's expert consultants provide guidance to help companies achieve global success. With over ten years in the business, Keynote has developed its expertise in the SLM lifecycle. Keynote's custom consulting group can provide valuable insight on how to develop a process model that works for a company; and ensures a successful Internet service.

**Measure progress toward business goals.** Financial measures are only one way to determine progress in the market. A company can use Keynote's indices to track their own ranking, as compared to that of key competitors. Keynote also provides role-based reports geared to executive management that report on the SLA status, downtime by service, and other measures of service health. An executive-level Performance Scorecard from Keynote can supply real-time, end-to-end visibility into SLA compliance by customer or overall Website availability and performance.

## Tactical SLM:

### A Focus on Web Application Improvement

The tactical level of management must implement Internet applications to meet strategic goals, and then judge how well the applications are meeting those goals. Tactical management must identify areas for immediate improvement, and plan for near-future capacity growth.

**Understand required Web functionality.** A decade ago, an average IT staff person could design a successful Website. Today, it takes a team of technologists with a variety of specialties ranging from Web design, traffic management, security, and more. With XML allowing interactive features and much better customer relationship management (CRM), site design must be created or adjusted by Web professionals. In addition to these issues, accessibility is becoming an important aspect of Websites, as is the security features incorporated to keep customer information private.

Keynote's Customer Experience/UX test and measurement products enable companies to examine what the customer sees and does, from their initial visit to the homepage, to placing an order, to their long-term relationship with a company's online services. Keynote's end-user panels provide customer experience analyses from many Websites in many industries, supplying concrete input into best practice recommendations. Keynote has real-world insight into how hundreds of end users interact with Websites—what design features they key into, the search strategies they use, and the difficulties they have.

Additionally, Keynote can help you understand the many compliance issues that should be addressed by your Website. Security is an area for major risk exposure that no company can afford to ignore. Keynote can provide

# Meeting Tomorrow's Internet Performance Requirements Today

help with online security—from processes to technology. Another growing issue is Website accessibility for the disabled. In February 2006, Target was sued for not making its Website fully accessible to blind customers. Keeping up with the latest in compliance issues can be a full-time job, one that can be outsourced to Keynote.

**Set performance goals.** Beyond the look-and-feel of a site, the site's performance will determine whether customers return or go to a competitor. Performance is a complex interaction of infrastructure and design—just as is the service itself. The factors include functionality of the DNS and backend systems, the connectivity, page design and any redirection to other pages, object weight, and the use of SSL, caching, and compression techniques, among other factors.

If SLAs are to be offered, determining what level of service can be provided is a complicated calculation, as an SLA cannot be any more stringent than any given underpinning contract. Since availability and performance are multiplicative, the overall rating will be the product of service levels of the underlying components. In other words, if you have 99.9% availability for the Internet service, as well as your own network, and the database, and the application; the resulting service across those components can be only 99.6%:

$$99.9\% * 99.9\% * 99.9\% * 99.9\% = 99.6\%$$

Tools and metrics must be chosen to measure and describe actual performance and availability. If you can't measure the performance of your service, there's no way to assess how well you are meeting your objectives. Funds may need to be added into the budget for new software or improved outsourced services.

Keynote has experienced staff to help determine necessary compliance functionality, weigh design factors, and create HTML pages and XML functions that optimize site performance. Keynote's experience with hundreds of complex online applications influences its decisions on the appropriate infrastructure needed to support a corporate Web presence. It can help with determining service levels and negotiating and writing SLAs.

Keynote also provides independent monitoring and alerting, using its "on-demand" model to help meet monitoring needs while sticking to a predefined budget. Rather than buying expensive software that must

be installed, tuned, managed, upgraded, and supported, Keynote can give you the functionality without the headache and associated personnel costs.

**Change Web design, underlying infrastructure, and optimal load to meet required performance.** Before the site goes live, it must be thoroughly tested. In addition to testing the applications themselves, the overall performance on the infrastructure must be tested. Load testing assesses whether the applications, databases, servers, and networks can handle all the hoped-for traffic and keeps the service at the planned level of performance. Frequently, one component in the transaction path is a bottleneck. Identifying this component and load balancing, or increasing the component's capacity, can provide significant performance improvements without building out the entire infrastructure. Load testing can be an expensive and time-consuming process when you buy the software yourself, configure it, learn to use it, and maintain it. Internal testing is limited by the number of computers that are free to run tests, and the geographical locations you control.

Keynote allows you to outsource the load testing process, as well as test your Website from a truly global perspective. The detailed information Keynote provides can isolate which pieces of your infrastructure are creating bottlenecks, allowing you to "right-size" your infrastructure, avoiding excessive investment while providing the best performance. Besides pre-launch testing, these products can help you determine if your infrastructure can adequately ramp up for holiday traffic, sales, or special events.

Keynote has two products to help companies with testing, which allows the customer to choose how much support they need. Keynote's Test Perspective provides customers with access to Keynote's simple yet powerful recorder to create scripts and select the parameters that describe how "virtual users" or synthetic transactions will interact with the site. This is a subscription model with costs dependent upon the number of transactions and the length of the testing period. The results are provided back to you for analysis.

Keynote's LoadPro simplifies testing even further by outsourcing the entire testing process. Keynote will generate scripts using its expertise on the best methodology for testing your infrastructure, as well as perform analy-

# Meeting Tomorrow's Internet Performance Requirements Today

sis on the results. A final report is provided with results and recommendations for capacity adjustments.

**Measure service performance.** Whether a company uses SLAs or simply measures downtime and outages, keeping track of actual performance over time requires a great deal of tenacity. SLAs do increase the tracking and reporting burden, although they can also help a company address performance issues more clearly. Historical reporting of application trends helps IT spot problems in the infrastructure, areas where greater capacity is needed, or providers that are supplying inadequate service.

Keynote has a broad array of portal-based reports, such as Performance Scorecards, suited to tactical management, showing overall performance against established goals, as well as trend and history reporting. The retailer's managers, including service, application, and network managers, can use role-based Performance Scorecards to track SLOs, identify application and network latency issues, visualize trends, and drill-down into infrastructure details.

## Operational SLM: A Focus on IT Services and Site Performance

IT Operations manages the day-to-day aspect of providing IT services and needs measurements of the performance level being delivered. In order to identify the end user's experience, measurements must be assessed from end-to-end, meaning across the service in its entirety, rather than for each silo separately. Many companies do not have management applications capable of monitoring the complete service. For Internet services, end-to-end monitoring is more difficult because the service is dependent upon the Internet service provider (ISP) and the globe-spanning Internet itself. Even if you have an SLA with the ISP, this is not the same as guaranteeing the performance of a service at any given time.

**Set response goals.** This is where classic ITIL SLM processes fit in. The core of SLM is tracking performance and ensuring that it meets the defined SLAs. Meeting an SLO is usually the "worst case" scenario—in order to consistently meet an objective, most organizations set thresholds above the SLO to trigger response and escalation. This kind of proactive SLM will identify trends toward violation and infrastructure problems, and take steps to ameliorate the problem. Goals for re-

sponse, mean time to repair, and other metrics, as well as escalation procedures to help identify extreme problems will keep operations within defined SLA goals. Detailed information appropriate to operational employees must be provided for troubleshooting incidents.

**Evolving services.** Systems, measures, and SLAs must be continually adjusted to keep up with the changing needs, expectations, and capabilities of the Internet and its users. SLM assumes the constant improvement of any service, as well as expansion of the services offered. This may trigger a new mini-cycle, as the infrastructure will need to be assessed once again to see if it can deliver the new services or higher performance. Knowing the true costs of any service allows the overall value to be more accurately calculated.

Keynote's foundational products are those used to monitor and assess internal and external measurements. Using Keynote's global test and measurement network, active and passive end-user monitoring provides information on Website availability, performance, transactions, application functionality, streaming data, and traffic, as well as wireless, mobile, and VoIP performance. Beyond testing for availability and performance, Keynote can test individual Web pages for compliance with security and accessibility initiatives.

Keynote supplements Internet monitoring with monitoring inside the firewall by partnering with vendors such as Hewlett-Packard and IBM Tivoli. It has also developed appliances that report data back to Keynote. Keynote incorporates and correlates alarms thrown by infrastructure management systems with data gathered from Keynote's public agents. The combined information creates in-depth troubleshooting diagnostics—pinpointing problems to the Internet segment, ISP, router, application, or other components of the service.

Keynote has a set of monitoring products called the Perspective family, which addresses a wide variety of performance monitoring needs. The Perspective products provide real-time SLA monitoring, notification, trending, troubleshooting assistance, and historic reporting.

Keynote Transaction Perspective is a leading web performance measurement tool. Using an Internet Explorer browser to generate real transactions from locations all over the world, it provides a highly accurate measurement of web performance and availability based on

# Meeting Tomorrow's Internet Performance Requirements Today

local visibility from the end user's perspective. It is ideal for competitive benchmarking.

Keynote's Transaction Perspective High Frequency is a real-time operational monitoring tool for performance monitoring of Rich Internet Applications (RIAs) using technologies like AJAX, Flash and ActiveX – designed for rapid detection and resolution of site issues with Rich Internet Applications.

Keynote's Transaction Perspective Last Mile is an operational monitoring tool for measuring web performance and availability from representative locations worldwide over last mile access types (DSL, cable, Dial-up, 3G) – designed for Competitive Benchmarking of Web applications from last-mile access points.

Keynote's Application Perspective is a real-time operational monitoring tool of simple web applications and network – designed for rapid troubleshooting of web application and network issues

During EMA's interview, the interview subject explained that it initially contracted with Keynote for Application Perspective. He later added Transaction Perspective, which uses advanced scripts to test the processes involved in online purchases such as shopping cart functionality, check out, and credit card validation. The retail company's once poor availability is now 99.99%, earning it the number one spot in retail online performance rankings. Keynote's reports help the IT group diagnose problems and react quickly. If one of Keynote's public agents fails there are hundreds of others to provide the needed diagnostic information.

In addition to these offerings, Keynote provides several others:

## *Keynote's Mobile Quality Test and Measurement Products*

**Mobile Device Perspective:** Measures the end-to-end subscriber experience of mobile quality services from mobile devices. It allows users to validate service availability, delivery times, throughput, and accuracy of content and services.

**Mobile Application Perspective:** Interactively tests and measures mobile content utilizing a library of over 1,000 device profiles. This emulated environment can certify and validate content in a WAP deck, validate links,

point out potential conflicts or compatibility issues, and manage your ever-growing mobile Internet presence.

**SIGOS SITE (System Integrated Test Environment) Test System:** Provides an end-to-end solution for testing and measuring mobile application and content delivery.

**GlobalRoamer:** Certifies and validates pre-paid and post-paid roaming agreements across multiple carriers.

## *Keynote's VoIP and Streaming Test and Measurement Products*

**Voice Perspective:** Provides benchmarking and monitoring of end-to-end VoIP service quality which includes audio clarity, service availability, and service responsiveness from the end-user perspective over any communication media: DSL, Cable, and Wireless.

**Streaming Perspective:** Measures the quality and reliability of streaming media delivery the way the user experiences it. Streaming Perspective is an effective early warning system that alerts IT of service availability issues or user experience deterioration for streaming media applications.

## **The Keynote Advantages**

Keynote embraces the SLM lifecycle—at all three management levels. For example:

- At the strategic level, Keynote publishes independent reports and indices that rate companies' Websites and applications in many vertical market segments, and conducts custom research and evaluations for its customers.
- At the tactical level, Keynote is an impartial authority for assessing Web application quality, covering site design, responsiveness, availability, and accessibility.
- At the operational level, Keynote's worldwide network of over 2,400 measurement computers provides the world's broadest independent network of testing devices, allowing customers to assess Websites as well as ISP backbones, mobile devices, VoIP services, and service providers.

Whether a company is considering its first Website, or trying to better manage a worldwide site with millions of visitors, Keynote has services that will fit the need. Competitive Research, Customer Experience/UX

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Keynote Solutions Applicable				
Level	Measurement Services	Analysis and Problem Identification	Guidance and Recommended Action(s)	Type of Sale
<b>Strategic (or Business)</b>	Rank relative to competition (Performance Indices, Ranking studies)	Customer Experience UX/SLM expertise and syndicated analysis, Long term trends	Customer Experience UX/Web Performance Consulting Services	Syndicated Studies and Consulting <b>Engagements</b>
<b>Tactical (or Development or Engineering)</b>	Competitive measurements, A/B studies, Load Testing, Trend Analysis	Competitive analysis, Website assessments, Diagnostic analysis, Index reports, Trending	Customer Experience UX/SLM Technical Consulting Services for Site Design and Optimization	Custom measurement and Consulting <b>Engagements</b> , plus some measurement <b>Subscriptions</b>
<b>Operational (or IT Operations)</b>	Monitor site and application performance continuously	Track short term trends and alert on exceptions (MyKeynote, Performance Scoreboard, Daily reports, Weekly reports)	Keynote Diagnostic Services (KDS) and customer technical staff, working together	Measurement, reporting, scoreboard, KDS <b>Subscriptions</b>

Figure 3: Keynote's Products to Support SLM

Research, and mobile and Web Performance Test and Measurement are the three prongs of Keynote's support for Internet services throughout the SLM lifecycle. The portal-based on-demand model and independent, third-party recommendations make this an easy model for CIOs to adopt.

Keynote conducts on-going research into its Performance Indices, every year expanding the industries it tracks. As an example, Keynote recently published a VoIP analysis and positioning, ranking the performance of several combinations of hardware and service providers. Bi-annual Performance Indices and Ranking Studies help clients keep track of their top competitors' capabilities. International end-user panelists provide real-world experience and detailed insight into Customer Experience/UX capabilities, forming the basis for Keynote's best practices consulting. Keynote keeps abreast of advancements on the Internet, as witnessed by its complete portfolio of services for Web, mobile, VoIP, and streaming capabilities.

Keynote will manage your load testing, content checking for international pages or compliance, daily monitoring and reporting, diagnostics and analysis, and SLA tracking and reporting. Keynote gathers real-time informa-

tion on traffic, transactions, content, performance, and availability from Web pages, applications, networks, wireless handsets, VoIP applications, or mobile access, both inside and outside the corporate firewall. Keynote can assess all aspects of site usability, worldwide, in many access modes, throughout the SLM lifecycle. Combining Keynote's Internet monitoring with private agents running behind the firewall can give you a 360 degree, end-to-end perspective of your services.

## EMA's Perspective

Keynote has been monitoring Websites for over a decade. Many of Keynote's capabilities and products are unique—building from its huge competitive advantage in the sheer number of global devices managed and end-user panelists. To leverage and complement its monitoring and reporting capabilities, Keynote has wisely acquired strong consulting services for design, implementation, testing, and tuning. Keynote's software as a service model is also unusual in the sea of software vendors, and necessary, given its solutions. Keynote has continually broadened and strengthened its offerings over the last several years through both strategic acquisitions and internal development. In January 2006, Keynote announced three new offerings: Mobile Perspective, VoIP

# Meeting Tomorrow's Internet Performance Requirements Today

Perspective, and Streaming Perspective, which go beyond most companies' current capabilities. Keynote truly provides the whole package for Internet service support.

EMA expects Keynote to continue to grow, both in services and customers. Keynote is not just another Internet performance company. It has a broad story that gives it a strong advantage. At the same time, its wide array of services can create confusion for would-be customers. Developing a good "elevator pitch" that succinctly describes all of Keynote's products is an area of attention for the company. Another challenge is in the area of pricing, where Keynote charges by the transaction or by the page, making Keynote's products somewhat expensive for large implementations. Keynote may find some potential customers who cannot afford its premium offering.

Still, Keynote has demonstrated a strong commitment to the changing face of the Internet. It has done so through acquisition and internal product development, and has expressed this commitment to the media, customers, and prospects alike. EMA expects that Keynote will continue to refine its messaging while it keeps a pulse on the performance needs of online business and consumer dynamics—always with an eye toward customer experience management in the highly competitive marketplace.

## About Keynote

Keynote Systems (NASDAQ:KEYN) is the global leader in test & measurement solutions that improves mobile communications and online business performance. As an independent and trusted third-party, Keynote provides IT and marketing executives with an unbiased view into their Internet services from around the world. For over a decade, Keynote has been providing measurement data and testing capabilities that allow companies to understand and improve their customer's online and mobile experience. Keynote has four test and measurement businesses: Web performance, mobile quality, streaming & VoIP, and customer experience/UX. In addition, the company's industry analysis group called Keynote Competitive Research publishes proprietary studies measuring customer experience and service levels across a wide range of industries.

Known as The Mobile and Internet Performance Authority(TM), Keynote has a market-leading infrastructure of 2,400 measurement computers and mobile devices in over 240 locations around the world. Keynote also maintains one of the most representative panels of online users consisting of 160,000 consumers. Its on-demand, hassle-free infrastructure allows businesses to access services they need, when they need them to pinpoint and fix mobile quality and Internet problems before they impact customers.

Keynote Systems, Inc. is headquartered in San Mateo, California and can be reached at [www.keynote.com](http://www.keynote.com) or by phone in the U.S. at (650) 403-2400.

### **About Enterprise Management Associates, Inc.**

Enterprise Management Associates is an advisory and research firm providing market insight to solution providers and technology guidance to Fortune 1000 companies. The EMA team is composed of industry respected analysts who deliver strategic awareness about computing and communications infrastructure. Coupling this team of experts with an ever-expanding knowledge repository gives EMA clients an unparalleled advantage against their competition. The firm has published hundreds of articles and books on technology management topics and is frequently requested to share their observations at management forums worldwide.

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#### **Corporate Headquarters:**

2585 Central Avenue, Suite 100  
Boulder, CO 80301

Phone: +1 303.543.9500

Fax: +1 303.543.7687



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[www.enterprisemanagement.com](http://www.enterprisemanagement.com)  
1268.032007