Achieving Business Performance Goals through Virtualization Management Best Practices

An ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) White Paper
Prepared for eG Innovations, Inc

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Executive Summary

Virtualization is a key technology that is changing the way system hardware is used. It is also changing the way desktop environments are delivered, and how users interact with core systems and applications. Outcomes from virtualization include improved system utilization, reduced downtime, improved business continuity, and better service level achievement.

However, there are significant inhibitors to a successful virtualization deployment. Specifically, the management and monitoring software that comes with the common virtualization platforms is not enough to meet the business or technical goals of virtualization. It does not provide the cross-domain metrics for technical administrators to effectively monitor and manage performance on a wide scale. It does not provide the correlation across physical and virtual systems that IT service managers need to ensure fast problem triage and resolution. It does not provide the high-level performance and service measurements that CIOs need to assure business service levels.

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Such solutions need to span technologies and platforms across diverse multi-tier environments in order to deliver business goals for the CIO, service goals for the IT service manager, and technical goals for the system administrators. They need to cover key areas including discovery, physical infrastructure monitoring, virtual infrastructure monitoring, system and application monitoring, and connecting the pieces in a holistic view.

This EMA white paper investigates these issues in more detail, outlining the key drivers and outcomes of virtualization, explaining critical inhibitors to virtualization success (and how to overcome them), and describing core virtualization performance management solution requirements. It also briefly describes one such solution, the eG Enterprise Suite, and includes a short case study highlighting this solution in action.

Virtualization – A Short Introduction

Virtualization is a technique for hiding the physical characteristics of computing resources from the way in which other systems, applications, or end users interact with those resources. Server virtualization, for example, allows multiple operating environments ('guests') to run on a single physical server ('host'). Remote desktop virtualization extends these virtual environments to end users, allowing them to access a centrally hosted 'virtual desktop' from any physically remote system.

EMA research reveals that over 90% of enterprises rate certain business drivers as either critical or important to their decision to implement virtualization. These include improved system utilization, reduced downtime, improved business continuity, and better service level achievement. Virtualization helps to deliver these goals in several ways, for example:

- Dynamic workload management and centrally hosted desktops increase server utilization and reduce physical desktop system requirements, while extending the usable life of existing desktop PCs.

- Faster (and cheaper) support of systems, applications, and even desktops from a central location reduces repair times, delivers new services and applications faster, and improves business continuity.

- Central management, support, and protection of corporate data and systems, and fast migration of failing server and desktop workloads reduces downtime due to system failure and data loss.

- Centralized control allows fast response to problems and ensures data security to meet corporate SLAs and compliance objectives.

Inhibitors to Virtualization Success – and How to Overcome Them

Difficulties in Monitoring Virtual System Performance

Value-added management tools from virtualization vendors, such as VMware's VirtualCenter, are invaluable for silo-based management of virtual systems, providing important capabilities for administration, failover, configuration, etc., within the virtual environment. However, they are not designed to be complete performance monitoring solutions, so in isolation they are not sufficient to address broader and more complex performance and management problems. Without sophisticated solutions designed specifically for performance management:

- Technical administrators waste time and effort manually correlating, diagnosing, fixing, and reporting on performance issues in larger deployments.

- IT service managers have limited visibility with no view of performance across multiple virtual and physical systems.

- CIOs cannot guarantee service levels or meet business objectives as they have no visibility into the impact virtualization has on business services.

A substantial contributor to these problems is that these tools are unaware of anything outside their limited domain. They do not 'see' the physical environment, unallocated capacity outside their own resource pool, external constraints like network and storage limitations, or the complex resource utilization across tens, hundreds, or even thousands of hosts and guests in large virtual infrastructure deployments. In large virtual machine (VM) deployments with multiple domains, the narrow focus on a limited set of virtual machines is not capable of seeing the bigger picture. When tracking complex user-level resource requirements, the machine-level focus is unable to see specific users and their resource utilization patterns. They also do not take into account the higher-level business needs, as they are unable to track and correlate business services and applications across multiple systems – especially when they are in constant motion due to live migration or workload orchestration.

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Even with resource isolation, such as limiting CPU utilization or memory allocation for each VM, other factors interfere with the ultimate goals of improving resource utilization, maximizing capacity, and ensuring end-user performance. For example, the utilization of host and guest environments, the resource demand from specific users, the movement of virtual machines across domains and boundaries, the dynamic utilization peaks and troughs, and the complex interdependencies of applications, systems, and devices are all beyond the capabilities of value-added virtualization management tools. Value-added virtualization management tools also focus almost exclusively on the virtual machines themselves, rather than on resource utilization patterns of virtual desktop users, so capacity planning does not adequately account for the resource needs of these heavy users.

Indeed, any 'silo-based' approach to system management – using isolated tools, teams, and processes – leads to major problems. In any environment, IT services typically comprise a complex mix of disparate technologies such as Web servers, databases, networks, application servers, storage arrays, etc., and multiple applications and devices rely on each other in complex interdependencies. Managing service delivery therefore requires a complementary and integrated mix of people and disciplines – such as application performance monitoring, server administration, or security administration. Without this teamwork, it is difficult to quickly diagnose and repair problems because it is too hard to locate and define problem responsibility areas. The network team says it is a database problem; the database team says it is a capacity issue; the storage team says it is a server problem; the server team says it is a network slowdown. This 'blame-game' causes the problem triage to be a never-ending analysis cycle, as disconnected tools and departments all blame each other for the problem. This is even more problematic for shared virtual infrastructures. As more workloads tend to share a common infrastructure, virtualization means that performance problems are liable to have a very broad impact.

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For example, while a CPU-intensive or high-I/O process in a physical desktop only affects one user, a single 'misbehaving' process in just one virtual desktop can severely degrade service for all the users sharing the same virtual server. Monitoring the physical system alone cannot always detect these problems, as physical monitoring does not understand the granularity of the virtual machines, and will show overall CPU or I/O as high, without pinpointing the specific VM that is the root cause of the problem. Similarly, monitoring just the virtual machines will not identify the problem, as VMs often mask (and yield false positives about) the root cause of problems. If the offending VM moves from one machine to another – using orchestration tools, or built-in capabilities such as Live Migration or load balancing – the root cause is even harder to identify. Load spikes will appear to jump from VM to VM, even though one user is the consistent offender.

Virtualization also increases complexity, adding additional layers and additional dependencies that further slow problem triage and resolution processes. EMA research finds that enterprises tend to deploy virtualization across multiple vectors of complexity – especially the triple-threat complexity of virtualization platforms (Windows, Linux, UNIX, etc.), virtualization technologies (server, OS, application, etc.), and virtualization vendors (VMware, Citrix, Microsoft, etc.). On average, each enterprise has eleven differ-

ent virtualization platforms, technologies, and vendors to deal with. Only 2% of all enterprises are dealing with a simple, homogeneous virtualization environment.

Without integrated management tools to identify problems that span multiple infrastructure elements, technical administrators are unable to detect the root cause of problems across the complex multi-tier virtual/physical infrastructure. IT service managers face problem delays and SLA breaches due to the buck-passing and finger-pointing between physical and virtual infrastructure management groups, between server and application management groups, between storage administrations and DBAs. Meanwhile one or more unidentified BU(s) are unable to work, and the CIO – who may be completely unaware when problems even exist – is sideswiped by incoming calls from BU leaders.

Maximizing Success with Sophisticated Performance Monitoring

To maximize the success of virtual infrastructure deployments in such a complex environment, enterprises require sophisticated tools that deliver management capabilities for all key stakeholders – including CIOs, IT service managers, and technical administrators.

The CIO, for example, needs:

- Visibility across the entire physical infrastructure, as well as across multiple components of the virtual infrastructure, to be able to quickly determine not just what is going wrong, but where it is going wrong, and what business units are affected.

- Management tools that understand the relationships between IT components – virtual and physical – regardless of location or type, and which can connect component performance to business services, and the specific BUs or LOBs it affects.

- An ability to connect low-level performance monitoring with high-level business services, using a simplified dashboard that displays the real-time health of the virtual and physical infrastructure, to present 'at-a-glance' holistic views of business service delivery.

IT service managers have slightly different needs, including the ability to:

- Drill down below the business service level, into the components of a multi-tier environment – such as specific servers or applications, or even down to specific daemons or processes – to locate specific components that are causing performance problems.

- Immediately detect the specific root cause of performance problems, so that they can quickly assign definitive responsibility for remediation to a specific team, and avoid the additional delays caused by triage conference calls and buck-passing among IT departments.

- Obtain critical diagnostic and performance information automatically, providing very fast triage data even in a very large virtual infrastructure, resulting in what EMA research has found to be a 60% improvements to mean time to repair (MTTR) compared to IT shops without automation.

Technical administrators, by contrast, need much deeper capabilities, such as:

- Visibility into specific technical metrics – such as the current user load, resource utilization, system latency, load distribution, etc. – so they can easily diagnose and even prevent system problems.

- An ability to pinpoint and predict the root causes of performance issues – whether they are in the network, the server itself, the virtual machines, the I/O subsystems, or even in the applications themselves – and not just the symptoms or effects of performance problems.

- Specific capabilities that not only support but extend the VMware environment, expanding visibility and control across the restrictive VMware silos to cover multiple subnets, multiple VirtualCenter deployments, multiple Virtual Desktop Infrastructure (VDI) user sets, etc.

The answer is to address all these needs with more sophisticated performance management tools that are able to provide visibility and control appropriate to the level of monitoring required by each stakeholder. This will ensure the CIO knows how business services are affected as soon as a problem becomes apparent; the IT service manager can identify the problem and assign responsibility to the right team leader(s); and technical administrators have the details they need to pinpoint and fix the root cause of the problem.

Preferred Solution Capabilities

The key promises of virtualization are to deliver on the most important business drivers – such as improvements to uptime, availability, continuity, resource utilization, and service level achievements. EMA therefore recommends enterprises implement sophisticated management solutions that overcome the difficulties of performance management in a virtual environment, and directly help to achieve these objectives. EMA believes that a strong approach to performance monitoring, measurement, and root cause analysis for a virtual environment includes:

The key promises of virtualization are to deliver on the most important business drivers – such as improvements to uptime, availability, continuity, resource utilization, and service level achievements.

- Discovery – locating, identifying, connecting, and visualizing the various assets across multiple operational layers, including physical servers, virtualization platforms, virtual hosts and guests, and the applications on top of them.

- Physical infrastructure monitoring – monitoring the availability and performance of the underlying physical server infrastructure, including detail of granular resources, network performance, file I/O, etc.

- Virtual infrastructure monitoring – monitoring performance of extremely dynamic virtual systems in real time, including where they are running, and what level of resources (CPU, memory, I/O, etc.) they are using at any given moment.

- System and application monitoring – holistic monitoring for the performance and response of the complete operating environment, including servers and applications, systems and networks, with an in-depth understanding of both physical and virtual platforms, and the resulting patterns of dynamic resource utilization.

- Connecting the pieces – connecting performance monitoring across the multiple layers, measuring performance in an integrated way across the physical and virtual environments, providing holistic visualization and customizable reporting, with business service views that relate to upper executives as much as they do to technical administrators.

How eG Innovations Delivers on EMA Recommendations

In researching management solutions for virtual environments, EMA has found that the eG Enterprise Suite provides capabilities that address these key requirements:

- Discovery – utilizing standard VMware APIs, it finds both ESX hosts and virtual guests, and provides identification for what systems (apps, DB, etc.) those guests are running.

- Physical infrastructure monitoring – with integrated capabilities to monitor granular resources such as physical CPU, I/O, memory utilization, network, disk, etc., it ensures that all core physical infrastructure resources are monitored at the hardware level.

- Virtual infrastructure monitoring – by collecting measurements from the standard VMware API, it gathers vital health and problem analysis of virtual hosts, and monitors virtual guests from an internal perspective. It also provides user-level tracking and reporting in the virtual desktop environment, mapping virtual desktop activity with VM behavior. In this way, eG's technology identifies end-user activity and determines how and why a guest is misbehaving. It also correlates end-user activity to help identify the root cause of higher-level VM or server performance problems.

- System and application monitoring – with the ability to monitor over 80 different operating systems and applications – including Windows, Linux, UNIX, Exchange, Oracle, SAP, WebLogic, and many others – as well as various network devices and services, and of course the VMware virtual infrastructure, it gives a comprehensive end-to-end view of the entire operating environment. With layer-wise breakdown of performance for each application and device, with real-time policy-based alerting, it is one of the only solutions that effectively connects low-level components, both physical and virtual, to the root cause of problems.

- Connecting the pieces – this complexity is presented in a simple visual interface that connects the pieces. Virtual machine performance monitoring is correlated with service performance to enable root cause analysis, raising alerts based on automatically or manually determined baselines and policies that are sensitive to context and time. Administrators can drill down across a broad set of infrastructure components into specific problematic component services. This solution is not just for technical staff and virtual domain experts, but also suitable for system administrator, IT management and even CIO reporting, as it comes with many pre-built reports, extensive report customization, and high-level 'traffic light' displays and real-time visual dashboards to provide executive management with holistic service views of performance.

The key outcomes of this solution include:

- For CIOs – the ability to provide business service assurance by monitoring virtual and physical components as holistic business services, with cross-silo correlation, high-level visualizations, and immediate awareness of problems affecting BUs/LOBs.

- For IT service managers – less firefighting and finger-pointing, better resource allocation, faster service response times, and a better ability to meet SLAs, delivered through specific disciplines that support strategic best practices like ITIL (i.e., availability management, IT service continuity management, capacity management, incident management, problem management, event management, workload prediction, and problem avoidance).

- For technical administrators – the ability to handle ever increasing business demands and workloads, to allocate virtual resources to ensure response times and meet SLAs, improve consolidation and utilization rates, find and repair trouble spots in the virtual infrastructure and applications, and easily provide high-level cross-domain management reporting.

eG Innovations' DCQ (Demand/Consumption/Quality) Reports provide a top-level view of the virtualized environment.

For example, eG Innovations' DCQ (Demand/Consumption/Quality) Reports provide a top-level view of the virtualized environment. Specifically, these reports consolidate and report on key metrics comprising the specific level of resources each end user requires (demand); the key hardware resources utilized by various virtual machines to service those requirements (consumption); and how these factors affect the service availability and performance as seen by the end user (quality). These factors are all customizable to reflect the needs of each specific environment, using an adaptive system where users can determine which metrics indicate demand, consumption, and quality.

This allows IT to monitor the quality of the service provided to make sure users do not see the effect of resource issues. It also allows IT to maximize available capacity as infrastructure demand changes, such as by time of day and day of week, by providing insight into resource utilization and demand at both the virtual host and virtual guest level.

Consolidated reporting on the key metrics of demand, consumption, and quality gives answers to questions such as:

- How effectively is the virtual environment being used?

- Are you getting the greatest utilization out of your virtual platform?

- What are the key resource bottlenecks across the entire infrastructure?

- How can demand and capacity be more effectively channeled to improve the quality of user experience?

Figure 1 - eG Innovations console display highlighting the integrated service view of the entire virtual infrastructure

eG Innovations – The Real Life Experience

In researching this paper, EMA spoke with James, a senior technical engineer for a large global consumer products company (full names withheld on request).

As the lone support person for 400 VMware ESX virtual machines, James found VirtualCenter did not provide enough detail or insight, so he had significant problems monitoring, reporting, and predicting performance. As James described it, they were "flying blindly."

After a formal evaluation, James selected the eG Enterprise Suite with eG VM Monitor solution from eG Innovations.

As a VMware technical administrator, he says the environment is now "easier and faster to manage and administer," and the reporting facilities alone will save him almost a day's work every month.

From the IT service manager's perspective, the solution allows them to "load up multi-CPU systems with multiple virtual systems," increasing utilization and cost savings while confidently meeting SLAs.

For James' CIO and business unit VPs, the "reporting function … was especially important to the management team," and ensures that BU leaders get the availability they need, and the CIO gets the visibility that he needs.

Having a sophisticated capability to discover and monitor the entire operating environment...and to connect the pieces intelligently, providing a holistic view of performance, (eG Enterprise Suite) provides a crucial success factor for any successful virtualization deployment.

EMA's Perspective

Virtualization is a revolutionary technology that promises to change the way businesses deliver IT services. From the data center to the desktop, it promises exceptional results. EMA research has documented many key benefits, including higher system utilization, better availability, faster service delivery, and improved agility. In many cases, however, EMA has seen the potential benefits of virtualization dissipated by ineffective management – especially silo-based management that prevents quality service delivery and directly extends downtime and other problems. EMA believes, therefore, that integrated performance management is one key management technology that drives straight to the heart of many virtualization goals, and overcomes the significant problems of silo-based management.

The eG Enterprise Suite, and specifically the eG Monitor for VMware Infrastructures, provides just such a solution. Having a sophisticated capability to discover and monitor the entire operating environment – including physical and virtual, OS and application, system and network, and more – and to connect the pieces intelligently, providing a holistic view of performance, it provides a crucial success factor for any successful virtualization deployment. This is key to delivering higher availability, faster response times, improved continuity, and resource maximization, to deliver on mission-critical SLAs.

About eG Innovations

eG Innovations, Inc. (www.eginnovations.com) is a global provider of IT infrastructure performance monitoring and triage solutions. The company's patented technologies provide proactive monitoring of every layer of every tier in the infrastructure, thereby enabling rapid diagnosis and recovery in enterprise and service provider networks. By ensuring high availability and optimum performance of mission-critical business services, eG Innovations' solutions help enhance customers' competitive positioning, lower operational costs and optimize the performance of their infrastructures. The company has customers in 14 countries, including organizations of all sizes in government, banking/finance, telecom, healthcare, manufacturing, and service industries.

For more information on the eG Monitor for VMware Infrastructures, visit http://www.eginnovations.com/web/vmware.htm.

About Enterprise Management Associates, Inc.

Founded in 1996, Enterprise Management Associates (EMA) is a leading industry analyst and consulting firm dedicated to the IT management market. The firm provides IT vendors and enterprise IT professionals with objective insight into the real-world business value of long-established and emerging technologies, ranging from security, storage and IT Service Management (ITSM) to the Configuration Management Database (CMDB), virtualization and service-oriented architecture (SOA). Even with its rapid growth, EMA has never lost sight of the client, and continues to offer personalized support and convenient access to its analysts. For more information on the firm's extensive library of IT management research, free online IT Management Solutions Center and IT consulting offerings, visit www.enterprisemanagement.com.

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