

# **The Business Case for Virtualization Management: A New Approach to Meeting IT Goals**

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## *A New Approach to Meeting IT Goals*

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The process of deploying virtual machines has led IT managers to discover that the value of virtualization -- the ability to pool resources, rapidly deploy new applications, increase resource utilization, and much more -- can only be realized if the process is well managed. Thus, IT management's evergreen goals of maintaining high service levels, reducing infrastructure costs and increasing IT staff productivity - all well in place before virtualization -- are even more important in today's data center. IT must not only justify the business case for virtualization implementation but also ensure that when a company becomes virtualized, its business-critical applications will run at a level of service that is as good or better than before.

Traditional systems management tools, built only to view and understand the virtualized connections between applications and their server and storage resources, cannot model the underlying physical complexity that is created by virtualization sprawl. A new set of virtualization performance and utilization management tools in the market is providing the ability to achieve the following results:

- Maintain high service levels by reducing troubleshooting time
- Reduce infrastructure costs by improving utilization
- Increase IT staff productivity by automating management

These new solutions significantly reduce the time IT staff spends isolating problem areas, understanding root causes and resolving issues, and reducing the number of critical events. They enable IT staff to understand how application workload and utilization impact performance and, ultimately, optimize the balance between maximizing resource utilization and assuring application performance.

As IT shops seek to extend the financial benefits of resource virtualization deeper into the data center, they are discovering a significant gap when it comes to assuring performance to end-user applications.

Simply allocating resources from a shared virtualized resource pool doesn't actually assure peak performance -- and adopting the outdated practice of overprovisioning

as a means of performance insurance defeats the resource optimization promise inherent in virtualization.

Even tougher, when multiple IT domains offer virtualized services that are layered or nested, as with virtual servers accessing virtual storage, serious performance contention inevitably creeps into the end-to-end architecture. Finding these kinds of bottlenecks between virtualization layers is like looking for a time-traveling needle inside a rolling haystack.

Implementing production virtualization projects with poor overall capacity and performance management practices quickly negates any positive project [ROI](#). In the worst case, this can eventually wedge a transitioning organization between its IT budget "rock" and the very real "hard place" of degraded user service.

## Virtual Infrastructure Management

There is a way to meet IT economic goals and assure high-quality service, but it takes a new approach to virtual infrastructure management. By recognizing that resource virtualization technology is focused on allocating capacity from within its own resource pooling but that the job of assuring performance requires system-wide intelligence about what is happening both upstream and downstream, IT management can gather the right information to deliberately control and balance IT spending with service requirements.

In other words, it's hard for a domain-specific virtualization technology deployed within an IT silo (like servers or storage) to "know" enough to be smart about delivering optimal performance. Optimization requires lifting the curtains not only on the virtualization wizardry, but also on each IT silo contributing to an application's infrastructure. With that broader knowledge, IT can be more effective and efficient.

Virtualization was rumored to be the death of capacity planning and performance management, but the opposite is actually proving true. While silo or "element" level system management activities can "autonomically" be handled by good virtualization technology, cross-element or cross-domain system management requires another level of sophistication and expertise.

This doesn't mean that virtualization infrastructure management needs to be expensive. If new best practices are followed, significant savings can be recognized

through reduced system management expense within virtualization projects. More significantly, the overall ROI of virtualization can be multiplied by minimizing real resources while delivering optimal performance to production clients.

## Business Case Alignment

This article will review some more specific capabilities that virtual infrastructure management solutions can offer and provide some example ROI for adopting virtual infrastructure management in the following areas:

- Maintaining high service levels
- Reducing infrastructure costs
- Increasing IT staff productivity

The ROI numbers are based on the average experience with [Akorri's BalancePoint](#) solution for virtualization projects with approximately 100 virtualized servers, a VM-to-server density between eight and 15, and production quality mid-range [SAN](#)-based storage arrays.

While there can be significant differences in approach with many kinds of performance management ROI calculations (especially in determining the exact value of particular optimizations and the future value of accurate scenario planning), the ROI areas chosen for presentation here can be measured and have delivered proven results.

## Maintaining High Service Levels

The goal of maintaining high service levels while in production operation is mainly served by avoiding performance problems to start with. However, while effective performance management in practice achieves a high reduction in performance issues, it's difficult to generalize an ROI estimate that would apply to all organizations equally. A more consistently predictable benefit is based on reducing overall troubleshooting time. The resulting savings can then be applied to the current rate of performance problems to provide a lower boundary of ROI.

Generally, reducing troubleshooting time for performance problems in virtualized environments benefits from three virtual infrastructure management features:

- Visualization
- Analysis
- Recommendations

## Visualization

The most important feature of virtual infrastructure management solutions is the automatic discovery and mapping of both the virtual client-provider configurations and the underlying actual resources allocated and assigned through the virtualization layers. This requires collecting data dynamically from multiple layers of IT architecture including applications, virtual machines, virtual hosts, SANs, storage virtualization switches and storage arrays.

Practically, because this involves collecting across IT domains with multiple areas of administration, this can be effectively implemented only through the use of unintrusive, agentless technologies that can be deployed across complex environments automatically without remote installation.

The best visualization topologies not only show the current logical mapping of data paths end-to-end from application to disk spindle across multiple virtualization layers, but also color code objects with a red-yellow-green indication of performance issues for immediate and direct troubleshooting.

## *Analysis*

The analysis that isolates those performance issues needs to accurately model and evaluate all the competing clients for every resource to identify performance contention and hotspots. Evaluating the impact on each application's performance through the intentional and unintentional sharing of resources requires sophisticated queuing modeling that leverages both the dynamic resource assignment/mapping and the dynamic collection of live component performance data at every level of the topology.

Because this kind of analysis is cross-domain and quantitative, drilling down into objects provides a level of analytical detail not found in event or fault management

solutions that are limited to alarming on individual elements that have failed outright or exceeded gross thresholds.

The resulting analytical picture can solve the difficult performance problems that escape identification by any domain-specific methods or tools. The best virtual infrastructure management solutions are constantly analyzing the environment to maintain current visualizations (and issue performance alerts as appropriate).

### *Recommendations*

Furthermore, once analysis is available, it can be used to generate actionable recommendations for proper workload placement, resource tuning, and optimal utilization goals. For example, analysis could indicate where to migrate [LUNs](#) within the available storage to improve an application's [I/O](#) performance across its I/O "fingerprint," even accounting for any other application/LUN volume sharing.

### *ROI of Reduced Troubleshooting Time*

In Akorri's customer base, 60 percent of virtualized environments report reductions in storage contention issues from once a week to less than once a month. Additionally, many persistent and previously unsolvable performance problems have been reported to be solved within hours or days of initial implementation. Ongoing savings can be quantified on several metrics:

- Time Savings (Staff Productivity and Efficiency)
- Faster Problem Resolution (Application Productivity and Avoiding Revenue Loss)
- Fewer Troubleshooting Events

For our example 100 VM customer, these kinds of savings average to more than US\$50,000 annually. If this were the only benefit, the payback period for adoption would be just less than a year, at 3.5 calendar quarters. Of course, the value of preventing just one critical performance problem on a business-visible production application could easily exceed this productivity-based calculation.

## **Reducing Infrastructure Costs**

There are significantly larger savings that can be recognized in reducing infrastructure costs. Of course, this cost savings is a prime motivation for virtualization adoption, but often the return on virtualization by itself is limited by

only being able to effectively virtualize the less critical and less performance-sensitive applications.

Virtual infrastructure management solutions enable virtualizing significantly more of the production application portfolio. This also prepares the organization to eventually leverage cloud computing. However, these strategic benefits are difficult to quantify in ROI calculations, so the focus here is on the more tactical returns experienced in practice by reducing infrastructure costs directly through the following processes:

- Assessing
- Adjusting/Aligning
- Anticipating/Planning
- Assessing

The first task in optimally reducing infrastructure costs is to establish a baseline for current utilization and headroom with regard to performance goals. This is fairly sophisticated capacity planning that requires producing each application's performance response time curve. In a virtual environment, producing these curves requires understanding all the real allocated infrastructure, the application's entitlements, and any competition for the resources within the same server and storage elements.

Akorri's BalancePoint encapsulates this complexity in one easily interpreted number called the "Performance Index" (PI). Based on the underlying performance curve, the Performance Index is normalized to 100 at the optimal point at which infrastructure utilization is maximized with regard to still delivering good operating performance. Therefore, a PI below 100 is a direct figure of "effective capacity," and immediately shows remaining headroom (the difference from 100) accounting for performance goals.

### *Adjusting/Aligning*

A Performance Index below 100 for a Virtual host server can directly indicate how many more "average" VMs might fit. Likewise, a PI above 100 shows performance degradation and can be used to determine that VMs should be moved elsewhere.

Details of the response time curves can show where both misalignment and the biggest opportunities for improvement exist. For example, cross-domain analysis of an application's I/O might show high response time. Drilling down might show the

application produces a high number of writes through layers of virtualization that eventually hit a [RAID 5](#) disk array, which is not the most suitable RAID type for high write applications.

### *Anticipating/Planning*

The biggest savings come from being able to anticipate resource requirements in such a way as to be able to take advantage of intelligent purchase timing and accurate resource acquisition. With both performance-based capacity forecasts and disk space capacity trending, it's possible to plan future hardware requirements to avoid unnecessary spending while taking advantage of Moore's law and the time-value of deferred purchasing. Often, having a solid understanding of actual requirements by itself creates a more favorable negotiating position with suppliers.

### *ROI of Reducing Infrastructure Costs*

The ROI expectation in this area is usually calculated based on a modest percentage of IT acquisition budget. Anecdotally, a few customers have deferred their entire annual acquisition budget; however, promising 10 percent savings is conservatively safe when considering actual savings opportunities due to the following factors:

- Cost avoidance through higher utilization of existing resources
- Purchase timing including some deferral to next fiscal year

For our average Akorri BalancePoint customer of 100 VMs, the ROI in reduced hardware costs for server and storage exceeds \$300,000 annually. This is quite significant and easily justifies thorough virtual infrastructure management, with a payback period of less than two months. Anecdotally, some customers have saved that much or more on the first day of implementing BalancePoint by canceling unnecessary impending resource purchases.

## **Improving Staff Productivity**

One of the hidden problems with virtualization deployments is that the actual number of "objects" requiring system management grows much faster than the rate of additional staff to manage them. While virtual objects don't occupy physical space in the data center, they do require change and configuration control, asset and security auditing, and of course, performance and capacity management.

It's essential to the ROI of virtualization projects, therefore, to find ways to automate management activities. By automating common tasks, eliminating problems and exceptions, and providing heterogeneous management views, staff productivity can be greatly enhanced. Virtual Infrastructure Management solutions provide productivity value in the following areas:

- Aggregation
- Assessment
- Allocation
- Aggregation

The first system management task for almost any process is to collect and organize supporting data. In the virtualized environment with dynamic changes in provisioning and allocations, this task must be automated. As mentioned earlier, data collection in a cross-domain solution needs to be agentless, or it will quickly revert to shelfware.

Perhaps most importantly, effective cross-domain management solutions must interpret and transform heterogeneous vendor and cross-platform metrics into a homogeneous and consistent set of standardized reportable analytical views. This enables a single administrator to understand multiple technologies, but also significantly enhances communication across IT silos, and between IT and business application owners.

### *Assessment*

Information is useful only if it is readily available for decision-making. The best system management tools provide both dashboards and online drill-down analysis views for instant at-a-glance profiling, troubleshooting and planning reference.

Productivity is also enhanced by providing custom reporting that can build upon standardized metrics to provide for unique organizational requirements. Especially important are the higher-level analytical results that summarize the impact of one IT domain on another, and that highlight the application performance contributions or contention at each managed resource.

The more a virtual infrastructure management solution can produce management numbers at the business-IT level, often referred to as IT "Key Performance Indicators" (KPIs), the more IT can be run as a business. Data center level statistics for total effectiveness, remaining capacity and relative efficiency are the ultimate in

capacity planning, and they form the basis of decision making when it comes to evaluating cloud computing alternatives.

### *Allocation*

Our final ROI value for virtual infrastructure management tools is the ability to produce quality chargeback or cost allocation metrics in addition to application performance service levels. In virtual environments, utilization allocations must be based on the real underlying (host) resources used and not on virtualized guest operating system (OS) metrics in order to provide a fair cost basis. Furthermore, intelligent assessments of quality of service (QoS) and indirect application benefits like type and tier of storage and available peak headroom can be used to create multiple classes of value for virtual environment customers.

Staff time producing chargeback metrics is recovered, and the value of the staff's total infrastructure service delivery can be externally quantified and made visible to the business.

### *ROI of Improving Staff Productivity*

Theoretically, staff savings due to virtualization projects could lead to reduced headcount if system management effort were tracked to physical server count. In reality, managing virtualization requires more expertise and often additional staff. The additional managed objects and centralized resource pools tend to require management efforts similar to traditional mainframe management. Virtual Infrastructure Management solutions can help alleviate those new requirements with automation and other productivity enhancements with these results:

- Time savings for staff
- Reduced future headcount costs

The average Akorri BalancePoint customer with 100 VMs can identify over \$500,000 in staff productivity annually. This number, surprisingly, exceeds the direct value of optimizing hardware utilization and assuring application performance. Upon close inspection, however, enhancing cross-domain IT communication by providing a common "language" (consistent view of the architecture and its behavior) creates deeper value in every system management process -- not just for performance and capacity management. Anecdotally, IT teams deploying BalancePoint have reported increased job satisfaction and sense of corporate alignment.

## Conclusion

The new Virtual Infrastructure Management solutions significantly reduce the time IT staff spend troubleshooting, understanding root causes and resolving issues, reducing the number of critical events, and ultimately optimizing the balance between maximum resource utilization and quality application performance.

Key to maximizing the return on virtualization projects is the best practice implementation of virtual infrastructure management for performance and capacity. The basic ROI calculations presented here add up to more than \$850,000 in the first year for a 100 VM organization. With a payback period within six weeks of implementation, there is a clear and compelling business case, especially for constrained IT budgets.

Virtualization is an important technology for companies to fully leverage in their production data centers. By applying these new system management solutions, the ROI of virtualization projects can be assured and even multiplied. Additionally, successful virtualization projects are a fundamental step toward supporting corporate cloud computing initiatives. In the near future, IT organizations that demonstrate an ability to optimally manage virtualization will be rewarded with ownership of private cloud operations, while others may find their data centers migrating to external clouds.

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***Rich Corley** is founder, chief technology officer and vice president of engineering of [Akorri](#), a developer of analytical software solutions designed to optimize performance and utilization in the dynamic data center. BalancePoint virtual infrastructure management software provides automated, infrastructure-wide visibility and analysis to help enterprises fix problems, optimize utilization and improve performance for both virtual and physical servers and storage.*

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