FUSION LABS
15770 Dallas Parkway, Suite 1100, LB 28
Dallas, Texas 75248
tel 214.739.5454
fax 214.739.5455
www.fusionlabs.net

A WHITE PAPER TITLED:

A PRACTICAL GUIDE TO COST SAVINGS WITH VIRTUALIZATION

October, 2008

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

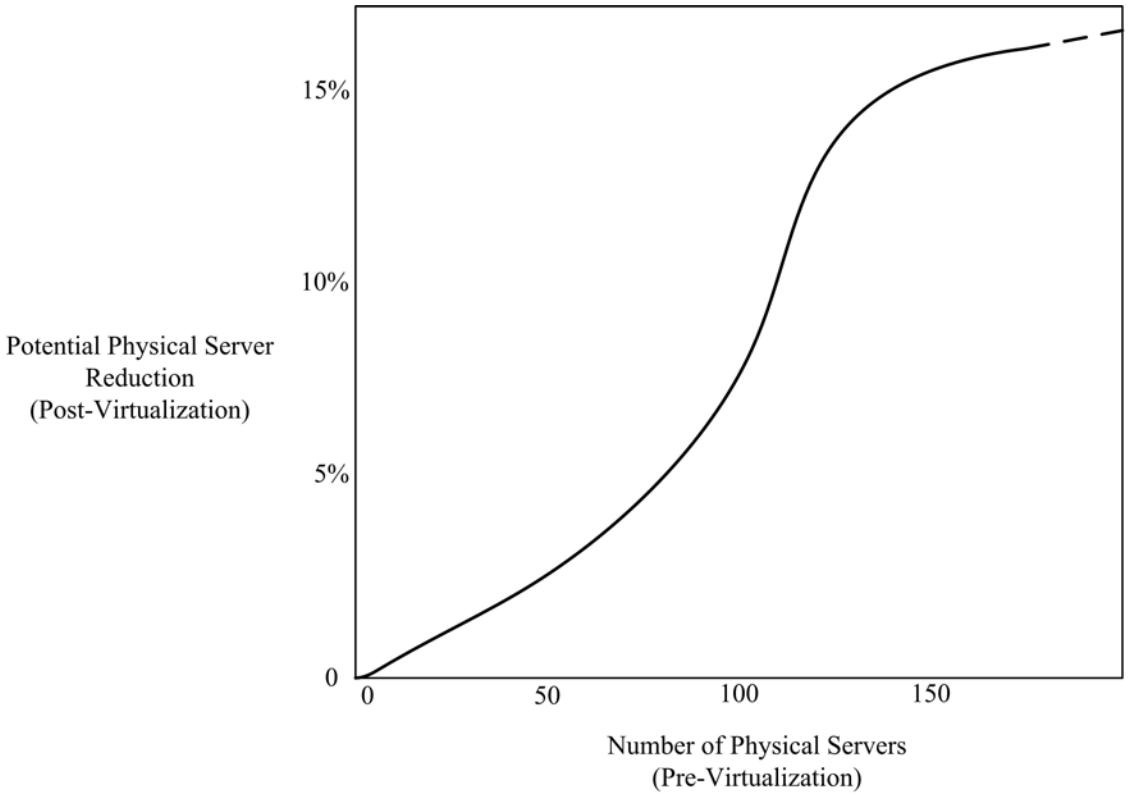
Virtualization is currently emerging as a key element for cost effective and reliable operation of information systems. The hypervisor-based oriented consolidation of physical servers under virtualization is based on practical business requirements and is driven by a set of solid ROI factors. Included in the real-world benefits of virtualization are:

- Direct Cost Savings
  - Equipment cost reduction
  - Software license savings
  - Power and cooling cost reduction
  - Facility space reductions
- Indirect Cost Savings
  - Reduced data center administration cost
  - Improved user accessibility and performance
  - Better security with less business disruption
- Other Benefits
  - Improved hardware and software flexibility
  - Support of “Green” philosophy
  - Increased SLA compliance and tracking

Although virtualization provides a solid business-based rationale for its implementation, it is flexible enough to vary considerably with specific business environments and generally follows a set of fit factors related to applications, loading, etc.

Often virtualization is one component of a more comprehensive effort to redirect I/T resources and lower the options associated budgets. In this context, an included case study illustrates the business motivation and results from a company combining virtualization with comprehensive data center outsourcing. The case study represents the move to virtualization by a practical and absolutely system availability critical organization. The net affect of their move to virtualization and DC outsourcing is a realistic example to others. A general estimate, rule of thumb, for the potential server, and associated cost, reductions with virtualization is shown in Table I.1.

TABLE I.1: POTENTIAL VIRTUALIZATION IMPACT*



***Notes:**

1. Source is practical experience and literature.
2. See Section II.D for a list application oriented virtualization ROI factors and exceptions.

The implementation of virtualization must be performed with a well planned and carefully executed step-by-step approach. Adequate planning and close attention to detail will ensure a smooth and cost efficient move to virtualized systems.

II. REVIEW OF KEY CONCEPTS

Although virtualization has been available in one form or another for some time, it's appropriate to start with a general overview of its key concepts and capabilities.

A. An Application Centric Approach

Since the first days of IT, the real benefit to most user organizations, with a few exceptions, has been directly derived from the applications being utilized. The goal of most IT organizations is to provide and operate these valuable, and often unique, applications in the most cost effective and reliable manner. In many cases, the critical IT applications are quite literally the life blood of the organization. The whole concept behind virtualization is to do just this – run the applications (both standardized and custom) in the best possible manner in terms of reliability, security, user accessibility and operational cost. In some organizations, to do this requires accommodating disparate application architectures, dissimilar processing platforms, non-uniform databases, etc., and yet perform in a consistent and effective manner. Currently, robust and manageable virtualization approaches and tools are designed to do just that. Today, virtualization is a proven technology that greatly assists reliable application operation and provides streamlined administration, improved security and reliability, and significantly reduced operational budgets.

B. Virtualization Overview

The terms "virtualization" and "virtual systems" most typically refer to the software-based technical ability to provide virtual servers that are defined and operated independently of their physical server platforms. Once established, these virtual servers are dynamically redefined, supervised and adjusted by a master or hypervisor software system. In concept, the hypervisor is similar to an operating system of operating systems and assures a seamless interface between the virtual servers and their physical environment. This master operating system also ensures total virtual server independence and optimizes the match-up of physical resources to the ever shifting load requirements of the virtual servers. In this manner, virtual servers are "hard partitioned" from each other for the protection of their reliability and for the insurance of their security and are typically defined to operate roughly equivalent to each other with respect to the utilization

loads. In this situation there are no physical servers idling along at a 2% to 5% load while others, under peak load, are struggling at 80%+ with users encountering delays. In many ways, the group of virtual servers resembles the dynamically managed processing environment of legacy mainframe processors.

C. Virtualization vs. Server Dedication Rationale

The shared physical resource capabilities of virtualization typically provide major savings to organizations who previously dedicated their physical servers to specific functions (storage networks, e-mail support, etc.) or to closely defined application groupings (financial, order processing, etc.). In this fairly common situation, through time the replicated server hardware and software components often become unnecessarily cumbersome and expensive. Although reliable and fairly straight forward to manage, the dedicated physical server approach can also result in excessive cost through server proliferation (and the associated software) and by ensuring uneven server loading.

D. Virtualization Fit

Once considered a fairly advanced and complex approach best suited to specialized user environments, virtualization is currently fairly common and often very economical. The master control software required for effective virtualization is available from a variety of hardware and software suppliers. The implementation of a virtual server-based environment is frequently accomplished along with other operational changes (data center relocation, hosted systems, etc.) as a key component of an overall IT larger cost reduction program and/or as a part of an internal headcount shifting initiative.

Again, with the overall IT goal of providing the user organization with the best possible operation of it critical applications, some environments are better suited to a virtualization-based approach. In general however, virtualization fits the bulk of common business applications with a few notable exceptions:

1. Database intensive application may not perform better, or even as well, under virtualization in that under virtualization the database may share

physical server(s) with non-database applications and, therefore, the overall environment may not be able to be “fined tuned” as well for some database functions.

2. Graphics intensive applications may not perform as well under virtualization due to their highly peaked, and somewhat unpredictable, CPU utilization.

3. Applications which actually require highly unusual, or even application specific, hardware may not be good candidates for virtualization. The operating systems and/or characteristics of such unique resources may not match well with virtualization.

4. Poorly performing and unpredictable custom applications may or may not run better under virtualization. Typically, it is better to clean-up poorly operating custom applications before moving them to virtualization.

While all these applications will probably operate at least as well as they have been, they are likely to cause set-up issues and/or ongoing administrative difficulty.

E. Hosted Virtualization Benefits

Fusion Laboratories Inc., Fusion Labs, has supported and assisted the planning and initial move to a virtual server environment and, once operational, provided the ongoing operational support of the overall system. In this context, Fusion Labs services include:

- Evaluation and ROI analysis;
- Detailed planning and design;
- Implementation assistance; and
- Managed services operation.

This end-to-end Fusion Labs support and assistance can greatly expedite and smooth the transition to virtualization.

III. VIRTUALIZATION ROI FACTORS

Because the move to virtualization is often driven primarily by cost savings resulting from improved physical resource utilization, it's imperative to closely review the Return On Investment (ROI) aspects and considerations.

A. Optimal ROI Environments

The Return on Investment (ROI) for virtualization is typically dependent on how well this approach fits the business situation and how well it has been implemented. Like most technical capabilities, virtualization definitely has no "plug and run" guarantee for performance. To best match virtualization capabilities to the environment and needs of the organization, the following characteristics are considered to be important:

1. **Prior Server Dedication**

   Organizations historically assigning physical servers to specific tasks (dedicated e-mail servers, etc.) can typically obtain major cost savings with virtualization.

2. **Irregular Load Patterns**

   Organizations with significant operational peak loads and heavy usage patters (end of month, etc.) can often provide good ROI opportunities with virtualization.

3. **Limited Resources**

   Organizations with a limited IT operations staff, those with minimal headcount and/or limited technical skills, frequently represent a major ROI opportunity under virtualization.

4. **Single Site Operations**

   Typically organizations having a consolidated data center with clustered server provide a solid ROI opportunity for virtualization.

Although most server rich environments are likely candidates for virtualization (see Table I.1), the ROI tends to be best where the above factors are present.

B. Primary Cost Savings

The cost benefits from virtualization tend to be derived heavily from direct (primary) savings. The primary savings obviously focus initially on the ability to reduce physical servers. This benefit includes:

- Lower equipment lease costs;
- Reduced maintenance expenses; and
- Pared back operating system fees.

In many cases, the reduction of physical servers also allows a fairly proportional reduction in application and database licensing costs. Considering that many organizations operate 100+ application dedicated servers, this element alone can provide a major ROI.

C. Secondary Cost Savings

The secondary savings come through a variety of virtualization-related benefits and associated cost reductions. Initially because there is less physical hardware there are also associated, and generally proportional, reductions in:

- Space costs;
- Power and cooling; and
- Operational labor.

Another indirect or secondary ROI factor is the improved user efficiency derived from generally faster throughput and improved availability under virtualization. A final indirect benefit is derived from the improved portability of virtual servers enabling much more efficient relocations and transitions, in effect, a virtual server move becomes no more complex than any other software move.

D. Storage Related Savings Considerations

While virtualization is generally focused on processing platform optimization, there may also be major improvements for storage-related operations and costs. Virtual servers performing data storage can realize the following benefits:

- Dynamic virtual server management server management can minimize the access delays caused by irregular peak demand.

- Multiple data copies can be automatically managed for back-up reasons and, in this manner, application contention for the same data can also be prevented.

- Storage Area Networks (SAN) are commonly implemented as an element of the move to virtualization resulting in further performance benefits.

In summary, not only does application performance improve with better processing server management, virtualization also offers significant storage management cost and operational benefits. For example, a major bank with decentralized systems found their next generation data storage, and data storage related software (including encryption, etc.), costs dropped about 90% when managed under virtualization versus their previously dedicated local data server approach. Although this is obviously an extreme example, the cost storage related savings with virtualization can be substantial.

E. Other Virtualization Benefits

In addition to the direct and indirect savings resulting from implementing virtualization implementation, there are several important additional benefits. Included in these considerations are:

- The ability to rapidly establish and manage the multiple environments needed for seamless testing, staging and productions.

- A more structured operating environment resulting in fewer operations errors and better overall administration.

- Far superior capacity management with much faster adjustments due to significant load variations.

- Much more operational flexibility with regard to hardware changes and even physical location – a key point in Data Center moves, disaster recover/contingency planning, etc.

- Tighter security due to better controlled system access and enforced policy-driven operations.

- Better system certification and application licensing compliance with correctly structured operations.

- Automated SLA tracking and reporting with real-time reporting of current or pending discrepancies.

- Due to the reduction in physical servers, the organization's power usage also decreases. This consideration can be important to the overall long-term corporate goals of "going green" and may qualify for the peak load scale back reward programs offered by some power utilities

All these beneficial virtualization features, especially when considered collectively, contribute to the solid business rationale for utilizing this approach.

IV. VIRTUALIZATION CASE STUDY

The following real-world case study clearly illustrates the rationale and possible results with a move to virtualized systems.

A. Organizational Background and Rationale

A major freight brokerage company that wanted to cut their IT operational headcount and costs determined a move to virtualization offered a major opportunity. The goals of their virtualization effort were: (1) to reduce their server costs and their associated software licensing costs; and (2) to improve their operational reliability. Key to their ROI was the virtualization ability to dynamically manage and adjust their virtual servers to more efficiently accommodate a strongly patterned transaction load profile.

B. Hosted Virtualization Approach

The virtualization project coincided with a physical Data Center (DC) relocation with additional savings planned to be realized by outsourcing these DC operations. In this manner, through the use of heavy redundancy and shared rather than dedicated staffing, their operational reliability and 7x24 support were also greatly enhanced and at a lower overall cost. Typical to the hardware savings of this type situation, they expected serious hardware and software direct cost reductions.

C. Practical Considerations

Virtualization must be compatible with the realities of the business environment it supports. This real-world requirement is no where more evident than in this case study situation. The practical considerations of this virtualization case study implementation included:

- Several application software licenses were not oriented to a virtualized environment.

- Company users had a very low tolerance for any disruption or other inconvenience during the hosted virtualization cut-over and start-up.

- The highly critical business application needs (supporting the entire end-to-end functions of the freight brokerage) demanded absolutely reliable 7x24 availability.

- Budget constraint issues, driven for all distribution organizations by escalating fuel cost issues, demanded minimal one-time implementation expense.

D. Virtualization Results

The freight broker's virtualized Data Center was implemented successfully in its hosted environment with the following results:

- Operational reliability has been significantly improved and is very close to 100%;

- Overall systems operations budgets have been reduced by approximately 15%;

- Internal operational headcount resources previously assigned to operations have now been reallocated and the previous DC headquarters facility office space has been reassigned to other corporate functions; and

- Service Level Agreement (SLA) based goals and user accessibility targets have been consistently exceeded.

In summary, after more than a year of operation the company's virtualization project has been considered to be a solid business-based success.

V. STEP-WISE EFFECTIVE VIRTUALIZATION IMPLEMENTATION

The implementation of virtualization is a critical element of success. Due to its critical nature, virtualization does not lend itself to an iterative start-up, but demands a "first time, final" implementation approach.

A. Preparatory Analysis

Once a decision has been made to evaluate the suitability and potential benefits of virtualization, a series of steps are put into action. Initially, a thorough review of application characteristics and load patterns helps to identify potential operational issues and requirements. The current processing platforms, storage systems and data communication capabilities next need to be reviewed and a "before and after" system profile can be established with cost differential estimates. In doing this, it should be recognized that a virtualization approach typically consolidates physical servers and thus improves operational management and hardware utilization, but virtualization also adds its own unique overhead. All these factors need to be established and considered. Also, key to this evaluation process is a review of likely software license cost impact. Software agreements are typically not highly uniform and in some cases can require a license fee for each logical rather than physical server. All these points must be reviewed in advance.

B. Architecture and Planning

Once the key operating parameters of the post-virtualization environment have been defined, the appropriate architecture needs to be designed. Included will be an evaluation of the processor platforms, the virtualization control software, storage system approach, data communication interfaces, etc.

C. Step-Wise Implementation Plan Definition

Once the post-virtualization environment is fully defined, a step-by-step implementation plan can be defined. Priority virtualization implementation steps may be based on critical reliability needs and/or ranked by ROI contributions. Included should be a full list of specific tasks and their

schedules and assignments. A key element is the supplier (especially software) contacts and detailed arrangement/contact definitions under virtualization. This detailed implementation planning is critical to later success and to being able to verify the post transition ROI.

D. Pilot Testing and Parallel Start-up

In addition to a carefully planned stepwise migration to virtualization, it is usually recommended to include performing a true pilot test prior to start-up and to use a parallel production level operation period to catch any discrepancies. If at all possible, the true "go live" should be accomplished during an off peak period and accompanied by full technical support. It is critical that the user's first impression of virtualization should be that of a seamless transition and generally improved service.

For further information, please contact: Brian R. Blackmarr
214-739-5454 – Office
214-435-4433 – Cell