

The Evolution to a Virtual Data Center

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Introduction – The Imperative of IT Efficiency

The demands facing IT organizations continue to multiply. At the same time, running a data center is becoming more and more challenging. While most leaders of businesses today may look at IT as a cost center, in many ways it represents everything the business knows. CEOs and CIOs increasingly realize their companies have to be more efficient in running this important part of their business.

In 2009, growth in IT spending all but stopped. By 2010, there was a growing realization by businesses that standing still, doing nothing, would not allow them to effectively compete, and IT investment began to come back. Companies knew they had to get down to the work of making IT much more efficient this time around.

It's no secret companies today are still not hiring more staff to any great extent, but they also realize they can't keep spending on IT and wasting it. They need to know how to utilize all the hardware, software, and networking assets they buy, or already own.

Two of the most oft heard terms in corporate America today are "virtualization" and "cloud computing." Together, they represent a major, ongoing trend in IT, and a high priority for management today. It is clear these technologies can help companies become more efficient, both financially and operationally.

IT leaders are beginning to see that, by evolving to a Virtual Data Center or "private cloud," many new benefits can be realized.

Virtualization Defined

Virtualization abstracts the physical resources from the applications that utilize them. It can be applied to server platforms, allowing multiple applications to leverage CPU, memory, network, and storage resources. Virtualization is fast becoming a basic in IT. Almost all IT organizations are doing some form of server virtualization. Knowledge of the concept, and the leading software for doing it, VMware, is fairly widespread in the industry. But server virtualization is just the beginning.

In this paper, we set forth a way companies can extend the virtualization process across the *entire data center*, including storage and networks, and automate it to a higher degree. Doing so puts a company on a path to its own Virtual Data Center, or private cloud -- a topic of extensive discussion today -- which offers several benefits we describe.

Challenges Facing Data Centers

Each year, businesses add new applications and the attendant processing power, networking, and storage they require. Yet, the demands that come along with running these additional apps are rarely matched by resources to support them. IT budgets haven't kept pace with these increasing application, storage, and network needs, and fewer people must manage more. The multiple challenges you face today can include:

- *Utilization and Floor Space Issues* – Your infrastructure footprint may be expanding, or you may have already run out of space. How can you better utilize what you have?
- *Environmental Factors* – Your energy costs are growing. Power and cooling can consume 25-30% of the IT budget, yet they can be difficult to measure correctly.
- *Operational Complexity* – You have multiple platforms, applications, and processes. Managing IT complexity is said to consume 30% or more of many IT budgets.
- *Time to Market* – Also called time to value for new applications, or IT service delivery to the business. Whatever you call it, competitive pressures continue to decrease it.
- *Budget Issues* – All expenditures must have an immediate return. Meantime, most of the IT budget is dedicated to “keeping the lights on.”
- *Cultural Issues* – Change in any IT organization, introducing new ways of doing things, is always accompanied by political challenges.

In addition, regulatory compliance demands more and better data protection, and globalization has made readily available data an indispensable competitive tool. Plus, the worldwide economy remains under pressure. What it all means is that efficient use of assets is more critical now than ever.

The purpose of this white paper is show how the process of virtualizing your data center help you better address and deal with these challenges, now and ongoing.

What Is the “Virtual Data Center”?

Virtualization technologies are an essential component for driving efficiency in IT operations. However, they also introduce complexity that requires revised architecture planning to accommodate extraordinary levels of availability, recoverability, performance, scalability, and end-to-end provisioning.

Leveraging virtualization across all your resources – storage and network included – is what leads to the ultimate benefits of improved utilization, reduced costs, and simplified management for your organization. The Virtual Data Center, also called the “dynamic data center,” is a compelling new vision:

- It abstracts software and services from physical devices. Services can more efficiently share IT assets.
- It removes physical restraints between IT components, providing higher utilization of physical resources.
- It cuts IT complexity by reducing the number of moving parts. It moves you away from “applications silos.”
- It provides a dynamic application infrastructure, a platform that supports most applications.
- It spans servers, where the process begins, but includes storage virtualization, which adds significant ROI, and the simplification that comes with network virtualization.

Solutions for the Virtual Data Center Application Platform

There is no question that the impact of virtualization on the enterprise data center is dramatic. The benefits are clear. There are tremendous savings resulting from consolidation and increased flexibility as applications are separated from hardware dependencies. However, some of the greatest benefits are derived from the encapsulation of the application environment, which enables services that ride on top of VMware’s “Vmotion” – such as High Availability (HA), Distributed Resource Scheduling (DRS), and Disaster Recovery (DR). Together, these services create a new ways to view data center resources.

Here’s a brief description of each of VMware’s offerings to help companies build and manage a Virtual Data Center:

- *VMware ESX and vSphere 4a:* Decouples software from hardware. Encapsulates operating systems and applications into “virtual machines,” providing an application environment for cloud infrastructures.
- *VMware Vmotion:* A core service of VMware, enabling portability. Reduces the need for a maintenance window, and is non-disruptive.
- *VMware High Availability:* Allows recovery from a hardware failure, requiring only a single action to restart on available hardware, rebooting the application on a new machine.
- *VMware Distributed Resource Scheduler:* Creates a dynamic infrastructure, which is policy driven and provides automated load balancing.
- *VMware Site Recovery Manager:* Automates site recovery, working with storage and replaces run book.
- *Other Solutions in vSphere 4:* vNetwork Distributed Switch, which supports portable network policies; the Nexus v1000 Switch; vShield zones, which provides security management; Fault Tolerance (FT), for high availability; and Integrated Storage.

To Virtualize or Not? The Build vs. Buy Decision

There is little argument that CIOs today are looking to apply virtualization at a more strategic level. But that can raise the question of building one’s own virtualization infrastructure *or* buying cloud infrastructure as a service from one or more external providers.

Every CIO is hearing about “the cloud.” They’re hearing that using public cloud services lets companies buy compute resources for a fraction of the cost -- and it takes a fraction of the time to get those resources deployed, too, so time-to-process is much shorter. CIOs are rightfully asking, how do I apply this to my organization?

Is the “public cloud,” today, the right place to put your critical apps? Probably not. Security capabilities, standards, and ability to manage SLAs are just not there. But what you *can* do is build a virtual data center infrastructure with “internal cloud” properties. This sets you up for buying public cloud services in the future as needed – for off-premises backup, for example, or a Mother’s Day ordering rush.

Thus, we advise that you now take the *build* approach: set a course to virtualize your data center, to create an internal cloud infrastructure. Do it over time, in steps. Ultimately, you’ll be in a position to have some of your apps go out to a cloud provider. By that time, security and other important standards will have been adopted.

But, on the build side there can still be disagreement over how to address virtualization, with so much technological innovation and attention resulting from the adoption of technologies like VMware. This disagreement is due largely to the number and complexity of solutions and the fact that they cross multiple disciplines. It’s helpful to look at some of the barriers to adoption of Virtual Data Center, both those inside and outside the organization.

Internal barriers. Most organizations use a variety of applications running on different platforms. Each has its own requirements for networking and storage resources and may have different requirements for access and availability. Geographical distribution can further add to the challenges.

Having multiple applications and technologies can lead to isolated islands of data and potential interoperability issues. In addition, the stakeholders who helped build those applications, including application, network, storage, and backup administrators, may have entrenched attitudes and policies that are not easily changed.

As a result, many organizations have a number of different virtualization initiatives being directed by different groups within the company. In many cases, server teams are not in sync with application administrators, and storage or networking teams may be taking a completely different and uncoordinated approach.

External barriers. While many new technologies are emerging to address these challenges, the industry is not in agreement on how to proceed. Even if an organization has internal agreement on a server virtualization strategy to consolidate compute resources, balanced by a storage and network virtualization strategy to consolidate resources, there are still challenges. This is because no two storage or network virtualization vendors agree on how to design and deploy a virtualization strategy.

Many of these technologies are relatively new and, as a result, are not integrated into end-to-end product lines. And while vendors may excel in one technology and have gaps in another, they are unlikely to recommend a solution outside their own portfolios. To date, there are no standards for interoperability. Nor, given the complexity of the solutions and multiplicity of vendors, are there likely to be any in the near future. As a result, there is no single source for an end-to-end solution with a single point of management addressing compute, storage, and network issues. There are many emerging integration efforts between leading server virtualization, storage, and network vendors, but the true breadth and scale of those integrations remains to be seen. Organizations will either have to wait for a more manageable solution or build a virtualized infrastructure before all the interoperability and manageability issues are addressed.

Virtualizing the data center isn't trivial because, for most organizations, there is much new to be learned. The benefits, however, are intuitive. One can quickly see that it will take less people, who can run more IT operations, more applications. It will allow IT to deliver more value to the business, more efficiency, saving significant money. The benefit is obvious, but the concept is nonetheless new for most people. They're used to doing things the way they always did.

It does require new skills. And many people need time to think it out. But thinking is good -- because building a cloud takes a lot of planning. It requires an understanding of exactly what the business needs. It's an incremental process, taking the time to think through where you want to go and how you will accomplish it.

So, those are additional recognized barriers to adoption of the Virtual Data Center: (1) the politics and cultural barriers, and (2) it's a new way of thinking about IT.

The Consequences to Inaction. The costs of waiting can be high. Server virtualization alone is necessary to meet near-term budgetary and operational objectives. But many organizations are finding that server area savings lead to expense and operational challenges elsewhere. For example, server virtualization consolidates several applications onto each physical platform. This provides significant benefits by leveraging fewer assets and reducing costs, but it frequently triggers challenges in the storage, network, and backup environment:

- More applications depend on a single instance of storage, so availability becomes more crucial
- Traditional backups strain the consolidated physical infrastructure
- High-cost network storage is required to support advanced high availability and DR functions

What Are the Benefits?

The benefits of virtualization in general can be summarized as follows:

- Improved asset utilization, reducing both capital and maintenance costs
- Reduced complexity, cutting demands on IT resources

- Dynamic (on demand) provisioning for faster response to user needs
- Reduced downtime, both planned and unplanned
- Improved performance due to load spreading, balancing, multi-pathing, and heuristic shifting
- Simplification of storage policies and procedures, allowing greater flexibility and better information lifecycle management
- Improved security both within systems and in disaster recovery scenarios
- Increased flexibility across the enterprise and scalability to meet growing demands
- Openness to new server, network, and storage technologies in “agnostic” architectures

Let’s look now at the specific benefits you can achieve with a Virtual Data Center:

- Reduce IT footprint and increase utilization
 - Consolidate infrastructure
 - Efficiently share IT resources
- Reduce energy and cooling costs
 - Draw less power in the data center
 - Require less cooling for infrastructure
- Reduce operational complexity
 - Simplify management to consolidated resources
 - Reduce number of things to manage over time
- Increase IT responsiveness, increasing profit
 - Faster response to business requests or changes
 - Better SLAs for all applications
- Achieve lower TCO over time
 - Significant reductions in CapEx and OpEx

The Foundations for the Virtual Data Center

Where does one begin the journey to virtualize a data center? *Server virtualization* is the first phase, which most organizations have begun. The concept is simple: an application that used to run on a physical server can now run virtually, and you can have multiple applications on the same server, and multiple virtual servers can exist on one physical server. Server virtualization is essentially a software platform that uses a discrete set of files to transform hardware into software. It does this using a virtual machine that runs an operating system and applications much like a physical server. The popularity of server virtualization infrastructures is exploding; nearly every IT organization is planning its aggressive deployment across multiple applications.

The motivation for companies to do server virtualization is to *consolidate*, or reduce, the number of their servers. They don’t want so many servers for a number of reasons. Often, it is less floor space, or footprint. But reducing capital expenditures (CapEx) is often the driver – which can be significant, because they’re not buying as many servers. They will also not require power and cooling for as many servers, which brings a reduction in OpEx. Server consolidation allows the IT organization to become more efficient.

Over the past three years, server virtualization has become quite common. Most companies we see have between 20% and 60% of their servers virtualized. Very few are up to 80% or 90%. On the other end of the scale, a very few haven't even yet started. But it's fair to say most companies have done some consolidation and virtualization across the server layer.

Automation and Management: When you virtualize your servers, you have access to a number of useful services. One of the most fundamental of those is "data mobility," which is done with VMware's "VMotion." It provides the ability to automatically make an application run on a different server. So you can move, at will, an application from one server to another. Almost all IT organizations are now familiar with this concept.

Another service of VMware is called "Dynamic Resource Scheduler" (DRS). If a physical or virtual server crashes, you can manually restart the application. But many companies need more than that -- something better than having a staffer go in and fix their servers when they crash. You can now automate this process with DRS. For example, if you have an application for selling flowers on Mother's Day, and you discover there's way more demand for than you expected, Dynamic Resource Scheduling lets you quickly accommodate for that. The software simply provides a suggestion that you should move this application over to this server because it has spare cycles.

Storage Virtualization

With server virtualization already in wide use, now a growing number of organizations are also beginning to recognize the value of *storage virtualization*. The act of virtualizing servers, consolidating and reducing their numbers, allows a company's resources to be used much more efficiently. That same concept can be extended across storage (and with networking as well, which we address in the next section).

Traditionally, with storage, disk drives (one or more) are assigned to an application, essentially hardwired, and another application can't use it. It can't be shared. But, with *storage virtualization*, some of the same things that server virtualization allows can be accomplished. Raw storage capacity can be allocated to those who need it, to allow better utilization of it.

In a virtualized server environment, virtualizing your storage helps ensure less waste of storage. Virtualization combines many servers together, and they all need storage. In essence, these servers would actually use more storage if you don't virtualize your storage. And that can cause problems with your virtualized server environment.

The concept of storage virtualization is not a new one, but it is not as widely adopted. At Datalink, we've been consolidating storage for many years, at minimum by deploying SANs for our customers, and ultimately with higher-level storage virtualization, in which storage is consolidated and services are added as well.

Let's look at four main concepts you need to understand in today's world of storage that have direct applicability to storage virtualization:

- **The first is “storage tiering.”** The three main types of drives all have different performance ratios. Getting the right drive to the right application at the right time is key, and that concept is essentially what tiering is about. It determines if an application needs fast storage, or more reliable storage, or if the data is old and few users are likely to access it. Those attributes determine the right storage tier for data coming from each application.
- **The second storage concept that's important to understand is “thin provisioning.”** Typically, business application owners don't know how much storage they need to run their app most efficiently. Thin provisioning is a way of getting around that problem. Essentially, IT grants the amount of storage requested, but doesn't provision it all. The bet is that all apps are not going to use all the storage they asked for. IT can save a lot of money if it does this efficiently. If needed, more storage can be purchased a year from now -- but, as storage pricing goes, that will definitely be cheaper than it is today.
- **The third important concept is “deduplication.”** Businesses typically have many copies of the same files on their hard drives – because many users within a company or division save these files individually. For example, there may be 100 copies of the same Powerpoint presentation. If you can “de-dupe” that, you might save 50% of your storage capacity, conservatively, time and again -- perhaps up to 80% in some instances. Thus, another optimization tip is don't duplicate files on your primary storage. Don't create or facilitate duplication.
- **Finally, there are important “data protection” implications.** This encompasses both backup and disaster recovery (DR). All the above storage concepts have value, but the value actually multiplies when you do backup and DR, because the only way to do these things is to make a copy. If you make your primary storage 80% more efficient *before* you make all these copies and send them over to other data centers, then you logically multiply your efficiency multiple times.

The above storage concepts have very real benefits, and they all bring you significant ROI in a virtualized environment.

There are two types of storage virtualization. The most common implementation is *block-based* storage virtualization. It can significantly increase the efficiency of server utilization, erase boundaries between systems from different vendors, increase data security, and simplify management. A newer and less well-known implementation is *file-based* virtualization, which provides complete transparency to users, allowing managers to freely relocate data without having to inform users of the change.

Both approaches to storage virtualization support capabilities like storage tiering, which can increase availability of critical data while reducing overall costs. The challenge is identifying and implementing a system that works with existing systems

and infrastructure, and one that cost-effectively meets organizational goals without unduly disrupting the organization's ongoing operations.

One final note: though you may have done *storage networking* before, you likely did not do real virtualization. If you put in a storage virtualization layer now, you can save 30-40% with thin provisioning. Deduplication can save you another 40-80% of your physical storage. Overall, you could reduce your storage requirement by 75%. Now you make a copy and it will only use 25% of the space to make a great copy of the application data. That means only 25% gets sent over the network, so you're using just 25% of the bandwidth, and saving significant costs. Again, this is *the multiplying effect* of these efficiencies.

Storage virtualization helps you ultimately move in the direction of an *elastic pool of IT resources* like the Google cloud -- but it's your own internal pool. And you can allow business-unit owners to access that pool as efficiently as they can Google.

Network Virtualization

When you consolidate several applications on servers, you create complexity in the storage, more I/O, and just more demands on the storage. Virtualization can cause the same kinds of changes on the network.

In most virtualized enterprises, VMware is running VMotion and DRS continuously, which consumes considerable bandwidth. There are dedicated networks to run these functions. VMware's Fault Tolerant can also require a dedicated network by itself.

The trend is that network management capabilities are starting to get embedded into the hypervisor. One thing VMware introduced recently was its "Vnetwork" -- using a product called the "virtual distributor switch." Soon after, Cisco responded with its own switch, which lets you connect everything as a single network. It even creates "personalities" for your applications, so that, if an app moves, the network sees it, and you don't lose any of its characteristics.

Generally speaking, these are advances in the networking capabilities of the hypervisor. But it's really not just a hypervisor anymore -- it's becoming a *management suite* that integrates all your vendors. Storage management has many of these same characteristics, so that you don't have to go into the storage itself to turn things on and off.

VMware now has something it calls "vCenter Server" for managing your VMware environment. More and more companies are asking for these capabilities, because they're used to it from their storage management tools. So, these capabilities are being integrated into what might be called a "virtualization management suite." Cisco is also saying they will put these capabilities into a management suite, so you can run everything from there and interface better with their equipment. Cisco is pushing really hard the notion of converging onto one network.

However, you already have a network and can't simply change it all at once. But you can start to transition over to either adopting Ethernet right away, and either run iSCSI or NFS and adopt 10-gig. Or, you can converge network adapters to run Fibre Channel over these adapters. So, now you only have two ports coming out of each box. Now, that doesn't mean you have to run Fibre Channel Over Ethernet (FCOE), which is considered somewhat aggressive. Many customers are not yet comfortable yet with that technology, even though Cisco supports it. For FCOE, it is still fairly early.

But, again, virtualization of your data center can be accomplished in incremental steps. It does not require waking up in the morning and changing everything. One day, you won't buy SANs anymore -- you'll buy FCOE, and have one network that's the core, with everything running out of that. You will be virtualizing all your network capabilities. But you do it incrementally, and, ultimately, you can create pools of resources that can simply be provisioned out to different parts of the business.

Giant vendors -- from Cisco to VMware to EMC -- might say they can build big parts of it for you now, but there's no single piece to manage it all. That is very much still evolving. At Datalink, we actually have a tool that does a good job of at least lining all these things up for you.

Managing the Private Cloud

A major topic in IT today is *operational complexity*. If every application has its own special sets of rules and processes and infrastructure, things just plain get unmanageable. You have too much to know. Every CIO today worries about what to do to reduce complexity.

Conceptually, if you have a single platform for all your applications -- if you can reduce the number of your application platforms -- you will reduce the number of things you have to manage. Such a goal cannot be accomplished overnight, but it is something we must move toward.

You need infrastructure that is *elastic* and available *on-demand*. One of the major attributes of a Virtual Data Center, or an internal or private cloud, is how fast it lets you bring new compute resources to the business. So, a business unit says it needs a new application up, and it points out that, if they went to Google, they could have that compute resource available almost instantly. They say they don't want to do that, but how fast can IT respond to their need?

Let's face it, organizations, especially large ones, are not going to suddenly take down their data centers and bring them back up as clouds. There must be *incremental steps* in this process of building a Virtual Data Center. That's why one of the fundamental points we want to make in this white paper is that this is a *journey*.

VMware has created a complete application environment for virtual or cloud infrastructures. It decouples software from hardware, and encapsulates operating systems and applications into "virtual machines." VMware offers a number of services to help

manage this virtual infrastructure, as mentioned earlier. It also offers services to manage applications. One is “vApp,” which is essentially a UPC barcode that specifies policies for applications running in the Virtual Data Center. Anyone using VMware Infrastructure can use the vApp to encapsulate a multi-virtual machine application. Even ISVs can use VMware Studio to create vApps that can be automatically updated and maintained by VMware Infrastructure. Features and benefits of vApp include:

- Allows management of multi-tier applications as a single entity
- Utilizes industry standard OVF to provide instructions on how to deploy
- Templates, Clone and other operations execute at the vService level
- Simpler, application-centric view of management
- Easier portability of applications
- Applications can now be written to monitor and scale themselves

Application Requirements: A typical enterprise’s applications vary widely based on business requirements. They include email, database, web server, and business management software. Each application will have its own requirements based on business demands. These requirements typically fall into the categories of performance and availability. Performance requirements involve the speed at which clients can access the application and that application can process the necessary data. Availability requirements directly relate to an application’s up-time. These requirements dictate acceptable levels of downtime for a particular application based on customer need.

Automated Cloud Services for Business Users: An internal cloud infrastructure also allows a level of automation that extends to users. Think of a vending machine, a self-service approach, where the client can simply visit a website and choose what he or she wants to run, and it's automatically provisioned. This is one of the concepts that companies can eventually add to their internal Virtual Data Center infrastructure.

Once you pool all your resources together in the cloud, then you can very efficiently add and remove services without redesigning anything. This is the objective you can eventually achieve. With your *Virtual Data Center* infrastructure, when a business user needs an application, you will have the ability to run it on that infrastructure with a minimal amount of work. You can define a set of “cloud services” for your users. They can make request of IT by simply going to a web site and clicking on the service of their choice. The system will automatically provision that from their virtual infrastructure. No one has to take the order and, best of all, no one has to start building any infrastructure. That is where building a Virtual Data Center can take you.

Cultural Implications: To move toward a Virtual Data Center, we've found an organization needs a top-down approach to be successful. Someone in the company must have the political ability to get all stakeholders in the organization, the various factions, on the same page.

There are many public cloud companies already active or preparing for this market, saying they can provide cloud infrastructure or services at lower cost to attract enterprises

to outsource to them. Once you complete your journey to a Virtual Data Center, you will have built a 'bridge' to them: that is, your internal cloud gets you more closely aligned with these external cloud providers. You'll eventually be able to take applications that you run on your internal cloud, or could run there, and choose to outsource them to an external cloud provider. We call such arrangement a "hybrid cloud."

Much in the way of cloud standards is still missing today, particularly in security and compliance. But by focusing now on building the Virtual Data Center, you can begin to interface with the new standards when they become available. At each step in the journey, you can ensure a good ROI for your organization. Each step you complete then keeps you focused in the direction of the ultimate goal.

Conclusion: Is It a Cloud Yet?

The promise of the "internal cloud" is essentially this: instead of building your virtual infrastructure application-by-application, you can build *a platform of infrastructure*. This whole concept of not having to build infrastructure, and being able to buy services on-demand that you can deploy immediately, turning them on and off whenever you want, paying only for what you use -- that is the real meaning of "cloud."

Very few organizations have yet built what we now call an "internal cloud" -- let alone an external-internal-external, or "hybrid," cloud. The good news is that all the steps we talk about in this paper will help you get there. And you can be assured that the flow of continuous improvements along the way will not ebb. There will be improvements in management, in security, and in the interoperability of the components and technologies that make up the Virtual Data Center.

At each step of this journey, there are significant benefits for your organization. Plus, the resources are much easier to manage, and the bonus is *they do more than they did before*. The benefits, the ROI, at each step can only be good.

Servers, storage, networking -- you can and will eventually address all the components of the Virtual Data Center. We can help you chart your journey, and reach your destination -- ensuring you reap all the benefits.

About Datalink

Datalink is a complete data center solutions and services provider for Fortune 500 and mid-tier enterprises, transforming data centers so they become more efficient, manageable, and responsive to changing business needs. The company helps leverage and protect storage, server, and network investments with a focus on long-term value, offering a full lifecycle of services, from consulting and design to implementation, management, and support. Datalink solutions span virtualization and consolidation, data storage and protection, advanced networks, and business continuity. Each delivers measurable performance gains and maximizes the business value of IT.

Datalink's Approach to Virtualization

Virtualization solutions can be complex and approaches can vary widely. Datalink can help eliminate the confusion. We independently assess the many alternatives available in the market and assure that you select the options that best fit your needs. At the same time, we work with you to leverage what you already have and fine-tune your existing environment. We specialize in several areas of virtualization:

- Server virtualization
 - Server consolidation
 - Storage and backup/recovery for virtual server infrastructures
- Block/SAN storage virtualization
- File-based storage virtualization
- Virtual networking and WAN optimization

Virtualization Services to Help You Improve Efficiency

Datalink offers comprehensive services – both quantitative and qualitative – tailored specifically to your virtual environment. Our audit and assessment services, driven by robust analytics management software, provide an end-to-end view of your infrastructure along with key deliverables that can help you easily identify and resolve problems in your virtualized environment. Additionally, you can be more proactive in designing an architecture that supports maximum efficiency, performance, and scalability.

- ***Virtual Infrastructure Audit:*** Data is collected through our automated tool. Includes:
 - Pre-engagement call to review your current environment and define scope of analysis
 - Installation and configuration of the automated tool
 - On-site interviews with key IT owners regarding business metrics and requirements
 - Off-site data analysis by Datalink
 - Presentation of virtualization audit report, including detailed cross-domain analytics
- ***Virtual Infrastructure Assessment:*** Includes all the elements of the above audit, plus Datalink experts do more exhaustive on-site data collection and provide additional, detailed qualitative analysis, including:
 - Strategic guidance on improving specific aspects of your virtual infrastructure
 - Tactical recommendations spanning technologies and proposed solution designs, processes required, and implications for existing resources
 - Roadmap for the future

Why Datalink?

- Independent viewpoint & approach
- Focused expertise & field-tested best practices
- An extension to your in-house teams
- Industry-leading customer support

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For more information, contact us at 800-448-6314 or visit www.datalink.com.

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A Case History

Here's an example of a fairly large company that was very aggressive in virtualizing its data center. It began two to three years ago with a major server virtualization project -- almost everything in the data center. The company took their old servers out and crushed them. The firm had a compelling event that caused it to act -- to move rapidly into virtualizing its data center. It was running out of space in its facility within 18 months of building it. The company was growing that fast. With such dire circumstances, the firm's IT leader had the willpower to say to management, "We have to do this, and here's why." Adding to the severity of the situation, many data center employees would be cut in the process, so there was a lot of resistance.

A major point to make regarding this transformation process: while there can be technical challenges, it is less a technology process than a political or cultural one, especially in larger organizations. This company ran very high-end SQL applications. Performance was absolutely mandatory -- very mission critical, very high requirements applications. But it simply couldn't manage its growth with a physical data center, and its CapEx was extremely inefficient.

What we've found is that it's common for companies adopting a Virtual Data Center transformation to save 80% of their infrastructure costs, and even 80% of their energy costs, if they take advantage of all options. In this example, it was an aggressive use of not only server virtualization but storage virtualization and network virtualization, all built together. The operational efficiencies this customer achieved were significant. The company says what used to take six weeks now takes a day. It was up against the wall. Now, the company has its IT environment for the future, and it looks like a real visionary for doing it.

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