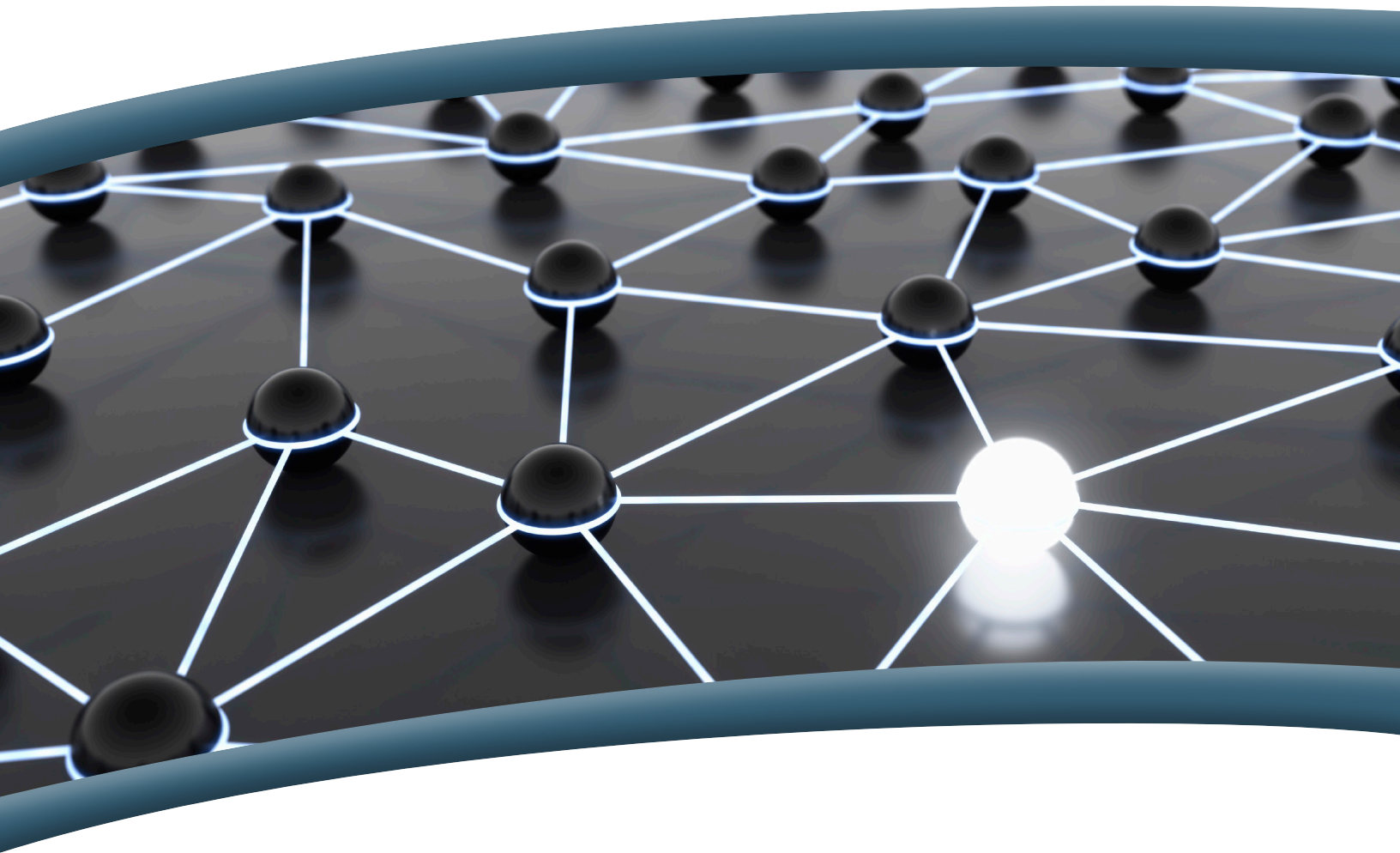




NATIONAL ASSOCIATION OF
ELECTRICAL DISTRIBUTORS

Executive Guide #6:

Server Virtualization



Developed by the NAED Strategic Technology Taskforce

Published January 2013
Updated Feb. 13, 2013

Server Virtualization: Technology enabling a single physical server to be divided into multiple logical servers. Once the physical server is divided, each logical server can run an operating system and applications independently.

Why Server Virtualization is Important to Electrical Distribution

1. Significantly decreases capital outlays—Virtual servers make fuller use of existing, underutilized computing resources, reducing the number and types of servers required to support business applications.
2. Greatly reduces operating expenses—Fewer servers occupy less floor space, consume less energy, and cost less to move.
3. Increases availability, reliability, and quality—System uptime is increased; virtual servers can be launched, reconfigured, and monitored remotely more easily than physical servers, especially in disaster recovery situations.
4. Improves responsiveness to changing business conditions—IT can quickly scale-up when extra capacity is needed and scale back when it isn't. (i.e., it can take weeks to buy a new server and less than a day to create a new server virtually).

Things to Consider When Virtualizing Servers:

1. **Storage requirements.** Storage is a very critical area when considering virtualizing your server environment, even for smaller organizations. You must have enough storage space and throughput to handle your existing work load, while planning for future growth.

Additional thoughts on storage requirements:

- While it is much easier to bring up a new server and application in a virtual environment, you must still have server resources available at the time you need it to take full advantage of a virtual environment.
 - Invest plenty of time researching vendors offering virtual environment storage solutions. Pay close attention to the features offered and make sure the storage device is supported by the virtual software platform selected.
 - Look for storage devices that can easily connect to your virtual hosts, provision storage quickly, allow you to easily add new disk arrays, easily be replicated, include support and monitoring tools, and has the capability to eliminate redundant data, i.e., deduplication. While a majority of storage devices offer most, if not all of the features listed above, others do not. A cheap networked-attached storage (NAS) device will not be sufficient for storage
-

- 2. Redundancy.** One Virtualization uses more of your systems' resources by running more operating systems and/or applications with a single server than a standalone physical server running one operating system (OS) or application each. Therefore, in a virtual environment it is much more important to have redundancy built-in in case of a failure. Moreover, redundancy does not just apply to the host servers in a virtual environment; it also applies to networking, storage, backups, etc.

Additional thoughts on redundancy:

- Take a look at one of your servers today. More than likely it is using a fraction of its system's available resources, with the majority of the system sitting idle.
- As an example, if a server is using less than 10% of its system's available resources, 90% of the system is sitting idle. If this is the case and you're a small business with 4 servers running just a couple of applications each, you could virtualize with just one server. But what happens if that one server, running all four virtual machines fails? Everything goes down. Having a second, redundant virtual server, spreads the work load across two virtual hosts with enough system resources available to run all applications on either one of the virtual hosts.
- Most of today's virtual software comes with tools to automatically move applications running on a failed virtual host and bring them up on another virtual host, if there are sufficient resources (i.e., space) available.

- 3. Backups.** Backups in virtual environments are very different from backing up physical servers to tapes and/or external hard drives. Moreover, your current back-up software may not be able to handle a virtual environment—you must back up the "server" and the underlying virtualization layer that makes the server work, resulting in a larger data footprint.

Additional thoughts on backups:

- While the basic principles of back-ups apply in a virtual environment too—*multiple backups stored in multiple locations, on-site backups for quick restores, and off site backups for disaster scenarios, etc.*—some virtual server platforms do not allow backups to tapes or external hard drives.
- Consider having your storage device replicate its data to another storage device off-site or use a cloud backup solution.

- 4. Support.** Understanding the support model for your virtual environment is crucial. Make sure the brand of hardware selected (IBM, HP, etc.) is supported by your virtualization software vendor and vice versa.

Note: This information is available on most hardware and software vendors' websites.

Additional thoughts on support:

- Hardware vendors (IBM, HP, etc.) often package virtualization software with the server. If you buy everything from the hardware vendor, you will most likely call them for support on your virtualization software as well. Make sure the hardware vendor is able to provide an appropriate level of integrated support on the specific hardware/software combination purchased.
-

5. **Networking.** Server virtualization complicates network management and can be challenging for smaller organizations. Since solutions vary by virtualization software platform, invest time on the front end to understand how the networking side of your chosen virtualization platform works, its requirements, and how it will affect your specific network(s).
6. **I/O requirements.** Pay special attention to the physical elements, especially inputs and outputs (I/O), when designing virtual systems. Make sure sufficient network and storage throughput is designed into the virtual environment to account for whatever logical systems are ultimately deployed.

Additional thoughts on I/O requirements:

- If multiple disk I/O intensive virtual servers are deployed on the same high-density server, make sure there is enough available storage bandwidth for all the virtual servers to work concurrently.

7. **Application compatibility.** While less of an issue today than in the past, make sure the applications you plan to virtualize are able to run (and are supported by the application vendor) in a virtualized environment.

Note: Task Force members have experienced cases where either an application is not supported, or even worse, is only supported in a virtual solution that the application vendor supplies.

8. **Software licensing.** Understand how your applications are licensed in a virtual environment. While improving, software licensing models seem to lag what hardware and virtualization technology can support.

Additional thoughts on software licensing:

- Many traditional licensing models cannot dynamically allocate computer and memory resources as required in a virtual environment. This can allow you to inadvertently assign more resources to a server/application than you are authorized to use.

Tips for Testing Virtualization

It is fairly easy to test virtualization begin learning some of the basics by downloading software—*such as VMware Player or VMware Workstation*—and installing it on your desktop or laptop computer. Better yet, if you have an older server not in use, download and run VMware ESXi or Microsoft Hyper-V. All are great ways to start familiarizing yourself with virtual machines.

- VMware Player (Free) - <http://www.vmware.com/products/player/>
 - VirtualBox (Free) - <https://www.virtualbox.org/>
 - VMware Workstation - <http://www.vmware.com/products/workstation/index.html>
 - Windows Virtual PC (Free) - <http://www.microsoft.com/windows/virtual-pc/>
-

Recommended Resources

CIO.com section on virtualization

www.cio.com/topic/3112/virtualization

Return on Investment (ROI) & Cost Savings Calculators

VMware Cost-Per-Application Calculator

<http://www.vmware.com/technology/whyvmware/calculator/>

VMware TOI TCO Calculator: Overview & Sample Analysis

http://roitco.vmware.com/vmw/Content/VMware_ROI_TCO_Calculator_Guide.pdf

Virtualization Software Platforms

Best Virtualization Software and Hypervisors—Compare and Review

Search at www.findthebest.com

Citrix – <http://www.citrix.com/products/xenserver/overview.html>

Microsoft – <http://www.microsoft.com/en-us/server-cloud/hyper-v-server/>

Red Hat – <http://www.redhat.com/products/virtualization/>

VMware – <https://www.vmware.com/virtualization/>

Book, “Mastering VMware vSphere 5” by Scott Lowe

http://books.google.com/books/about/Mastering_VMware_vSphere_5.html?id=gTF8f5v20ocC

Storage Providers

Dell – <http://www.dell.com/us/business/p/storage-products>

EMC – <http://www.emc.com/storage/vnx/vnx-family.htm>

HP – <http://www.hp.com/sbso/serverstorage/index.html>

NetApp – <http://www.netapp.com/us/solutions/virtualization/server/>
