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The Essentials Series:
Virtualization and Disaster Recovery

Leveraging Virtualization for High Availability and Business Continuity

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Leveraging Virtualization for High Availability and Business Continuity	1
High-Availability and Business Continuity Benefits from Virtualization.....	1
An Overview of Replication-Based Technologies	2
Levels of High-Availability Resiliency	4
Common Replication Configurations	4
Ensuring Critical Business Functions	5
Regulatory Compliance within a Virtualized Environment.....	6
Summary	6

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Leveraging Virtualization for High Availability and Business Continuity

The previous article discussed the basics of virtualization and examined its benefits for data protection. Companies can also benefit from virtualization in the areas of high availability and business continuity. High availability and business continuity are critical; without them, adequate data protection is impossible and the problems that arise can be very serious. In some cases, a lack of high (or more precisely, any) availability and business continuity, especially for a prolonged periods of time, can threaten the very existence of a company.

The concerns of disaster recovery, virtualization, and high availability often fall into the IT department's 'worry box.' However, these concerns effect the company's ability to continue business, and should therefore be viewed as critical by the entire company—especially decision makers who all too often have shallow pockets when it comes to disaster recovery needs.

Modern business has a 24/7 non-stop running requirement. Consider your various servers and imagine any one of them being unavailable for any length of time. Would your company be able to lose any one of your IT services and deal with a long-term disruption (or even a short-term one)? The cost of a disruption in service could be substantial, so it is a key part of a business continuity plan to look into all approaches (both hardware- and software-oriented) to ensure data protection, high availability, and disaster recovery. As hardware solutions are often cost prohibitive, companies are looking more to software and virtualization to provide the cost-effective and reliable solutions they need.

High-Availability and Business Continuity Benefits from Virtualization

The following list highlights ways an organization can benefit from virtualization:

- **Simplification of infrastructure**—Virtualization, both server and storage, simplifies the infrastructure. All equal, when there is less hardware, there is less complexity, which in turn, means that the infrastructure is easier to monitor and troubleshoot when problems arise. This translates into less downtime and higher availability.
- **Easier branch management**—Providing data protection to a globally dispersed network of machines is always a challenge, but thanks to virtualization, remote locations are easier to manage. With virtualized solutions, there is no need to have physical access to a machine in order to troubleshoot and restart it. Additionally, thanks to virtualization, branches can be easily consolidated, thus helping to not only achieve higher availability and improved business continuity but also reduce costs.

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- **Cross-platform issues become irrelevant**—Homogeneous networks are more of an exception than a rule, and virtualization can make the administration of heterogeneous environments much easier. For example, suppose you have applications that run on Linux but you don't have a spare machine with Linux installed. If the Linux machine on which the applications are running crashes, in a traditional, non-virtualized environment, you are helpless. But when you use virtualization, this scenario is not a problem. You simply copy the file with the Linux machine on another machine (regardless of its operating system—OS; the only requirement is that the machine be capable of running a virtual machine. The solution is fast, easy, and efficient.
 - **Easily separate business units**—In addition to centralization of resources, virtualization can be used to separate business units. Decentralization is useful in large infrastructures where there are many business units and it is better to isolate them from one another in order to manage them easily as separate entities. A good example is a hosting provider who runs each customer's sites in a separate virtual machine, thus shielding them from the dangers of sites run in a multi-client environment while still using a reduced number of physical machines.

An Overview of Replication-Based Technologies

Let's focus a bit more intently on the technical aspects, or more precisely, the types and uses of replication-based technology in a virtualized environment. Replication-based technologies allow the capturing of a set of data at a particular point in time, typically involving minimal overhead and fast restoration of data. This functionality is why replication-based technology is the preferred solution for providing high availability of critical systems. Although replication is typically viewed from the perspective of remote WAN-based replicas, using the same technology for the creation of local replicas is another method to achieving business continuity.

When looking into a solution that you can count on for your environment in terms of replication, you want to be sure you have real-time data replication, which basically means data is replicating as it is coming into the local system. In some cases, the right solution is synchronous replication, which offers zero data loss by ensuring that the data is written to both the local and remote systems with a confirmation before proceeding. In other situations, asynchronous replication is utilized. This method requires specific data or logs to be closed out on one server before being replicated over to the other server. With asynchronous real-time replication, there is the potential for a small amount of data loss.

One of the concerns with replication is that a corrupt file on the production side might be replicated over to the disaster recovery site or to a local virtualized server that you use for replication. To meet this challenge, a feature called Continuous Data Protection (CDP) is a crucial factor to any business continuity planning. CDP provides the ability to revert back to an earlier version of data. Thus, in the event corruption occurs, you can replay point-in-time versions backward to remove that corruption. Depending on the technology you are using, there are different granularities to such a solution. Some solutions may have fixed-time intervals of restoration (every hour, 5 hours, 24 hours, and so forth). When considering a replication solution, factor in a solution's ability to offer CDP based on either every write or a specified timeframe (even if those timeframes are as narrow as seconds).

You should also pursue replication technology that considers WAN optimization in either hardware or software (or both). Although you might be replicating data between two local systems in your scenario, typically for disaster recovery sites, you need a WAN connection to an offsite location. That WAN connection becomes a critical component not only for the replication process but also in the event you need to support your offices from that disaster recovery site (and then eventually when you need to recover over those WAN connections). While looking for a product to meet your needs, consider WAN optimization an essential item on your checklist. Depending on the size of your environment, you should also have a replication strategy that centralizes your servers, relocating them to primary and secondary data centers.

Replication can work in many environments, but you need to take into account what hardware and software you will be using because the existing environment could be an issue that limits your choices. For instance, there are virtualization solutions that work on only certain OSs and on only particular models of hardware. If your hardware/software is not supported by the virtualization solution of your choice, you will either have to choose a different virtualization solution or replace your hardware/software, which could be very expensive. Consider, for example, environments that use a mixture of Microsoft solutions (Exchange, SQL, IIS Web servers, file servers) across both 32- and 64-bit architectures. Suppose they also utilize an Oracle server, a BlackBerry server, and Linux or Solaris servers. They must ensure that the solution they are pursuing has the ability to support all of these platforms. If not, they will need to continue investigating for an all-inclusive solution. Fortunately, many of the leading virtualization solutions support a wide range of hardware/software platforms, so chances are that you will not face this incompatibility issue. It is worthwhile, however, to first double check compatibility and then proceed to the choice of a replication configuration.

Levels of High-Availability Resiliency

There are a variety of ways to implement virtualization for an environment. In addition to checking possible compatibility issues, you must take into account the following replication configuration considerations:

- **Deciding what to replicate.** First you need to decide if you will replicate everything or only some data. This decision influences your choice of replication configuration. If you decide to mirror a server (that is, replicate everything on it), it is best, though not mandatory, if the replication target is a dedicated machine or at least a very powerful one. Of course, you can replicate many virtual servers to one target machine, but only if you have made wise disaster recovery preparations for that critical server (which leads to our next point).
- **Deciding where you will replicate to.** Choosing the replication target (the machine you will be replicating to) is also important because if you make unwise choices and your target fails, you will have no replica to restore from. One of the worst cases is when you decide to replicate all your virtualized systems to one target. This choice is risky because the target becomes a single point of failure.

Additionally, if the applications you are replicating do not coexist peacefully on one machine (for example, SQL Server, a Lotus server, and an Oracle database or two versions of Exchange) and you replicate them on one machine, you can bet at least one application (or even all of them) will stop working. Fortunately, in this case, virtualization can help because all you need to do is create a separate virtual machine for each of the applications and replicate them there. Of course, if you are replicating database applications, which generally use a lot of resources (CPU time, writes and reads to the disk, and so on), you need to insure that the physical machine is a powerful one—otherwise the whole scenario might not work.

Common Replication Configurations

Choosing what and where to replicate are very important decisions. The next step is to choose how exactly you will perform the replication. There are many possible configurations that use virtualization for high availability and business continuity. The following list focuses on three common configuration possibilities:

- **Replication of a physical set of servers to a virtual set of servers**—The advantage of using a physical set of servers replicating back to a virtual set of servers is that you can utilize fewer virtual servers on the back end. This configuration makes sense when your front-end servers are not under a very heavy load and/or you are not replicating everything from them. The host machine of the virtualized system must be a very robust one; otherwise, the whole configuration is risky.

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- **Replication of a virtual set of servers to a virtual set of servers**—This configuration uses virtualized servers both for the production side and for the recovery site (or for a localized set of virtualized servers on-site). Using this configuration allows you to maximize hardware utilization on both the front end and back end. Due to numerous advantages over the other configurations, this configuration is frequently recommended as the most cost effective way to increase availability.
 - **Replication of a virtual set of servers to a physical set of servers**—This configuration is rarely used because it offers the least cost savings and not necessarily the highest availability. Additionally, it is more difficult to administer. This configuration makes sense if you happen to have spare physical machines at your remote location that you want to utilize.

Virtualization opens new perspectives for data protection. Thanks to virtualization, it is possible to achieve high levels of availability and business continuity at an affordable price. However, not all virtualization solutions are equal.

Note

The next article of the series will focus on the pricing models for virtualization solutions, thus helping you to decide how to find the perfect combination of quality and price to suit your needs.

Ensuring Critical Business Functions

One of the global benefits of virtualization for a company is that it makes IT operations much easier and more reliable. Virtualization makes company management easier by significantly reducing the required hardware and the number of people involved to perform the same amount of work. Managing less hardware and people eases the management of the company as a whole.

Sometimes it is neither possible nor necessary to ensure high availability for every single business function in your organization. There is no doubt that it is best to provide 100% high availability for every business function, but the price and effort required to do so could be more than you can afford. In this case, you need to make sure that at least your critical business functions are covered by your high-availability efforts.

Critical business functions vary from one company to another and you need to identify them for your company rather than “borrow” them from the docket of another company. Think of all the business functions within your organization that if interrupted could lead to serious financial, legal, or other damages or penalties.

Through virtualization, you achieve high availability for your critical business functions because it allows for rapid restoration of these functions after they have been interrupted by a disaster. With virtualization, restoration of a failed system is as easy as copying the configuration from one machine to another. Also, when you have multiple servers on one physical machine and one of them fails, you can quickly isolate the failed server and prevent disruption of operation of the other servers on the same machine or on the network as a whole.

Regulatory Compliance within a Virtualized Environment

High availability and business continuity are not only essential for internal operations; very often, external factors such as regulations make it mandatory for companies to provide continued business. Regulations such as the Sarbanes-Oxley Act and the Health Insurance Portability and Accountability Act (HIPPA) are examples.

Thanks to virtualization, it is possible to consolidate data centers and have centralized, stricter security policies in compliance with these regulations. In that aspect, virtualization is not a luxury, it is a necessity; if your IT department is not compliant with these regulations, non-compliance could lead to financial penalties, a drop in company stocks, loss of customer confidence, and lost profits.

Summary

Virtualization can help a company to achieve high availability and business continuity while keeping the costs under control. When a company can't ensure high availability for its IT operations, consequences are hefty. High availability is not a function of technical expertise and modern equipment only; it is also a function of management capabilities (or their lacking). However, when a company doesn't have the necessary expertise and equipment to handle disaster recovery quickly, even the most brilliant manager is helpless. That is why the successful combination for high availability and business continuity is the right equipment/expertise and good managerial skills. In this aspect, virtualization is a valuable ally to any good manager.