



NSI Double-Take and Virtual Servers

Microsoft Virtual PC and Virtual Server
VMware GSX Server and ESX Server



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Powered by  **Double-Take**

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“How would you protect 11 production applications (or clients) with one disaster recovery server?”

Double-Take® is the undisputed leader in Windows® based replication software. And for most continuity of business solutions, that is all that is required to ensure that one’s data is protected and can be made available.

There are a few scenarios, however, whereby NSI® customers wish to employ O/S virtualization software. Examples of the virtualization software include Microsoft® Virtual PC (formerly known as PC Connectix), Microsoft Virtual Server, VMware® GSX Server™ and ESX Server™.

Protecting virtual servers, and their virtual disks, provide some unique challenges that are only surmountable by Double-Take, due to its patented architecture and feature-set. Most notably, Double-Take is able to protect the virtual server’s disks, regardless of whether they are virtual or direct. And queuing model and options within Double-Take allows for flexible configurations around the type of disk I/O created by virtual machines.

By combining Double-Take and virtual server solutions, some exciting solutions are possible:

- Some NSI Partners specialize in Disaster Recovery hot-site services or other off-site vaulting of data. For them, an unusual challenge is to provide each customer with a secure location for their data. By using designated virtual computers for each customer, each customer’s data is completely isolated from others; while allowing the hot-site provider to more efficiently use their servers and floor-space.
- Similarly, some enterprise customers may also have a need to segment servers (for security or other reasons) by business unit. Designating separate virtual servers as targets accomplishes this.
- But perhaps most common is the need to protect unusual and sometimes conflicting applications to a single target. While a normal Double-Take implementation already supports “many to one”, the target has only one O/S and may not be able to launch all of the source applications simultaneously. By leveraging virtual computers on the target platform, each failed source can be protected and made available by an independent virtual target.

This document will describe how these types of virtual O/S products can be leveraged with Double-Take from NSI Software, Inc.

A Primer on Virtual O/S Technology

While the specifics may vary by vendor, these tools (in general) allow one physical server and operating system to run multiple virtual computers within memory. Each virtual computer has its own processor(s), memory, disks and network interfaces.

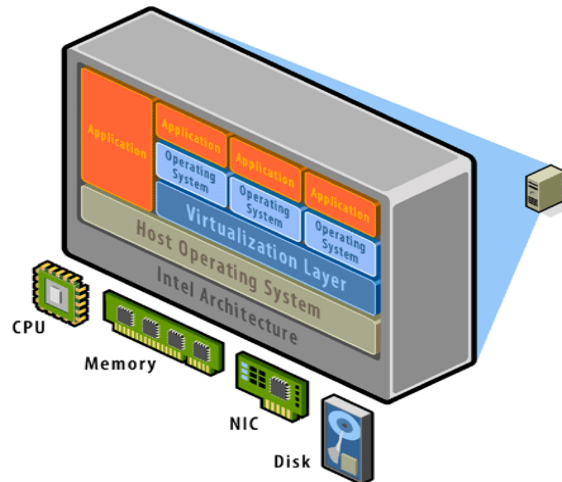


Figure 1 – VMware GSX Architecture

Functionally, each virtual machine is autonomous and, in fact, unaware that the hardware is being shared. This allows multiple servers (even of different operating systems or versions) to run on one hardware platform.

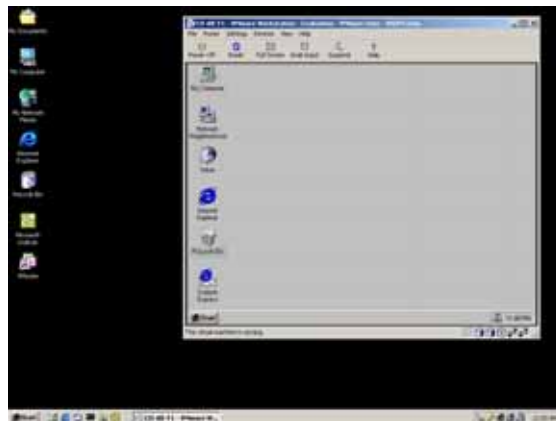


Figure 2 – Screenshot of a Virtual Machine
“Guest OS” on the “Host” Desktop

This allows for a single Windows 2003 target to server to support one virtual server with Windows NT™4 and Microsoft Exchange® 5.5, while another virtual server with Win2000 and Exchange 2000 is also running. One might run one virtual server with Microsoft SQL Server™ and other virtual servers with Oracle® and/or Lotus® Notes.

How does Double-Take protect Virtual Servers?

O/S Virtualization software typically runs as an application or system-service, which in turn segments off memory and other resources internally. But from a Double-Take perspective, it is like any other application, which resides on top of the operating system, file system and hardware aspects of the server.

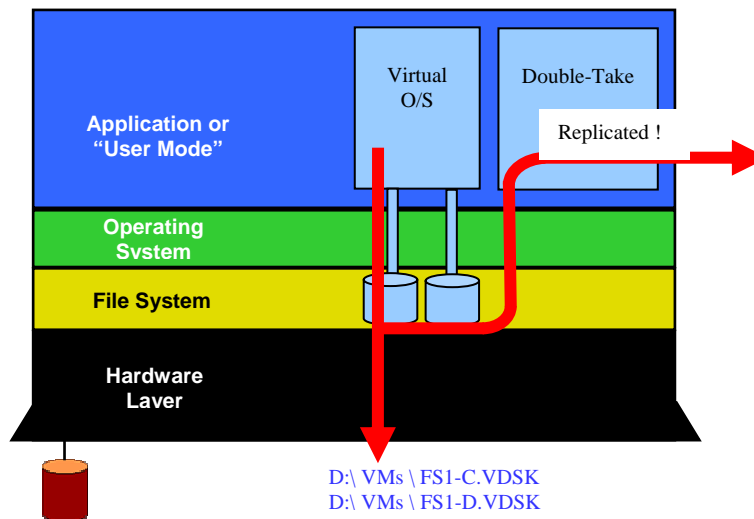


Figure 3 – Double-Take protecting Virtual Disks

Double-Take captures writes at the file-system layer, while all applications (including virtual servers writing to virtual disk drives) operate above the actual file system layer. This allows Double-Take to transparently and reliably protect that data, which is then replicated via Double-Take software's normal mechanisms to a target server.

On the target side, Double-Take simply applies the same file-update command to the duplicate virtual disk files that reside on the target server.



SCENARIO 1– Fully-Integrated VM/DT Solution

Many Virtual Machine customers are deploying “Virtual Servers” over standard hardware, to provide standardization of software and support tools, and ease deployment of new platforms.

In this case, the production server platform might run Windows 2003 Server as the Host O/S and Microsoft Virtual Server or VMware GSX Server. The Guest O/S (running in a virtual session) might be Windows NT4 and Microsoft SQL 7. The Guest O/S “hard drive” is actually a file on the Host O/S drive (e.g. c:\VMs\svr\C-DRIVE.DSK), while the data drive(s) might be additional DSK files or actually reference the D:\ and E:\ of the Host O/S.

In order to provide fault tolerance across any IP network (LAN or WAN), Double-Take can be installed to replicate the bytes of data that change to another Windows server somewhere in the enterprise.

- Solution 1A – Double-Take can be installed within the Guest O/S. This allows Double-Take to replicate any part of the logical files or directories within the VM disks. The target server has no recognition that the source server is not “real hardware” but instead a virtual session. Upon failover, the Double-Take target server would assume the name, IP, shares and services of the failed guest O/S.
- Solution 1B – With all of the Guest O/S drives actually being DSK or Virtual-Disk files, Double-Take can be installed on the Host O/S and maintain replicas of all of the files on the target server. The target server would “monitor” the guest O/S for failure, but instead of actually assuming the name, IP, shares and services, would simply invoke a script that would initialize Virtual Server or VMware on the target server. The VM session would utilize the existing DSK files (which hold the actual configuration and data from the Guest O/S). This is the most common solution. *See Figure 3.*
- Solution 1C – While the Guest O/S system partition is a DSK, the actual data drives may actually be the partitions of the Host O/S. In this case, Double-Take would be installed on the Host O/S, and replicate not only the data areas, but the DSK that represents the Guest O/S C-Drive. Similar to Solution 1B, upon determination of failure of the guest O/S, the target server would invoke VMware, which after mounting the DSK of the O/S, would be able to access the data areas and continue.

Solutions 1B and 1C also illustrate how the entire O/S and registry of the Guest O/S can be captured by the target server. By design, Double-Take does not normally attempt to replicate the Source server’s registry or O/S areas. This is due to the “Many to One” design of Double-Take.

Consider if three Double-Take source servers were replicating to one target:

- HP® ProLiant running Windows 2003 and Exchange 2003
- Dell® PowerEdge running Windows 2000 for SQL 2000
- IBM® xSeries running Windows NT4 and Exchange 5.5



Which registry areas should Double-Take replicate to the target? Which drivers? Which O/S files and hives?

But, in fact, Double-Take *does* work in these environments - running a separate and fresh O/S on the target - by being able to assume the names, IP's and shares (and services) of each and every source server.

For most current “BackOffice”-type applications, the registry is relatively static, with the registry simply pointing to the data areas, which hold the application’s true configuration. This model is warranted because it makes the application “portable” for clustering and other fault-tolerant approaches.

However, for application servers where the registry or O/S binaries are not static, encapsulating the O/S within a Virtual Server or VMware Guest O/S (which is then held as a DSK file) enables Double-Take to replicate the actual O/S to the target. Then, the target server simply needs to mount that DSK (in a new VM session) to recover the server.

SCENARIO 2 – Enhanced “Many To One” Failover

Because the target server might be need to act as multiple source servers, some care must be maintained for compatibility issues. Consider if four Double-Take source servers were replicating to one target:

- Database server SQL1 running NT4 and SQL 7 for Sales department
- Database server SQL2 running NT4 and SQL 7 for Marketing department
- Database server ORCL2 running Win2000 and Oracle 9i
- Database server NOTES01 running NT4 and Lotus Domino Server

One potential problem would be if SQL1 and SQL2 both experienced an outage simultaneously. Microsoft SQL 7 was not intended to run multiple instances on one machine. While there might be way to mount both datasets, this would add complication to the redundancy solution.

Also, while each of these applications may run fine as the only application on each server, compatibility issues may arise by having three database applications installed on target server.

However, using Virtual Server or VMware, Double-Take can provide for failover for these servers. During failover, the target server would not actually start each application. Instead, the target server can again initiate Virtual Machine sessions, each with a single application engine (SQL, Oracle or Notes), which would then mount the data set and provide redundancy.

A Virtual Server Customer example.

This example uses VMware GSX server, but the same principles would apply to Microsoft Virtual Server or other O/S virtualization software solutions.

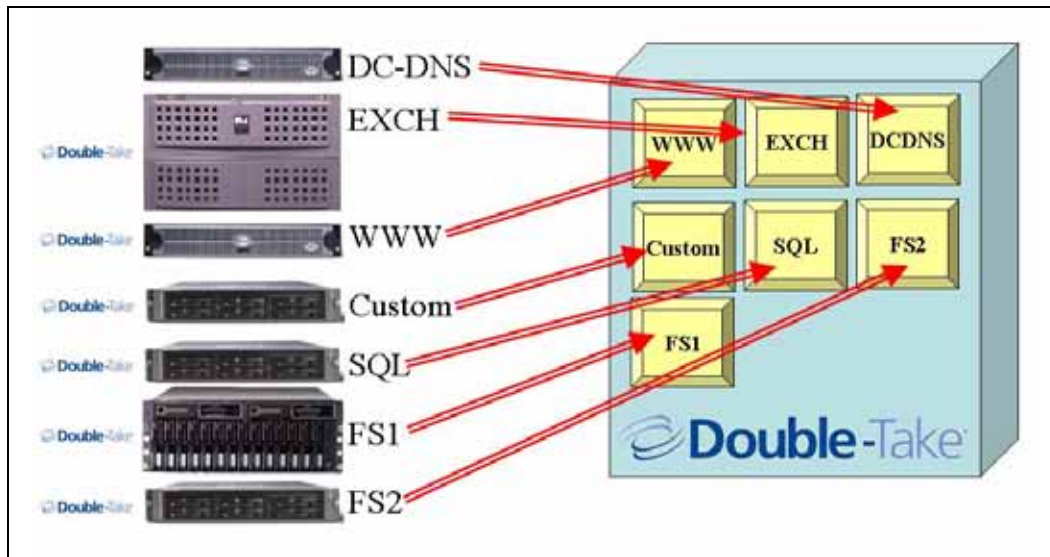


Figure 4 – “Many to One” with VM’s on the Target

One NSI customer had seven production servers, with a variety of hardware manufacturers, O/S’s and applications, but needed to provide the same level of recovery across all Windows platforms.

- Windows NT4 and SQL 7
- Windows NT4 and Exchange 5.5
- Windows 2000 Domain Controller
- Windows 2000 and Custom Application
- Windows-Powered NAS File Server
- Windows 2003 and IIS Web Server
- Windows 2003 File Server

A common request by NSI customers is that the same level of ‘data protection’ be applied across the enterprise. This makes byte-level file replication technology the only cost effective solution. Similarly, those customers want the same level of availability. And while Double-Take does support “Many to One” solutions, the variety of applications warranted keeping each application separate.

To accomplish this, the Windows 2003 Target server was configured with Double-Take and VMware GSX Server. A copy of Double-Take was also installed on each of the seven production servers. Then, seven VMware Guest O/S sessions were configured, with the Guest O/S data drives being mounted to the Host O/S disk.

Failover of any one or more failed servers is accomplished by simply starting that particular Guest O/S, which runs a similarly configured O/S, mounts its data areas and continues to service the user community.

A Virtual Server Hot-Site / SSP example.

This example uses Microsoft Virtual Server, but the same principles would apply to VMware GSX Server, ESX Server or other O/S virtualization software solutions.

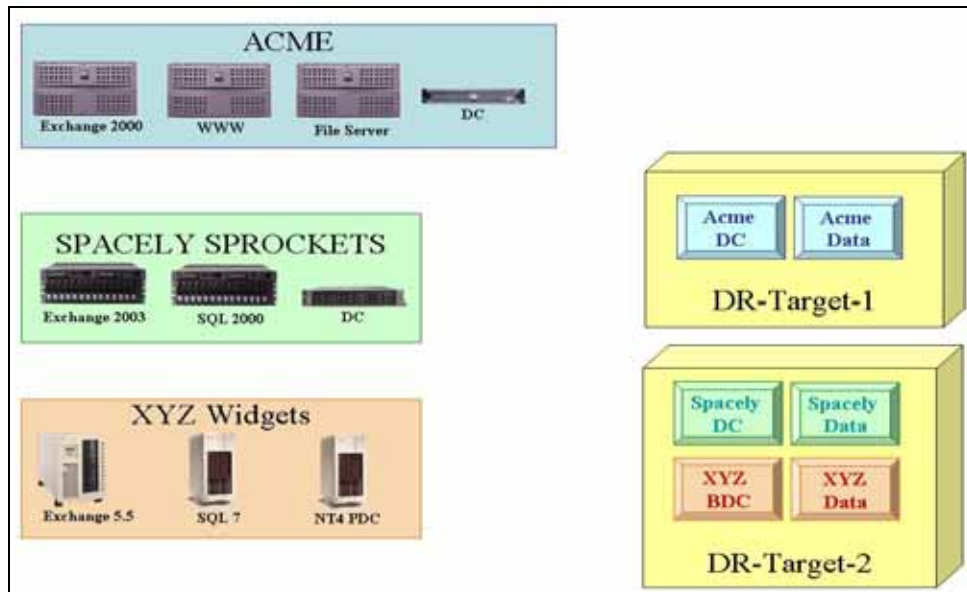


Figure 5 – Hot-Site server, supporting multiple clients

A Disaster Recovery company wished to maximize the use of its hardware assets across multiple client companies, while still insuring that each customer’s data was separated for security purposes. Below are the three customers’ server lists for protection.

<u>Acme, Inc.</u>	<u>Spacely Sprockets</u>	<u>XYZ Widgets</u>
2000 DC	2003 DC	NT4 PDC
2000 IIS Web *	2003 Exchange 2003 *	NT4 SQL7 *
2000 Exchange 2000 *	2003 SQL 2000 *	NT4 File *
2000 File Server *		

* - All non-Domain Controllers run a copy of Double-Take

At the hot-site, two physical platforms were configured with a base-O/S and a copy of Microsoft Virtual Server.

- A Virtual Machine was built for each clients’ domain controller, and the native Domain and/or Active-Directory process populated and maintained the DC’s.
- A Virtual Machine was built as the “data target” for each client, each running a license of Double-Take. This allows each client to manage their own replication solution and maintain security.

However, to maximize the hardware, Spacely’s and XYZ’s Virtual Machines and data sets were actually maintained on one physical server. If any client’s data becomes too large, their virtual machines can be moved to larger or faster equipment without significant effort.



Additional Double-Take solution examples:

1. NAS to SAN storage migration
2. Branch office stranded server storage to centralized data centers
3. Small office Server to Server protection
4. Offload or move backup operations to centralized storage area
5. Multiple site replication – Fan-Out or Fan-In

Example 1 – NAS to SAN storage migration. As more environments move from local-storage based servers to NAS/SAN, the question of how the actual migration will occur becomes more frequent. Using the same techniques outlined above, one can migrate from local storage to a NAS, a server utilizing a SAN, or even a NAS-gateway to the SAN. In all cases, the fundamental requirement is that the data is moving from one Windows platform (with local storage) to another Windows platform (with more manageable storage), like that of a Windows-Powered NAS (or Storage Server).

Example 2 – Branch office server to Centralized Data Center. Even in the enterprises where protecting the corporate data has become a standard, branch offices tend to still be isolated to tape solutions. This forces non-I/T personnel to be responsible for tape rotations and cleanings; and the result is higher manpower costs and lower restore reliability. By efficiently replicating the byte-level changes within the data using Double-Take, one can bring the branches' data back to a centralized data center. This provides disaster recovery for the branches, and allows back ups to be done at the centralized facility (by I/T personnel and using more advanced tape technologies).

Example 3 – Small office Server-to-Server Protection. Whereas large enterprises may have multiple data centers and a myriad of server technologies, the small office relies heavily on its perhaps one or few server resources (with limited I/T resources or personnel). When the primary server fails, the office productivity can grind to a halt. Double-Take provides a simple and cost-effective way to “fail over” to a second machine (in the same office or perhaps at an employee’s home). The result is rapid recovery of the server – and the small office continues doing business.

Example 4 – Consolidate Backup Operations. Today’s corporations are increasing their business day, as geographic and national boundaries no longer limit effective commerce. Unfortunately, this results in an ever shrinking back-up window. However, the redundant copies of the files on Double-Take target servers can be backed up, even when the original copy of data is in use. Without expensive and application-specific backup agents, the second copy of the data can be protected using existing tape technology, attached to the redundant server. And perhaps even better, the backup can be done at local disk/tape speeds, instead of a media server backing up multiple application servers.

Example 5 – Site Replication. Many replication needs are not based around data protection or availability. Like the discussed Migration solutions, some business goals simply need to get the data to an alternate location. Double-Take can provide a corporation with a master-content server and then ensure that all regional locations (and branch offices) receive the replicated files – regardless of whether it is a custom application, or simply the Human Resources directory for vacation forms and business card requests.



When considering the range of examples listed above, the key to remember is that Double-Take provides the most efficient, byte-level replication of files within a Microsoft Windows server environment. Whatever the business goal (migration, protection, availability or distribution), it starts with having multiple copies of your files. So it starts with Double-Take by NSI Software.

Please visit www.NSIsoftware.com for more information on Double-Take, including information on how to migrate your existing servers, how to replicate data for business continuity, and how to improve and centralize one's backups.

All of these solutions are based around NSI Software's fundamental philosophy that all business continuity efforts start with protecting the data. From there, it is simply a matter of what you want to do with it.

NSI Software knows how to protect applications running on Windows file systems. "Business Continuity through Replication" is the single focus of every person in our company. That focus, and the quality of our products, has helped NSI forge relationships with NSI®, IBM®, Dell®, SunGard®, Microsoft® and probably your preferred reseller-integrator.



For over 10 years, NSI has been providing the products, services, and support to help you be successful in protecting your most critical applications...

We'd like the chance to prove it to you.

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Our Vision

To be your leading provider of data protection & high availability solutions & services for continuous business operations

Our Offer to You

We would like to become your partner in ensuring the continuous operations of your business.

Please allow us the opportunity to talk to you about your specific data protection needs and to discuss our products and services that may apply.

Your data is your business.

Protecting it is ours.

For more information on NSI Software's products and services, please contact NSI.

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