

# DOUBLE-TAKE WORKLOAD PORTABILITY: X2X Server and Storage Migration Solutions

**Whitepaper**  
**Double-Take Software, Inc.**  
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## Executive Summary

Migrating applications, systems and data has always been a challenge for IT staff; in fact, most have just gotten used to the pain and suffering that comes with migrations. To properly migrate applications and data to new platforms involves risk and takes time to complete, meanwhile users have to stop changing data while it's migrated. The larger the storage footprint, the longer that it's going to take, and migrations routinely take hours or days to complete.

IT staff usually cobble together a range of tools to perform migrations, but successful migration is far from quick or assured. Manually configuring the new platform to match the original system as close as possible and the testing, testing and more testing to ensure that the applications are functioning correctly on the new platform add to the time, expense and hassle of migrations.

## Common Migration Triggers

Virtualization – Physical to virtual migration (P2V) seems to get all the media attention, but application virtualization isn't a sure thing. What about when your production applications can't perform after you've virtualized them? What about changing virtualization vendors? What if you don't want to take your production applications offline while the entire machine is virtualized?

Hardware Refresh – Hardware refresh usually has to happen once hardware has exceeded its warranty, lease period or useful lifetime. Regardless of the reason, you need to move your data as quickly as possible and reduce the amount of interruption to the business processes that depend on the affected systems.

Hardware Upgrade – When your systems outgrow the system that they're running on, you have few choices but to give it more compute and/or storage resources. If the system is already at full capacity, then your only choice is to migrate to bigger hardware.

Changing Vendors – Disparate platforms seldom work together seamlessly, so while migrating data assets may be simple between two arrays from the same manufacturer, they can rarely communicate with a different model or manufacturer, thus forcing risky and manual migration processes that require application downtime.

We thought there should be a better way to perform server and storage migration – a way that eliminates user impact and reduces risk – so we built one. Read on to find out how you can greatly reduce IT total cost of ownership and take your weekends back.

## Introduction

Double-Take® Move provides migration functionality that dramatically reduces the impact and risk of migrations in the data center and across any geographic distance. Double-Take Move has a patented and award-winning replication engine that provides real-time, byte-level data replication and ensures transaction consistency without affecting users and production applications. The remainder of this whitepaper discusses concerns that affect data, application and whole system migration. It also explores existing methods of performing migrations and use case scenarios that describe a way to change how you perform migrations.

## Migration Needs

Migration has different impact depending on what you're migrating (data only, whole applications, configurations and system state or multi-tiered applications). Migrating data between systems is easiest on the surface because it appears that you would just have to copy data to a new environment. However, as file servers and databases have grown over the years, the time that it takes to copy all of those bytes have grown as well. Copying 1 terabyte of data (1,000,000,000,000 bytes, or one trillion bytes) is a task that can easily take hours to complete over the fastest networks with the fastest storage. But what about the migration needs of entire servers? How do disparate platforms and geographic distance requirements affect your migration plans?

### Data Migration

Performing data migration of a file server using traditional copy and file synchronization tools requires you to ensure that users can't change any data while the migration takes place so that any files modified after they were copied won't be lost. You may also need to create a plan for recreating the file shares, permissions, compression, encryption and other settings on the new storage – which can mean hours of downtime and allocating a maintenance window to accommodate the migration process (if everything works as planned the first time). Many times there are unforeseen obstacles that can cause copy or synchronization to fail, such as an application or anti-virus process that locks a file. This usually means starting the copy from the beginning after finding and stopping the process that's causing the problem.

Double-Take Move is designed to eliminate user and application downtime during migrations – including running database applications that constantly lock their database files while they're running. Double-Take Move provides true data replication functionality that precisely duplicates the application's native write processes with real-time transaction awareness that never requires a quiesce. This includes replication of file system metadata like permission, attributes, compression and encryption settings. These features allow you to keep your applications running while the migration proceeds without impact using the spare CPU cycles and I/O on the system. If an application needs those additional processing or data bandwidth resources then the operating system will pre-empt Double-Take Move and make those resources available to the running application, allowing Double-Take Move to continue working quietly in the background migrating data without impact to your running applications and users.

### Application and Full Server Migration

Applications usually consist of more than just a few executable files on disk and performing traditional migration of whole applications requires specialized in-depth knowledge of their inner workings. Applications can store vital information in configuration files or centralized locations like the Windows registry. Applications can also store vital objects like DLLs outside of their installation directory in shared locations like the Windows System32 directories. There are no hard rules that application developers are required to follow which provides an open canvas and great flexibility for developers, but also creates a nightmare for administrators that have to perform migration. Some applications can embed themselves into the operating system for licensing restrictions and many times the people that built a custom application system may not be available to determine its requirements – therefore, you must fully understand the application and what requires migration to create a solid plan to perform migration using traditional methods. Finally, application migration typically involves lengthy acceptance testing to ensure that the application was migrated completely before it is approved for production use.

Double-Take Move eliminates the trial and error of application migration and the acceptance testing requirements using the industry's first system state migration functionality. Double-Take Move provides hardware independent migration features that remove hardware dependencies during migration, substituting them with the dependencies of the new system. This unique technology allows full-server migration that includes the data, applications, operating system, configuration files and registry. Double-Take Move can even migrate a computer's unique system identifier (SID), event logs, patches, service packs and system settings so you can migrate a complete duplicate of your production systems in real-time without impact and without extensive acceptance testing since the entire system is migrated.

## Migration between Disparate Platforms

Migration is tough enough when your production and target systems are fully compatible (such as migrating data between two Windows servers). Now imagine the challenges of migrating between systems that aren't fully compatible. Maybe you want to migrate from direct attached storage (DAS) to a storage area network (SAN), or from an older storage product line to a newer product line or change vendors entirely. Maybe you want to change storage technology from fiber channel to iSCSI or change storage geometry from SATA RAID 5 to SCSI RAID 10. It's rare that you'll be able to migrate your data and applications between incompatible platforms without significant effort and lengthy production impact.

Migrating workloads between different servers and virtualization platforms is even more difficult since workloads are deeply embedded into the platforms. Double-Take Move is designed to remove these integrations and replace them with the appropriate drivers and HAL on the new platform to eliminate the sticky nature of workload platforms, allowing you to seamlessly migrate your workloads between their existing hosting platforms to new systems within minutes, eliminating the tedious manual migration methodology of the past.

## Unlimited Distance Migration

Migrating to new systems routinely takes place within the same data center. However, there are a new set of challenges when performing migration over long geographic distances such as data center moves and consolidations. There are two basic choices when performing geographic migrations with traditional means: either suffer extensive application downtime while transmitting the bytes over low bandwidth, high latency WAN circuits or shut everything down, load up the trucks and start driving.

Double-Take move is designed to overcome WAN challenges, without sacrificing data integrity or transaction awareness. Thousands of customers have used our tools for well over a decade to perform geographical replication that easily crosses continents and oceans without production impact. Allowing your applications to continue running gives makes the challenge of migration far easier. If you have the time but not the money for additional bandwidth, then Double-Take Move will trickle the changes over whatever bandwidth you have available. If your WAN connections are like most, you'll find that they routinely drop packets and lose connectivity which you never noticed with non-streaming applications (such as web browsing). Double-Take Move protects against intermittent outages with the most efficient real-time queuing technology in the industry; it even includes long-term caching capabilities for extensive outages like circuit breaks.

Double-Take Move also has data compression technology that uses very little CPU and provides high levels of compression. For reference, a T1 can handle about 16 Gigabytes of raw throughput per day and customers routinely experience greater than 50% compression in real-time. This means that you can double your throughput with Double-Take Move. Double-Take Move also works with WAN acceleration appliances to further improve the raw network performance when you need to move more data in less time than your bandwidth will allow. These features combine to allow you the flexibility of making migration decisions based on business requirements and not technology limitations.



## What Happens When Migrations Fail?

Migration failure is a chief concern for any IT organization and it can happen for any number of reasons. Regardless of the cause, the impact is extensive and causes additional downtime to find the problem and correct it. Some migrations technologies are one-way (no return), such as physical to virtual (P2V) system migration. This becomes a major problem when you find that after extensive trial runs, your applications simply don't perform well enough (or at all) under production load once virtualized. You can also experience major migration setbacks when the tools that you're using fail to work as expected because of locked files, network disruptions or site outages. It's important that your migration tools can perform under adverse conditions without production impact or sacrificing data integrity – otherwise you'll be starting the migration over from the beginning.

Double-Take Move is designed to dramatically reduce the risks of migration failure. They have extensive network throttling and management features, as well as extensive queuing functionality that protect you from massive network conditions that easily break other tools. Double-Take Move has patented data integrity algorithms that provide transaction awareness without quiesce. Double-Take Move also provides complete X2X platform independent migration functionality so you don't have to worry about stranding your data and applications on platforms that won't allow you to easily migrate back to the original or different target platforms. You can also perform trial migrations to test the systems before committing to the new platform. It's easy to see that Double-Take Move provides a zero-risk migration solution suitable for businesses of any size.

## Migration Technology Comparison

	Double-Take Workload Portability	Copy Tools (Xcopy, RoboCopy, FTP ...)	File Synchronization Tools	Backup and Restore Tools	Imaging Tools (Ghost, LiveState...)	P2V Tools	Storage Platform Migration Tools
<b>Migration Flexibility</b>							
Data Migration	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Full System Migration	Yes	No	No	Some	Yes	Yes	No
Hardware Independent	Yes	Yes	Yes	No	No	Limited	Rare
<b>Change Detection Granularity</b>							
Byte-level	Yes	No	No	No	No	No	No
File	Yes	Yes	Yes	Yes	No	Some	No
Block	Yes	No	No	No	Some	Some	Some
Volume/LUN	Yes	No	No	No	Yes	Yes	Yes
<b>Change Detection Type</b>							
Data Change	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Scheduled Scan	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Real-time Detection	Yes	No	Limited	No	Some	Rare	Some
Transaction Awareness	Yes	No	No	Limited	No	No	No
Permissions	Yes	Some	Some	Yes	Yes	Yes	Yes
Attributes (Read Only, etc.)	Yes	Some	Some	Yes	Yes	Yes	Yes
Alternate Data Streams	Yes	No	No	Rare	Rare	Yes	Yes
Configuration (Registry, etc.)	Yes	No	No	Yes	Yes	Yes	No
Full System State	Yes	No	No	Some	Yes	Yes	No
<b>Production Impact</b>							
Applications and Users Online	Yes	No	Some	No	Some	Some	Some
Locked Files Support	Yes	Rare	Some	Yes	Yes	Yes	N/A
CPU Throttling	Yes	No	Limited	Rare	Some	Some	N/A
I/O Subsystem Impact	Low	High	Medium	High	High	High	High
<b>Network Management</b>							
Bandwidth Requirement	Low	High	Medium	High	High	High	High
Bandwidth Throttling	Yes	No	Some	Some	No	No	No
Bandwidth Scheduling	Yes	No	No	No	No	No	No
Transmission Compression	Yes	No	Some	No	No	Limited	Some

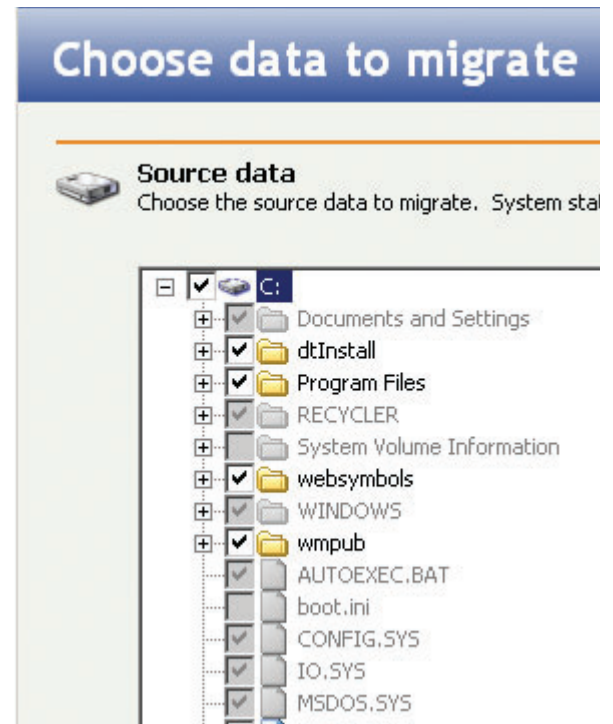
## Use Cases

Now that we've discussed the affects of migration and the various methods of performing migration let's take a hard look at some of the most common use cases.

### Data and Storage Migration

Migrating data and storage are the most common forms of migration affecting IT departments today. Whether you're migrating data between incompatible storage platforms or across continents and oceans, Double-Take Move can dramatically reduce your costs and effort. Double-Take Move gracefully migrates your data while it's still accessible to users without adverse impact to production systems. You select which data that you want to migrate through an easy Explorer-like interface and Double-Take Move does the hard work, migrating data and metadata such as permissions and attributes.

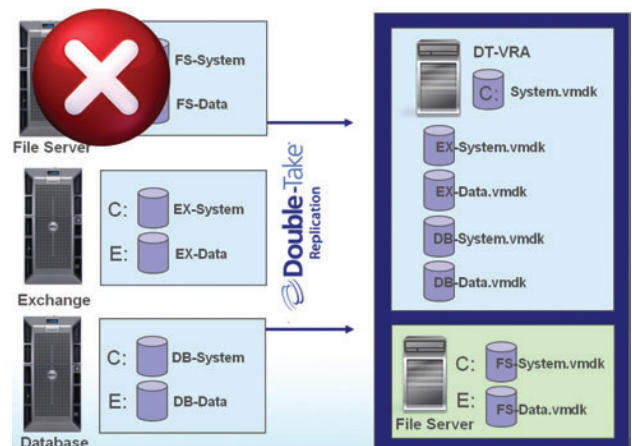
You can also mix and match storage configurations (Fiber RAID 10 to SATA RAID 5) and replicate just the actual data and not the entire LUN. This further helps you flexibly migrate data and storage by eliminating configuration boundaries to which other migration methods constrain you. Once the baseline migration is complete, Double-Take Move continues to keep the new target storage synchronized using real-time replication, allowing you to choose when you want to complete the migration based on your schedule – without forcing migration when you desire it least, such as during the business day.



### Physical to Virtual (P2V) and Virtual to Virtual (V2V) Migration

Double-Take Move provides migration services from physical or virtual production systems to virtual systems. You can transition workloads between storage that is incompatible for virtualization tools native workload migration features, geographic distances, or between disparate virtualization platforms such as migration from VMware® ESX to Microsoft® Hyper-V™. Double-Take migrates the data, applications and system state, including the operating system, registry, event logs and SID of the production machine. This provides a full server migration that doesn't require a lot of manual reconfiguration or acceptance testing.

You can choose the configuration for the new virtual server including CPUs, memory, storage and network settings. When you migrate the workload, Double-Take Move replaces the hardware dependencies to match the new virtual platform within the image, creates the virtual machine and starts the workload.



### Virtual to Physical (V2P) Migration

Migrating workloads from virtual to physical systems has always placed a strain on IT departments, especially when production applications don't perform as expected. Double-Take Move makes this task as easy as P2V migrations. Simply select the workload that you're interested in migrating and the new physical target machine, then Double-Take begins migrating the data, applications and system state. Once migration is finished, you can transition the workload by gracefully stopping the production virtual machine and completing the migration.

## Physical to Physical (P2P) Migration

Whether you're performing a hardware refresh because your systems are coming off lease, out of warranty or they've simply outgrown their existing hardware, Double-Take Move makes P2P migration simple. You can easily transition workloads between different hardware vendors and complete migrations with only seconds of manual effort. Just point and click to select your existing server and the server to which you want to migrate. Double-Take Move removes hardware dependencies when migrating the workload and performs complete system state migration in record time.

### Summary

Using traditional data and application migration methods is not an exact science; there are too many moving parts that are constantly changing – and traditional tools were never designed for migration. There will always be pain associated with using these tools when performing migration and new technology is necessary to eliminate downtime and reduce total cost of ownership for this traditionally tedious task.

Double-Take Move uses a mature technology foundation to provide replication and system state migration that are generations ahead of other methods. Double-Take Move allows you to dramatically reduce the impact of migration tasks on your users and IT staff. You no longer have the stress of planning, executing and acceptance testing migration with tools that won't give you security. With Double-Take Move you'll only spend minutes configuring and managing your migration tasks, and then leave it to Double-Take Move to do the heavy lifting. Later, you'll return to the migration task when you're finally ready to transition your workloads to their new homes. All of these features and many more will also get you closer to going home at a reasonable hour.

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