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Damon Robertson
Coolspirit Ltd

Our address

24 The Bridge Business Centre
Beresford Way
Chesterfield
S41 9FG

Get in touch

Call us on: 01246 454222
Email us: web@coolspirit.co.uk
Find us: [View location map](#)
Web: www.coolspirit.co.uk

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Dot Hill AssuredUVS™

Unified Virtual Storage

Streamlining Data Migration through Storage Virtualization

A Dot Hill White Paper



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1 The Role of Data Migration in the Enterprise

Most IT organizations are at a critical crossroads: determining how best to meet the ever-growing needs of the business, while striving to contribute to the company's bottom line. Efforts usually focus on areas where changes in IT can help realize cost savings on infrastructure, management simplification of existing systems, strategic improvements that drive competitive advantages, or operational streamlining responsible for an immediate boost in employee productivity.

Many activities and events contribute to assessing whether the IT organization will succeed or fail at its task: The ability to effectively execute and handle company data—including the systems and storage devices associated with its management and protection. Has the IT department deployed infrastructure that is resilient? Has the IT group demonstrated the ability to adapt, grow, redeploy, and realign its underlying storage resources in order to successfully meet the strict application demands of key lines of business?

Among many such IT efforts is the burdensome task of data migration. On the surface, getting data out of one system and into another sounds simple. But, reality paints a different picture. System administrators might plan for weeks for a sizable data migration project. During the actual migration, the project can easily be foiled by a number of factors that result in significantly longer periods of application downtime and extra overtime hours. This causes an adverse impact on end users and worse, an adverse impact on the bottom line.

This trouble-prone migration experience is so typical that organizations may even decide to defer the acquisition of new storage or new infrastructures in an effort to postpone the potentially negative impact of data migrations.

Dot Hill takes a different view of data migration. Instead of seeing it as a cumbersome and necessary part of routine data management, data migration should be a relatively light, seamless task with little impact on the availability of production applications. Instead of seeing the many challenges surrounding migration, it is an opportunity for organizations to achieve true data mobility. With data mobility, also comes the dynamic ability to change and adapt the storage infrastructure virtually on-the-fly in order to successfully meet the changing needs of the business.

Why do these views differ? This white paper clarifies the reasons, looking at current drivers surrounding data migration along with the current challenges most organizations experience. Then it goes on to explain the different approach to data migration offered by Dot Hill's Unified Virtual Storage (AssuredUVS™) system.

2 Key Data Migration Drivers

Migrating data from one platform to another is often prompted by a variety of events occurring in the organization. These may lead to migrations being performed as much as once or more each week. Some events tend to be reactive on the part of IT such as migrating data to bigger storage when applications begin to run out of disk capacity or managing inorganic growth as a company goes through mergers or acquisitions. Others are more proactive such as the need to implement new, lower cost tiered storage architectures to make better use of existing assets.

According to Greg Schulz, senior analyst of the Evaluator Group, data migration efforts are typically undertaken for a variety of reasons.

¹ These include:

- **Storage system upgrades, replacement or consolidation.** These events are the most common reasons for data migrations. Data migrations may also be prompted by the approaching end-of-lease for one storage system, or the need to perform a technology refresh. These types of migrations may also be prompted by a conscious decision on the part of IT to align with a different storage vendor. Some may be necessitated by the need to consolidate the storage infrastructure and simplify the mix of vendor storage systems currently in place. They may have been brought about by prior mergers and acquisitions that have contributed to the current, heterogeneous mix of systems that now need simplification.
- **Tiered storage infrastructures.** As organizations seek to make more effective use of existing assets, many are changing their infrastructures to better support the existence of multiple tiers of storage systems, often from different vendors. Mixing high-end, high performance storage systems with lower-cost systems based on technologies like Serial ATA disk, organizations are looking more carefully at assigning and migrating less-critical or archival data to lower-cost tiers so that high-end storage can remain free to focus on addressing the most critical application demands of the business. Compliance with regulations is also driving this trend, as IT groups try to identify and migrate highly regulated data onto legally approved storage systems, such as those with write-once, read-many (WORM) functionality.
- **Manual load balancing.** Sometimes, data may be migrated onto other devices to more evenly distribute high transaction workloads to other storage systems with different levels of performance. One database table may have significant read/write I/O activity impacting application performance. IT groups may decide to migrate some of the associated data onto other storage in an attempt to boost performance.
- **Application development and testing.** R&D groups often have the need to test their work in progress against samples of real data sets. For this reason, application test data often need to be migrated to lower-impact storage systems that do not affect production.
- **Disaster Tolerance/Disaster recovery.** In this age of reducing overall risk profiles, IT groups are also being required to perform extensive data migrations to support new disaster tolerance and recovery initiatives and the need to host a second (or third) copy of critical data in an off-site DR location. This strategy can minimize the risk of loss and speed up recovery of data and resumption of business.
- **Data warehousing.** Key data is often migrated to other central repositories or file shares where it can be utilized by other company reporting and decision support systems.

- **Collaborative projects.** Large files, such as CAD drawings and renderings that several people will work on by may need to be migrated to a centralized, shared resource on the network.
- **Physical IT relocation.** Data migration is usually a big part of any data center move or relocation to new facilities with new infrastructure.
- **Data staging.** In the case of software, downloads or fixed content, data may need to be migrated to somewhere closer to the place they are needed.

3 Key Challenges Associated with Current Data Migration Efforts

Many IT organizations are familiar with the burdens of data migration:

- Migrating data from one platform to another
- Taking applications offline
- Logging weekend overtime
- Performing potential rollbacks if a significant hiccup occurs in the process.

These are all familiar scenarios to most IT groups.

In fact, results of a large survey on data migration reported by the Enterprise Strategy Group, show that 75% of those surveyed had experienced problems with migrations. Chief among the problems experienced was extended periods of unplanned application downtime, reported by 58% of the respondents. Another 36% also cited significant problems with application performance surrounding recent migrations.² Figure 1 shows that over 50% of respondents also indicated data migration issues were responsible for overruns in necessary staff time and added budget expense.

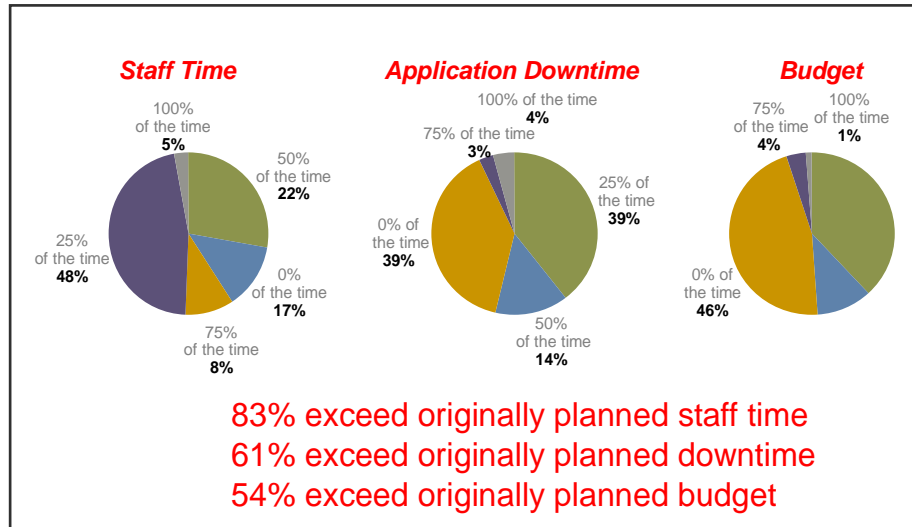


Figure 1. Current Cost of Data Migration.³

In order for IT organizations to be successful at meeting the needs of the business, they must first be successful at reigning in these types of unpredictable maintenance tasks that stand in the way of true IT flexibility and data mobility.

With such challenges to overcome, it is no wonder that 31% of survey respondents had actually delayed the purchase of new storage in order to postpone the pain involved in data migration.

4 Data Migration Needs and Opportunities

Given the struggle many IT organizations face with performing data migrations, they need to look seriously at other, more successful methods and solutions for solving the problem. What they need are solutions that allow them to perform data migrations online, in a seamless manner, from one type of storage to another type of storage, even across different storage vendors' products. Simplifying complex tasks such as data migration is at the heart of storage unification and virtualization.

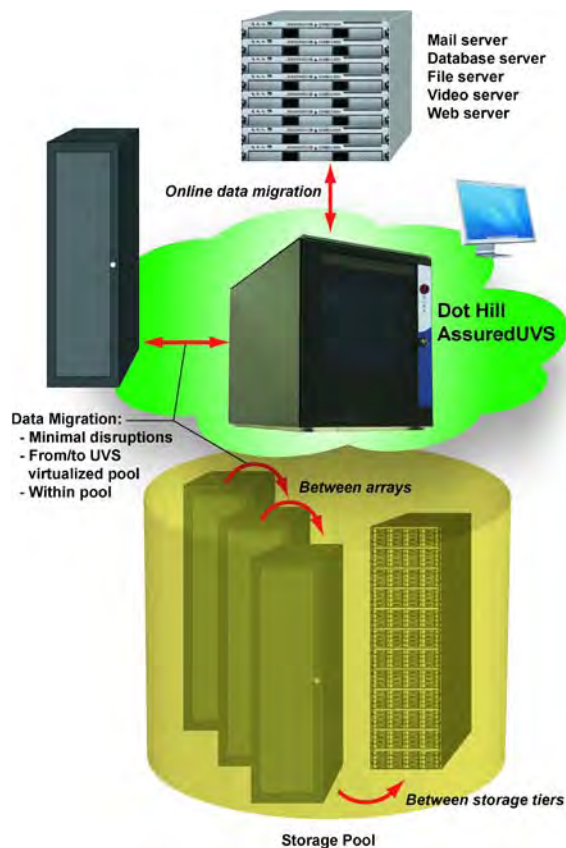
Such solutions should be able to allow applications in production environments to remain up and running most of the time – with little to no impact to end users – all while the migration occurs behind the scenes.

What IT groups really need is a rapid means of data migration that ensures data integrity does not adversely impact network traffic and allows systems administrators to take back control of their weekends. The next few sections show how to obtain this type of data migration functionality from Dot Hill. It also goes several steps

further, however, and demonstrates some of the other data migration opportunities organizations can now embrace when using Dot Hill Storage and Dot Hill AssuredUVS. By moving beyond basic migration into these new areas of opportunity, IT organizations can begin to move into the true promise of data mobility. This leads to a more adaptive, fluid environment that is capable of responding better to the needs of the business.

5 Data Migration with Dot Hill AssuredUVS

Dot Hill's opportunistic view of data migration is reflected in its Unified Virtual Storage systems, available as the AssuredUVS Standard and the AssuredUVS Datacenter. As the result of years of research and usage in some of the most demanding, high-end settings, the unique design of AssuredUVS systems allows organizations to capitalize on data migration in a whole new way. With AssuredUVS, it is now possible for IT groups to perform, seamless any-to-any data migration with minimal disruption or downtime associated with the organization's critical production systems. Figure 2 demonstrates the few steps required to perform this type of migration from within AssuredUVS.



DATA MIGRATION WITH AssuredUVS

Map data on physical storage or LUN to AssuredUVS's virtualized storage layer. To do so, just create AssuredUVS proxy volumes:

1. Map the proxy volume to the client/host.
2. Stop the application for minutes only to flush the cache down to the storage.
3. Switch storage and servers to AssuredUVS.
4. Run the application through AssuredUVS with no changes to the original application volumes (allows you to provide data protection and disaster recovery for any storage tier).

Now, perform seamless data migration:

5. Copy data non-disruptively, as a background process, through AssuredUVS to other physical storage arrays or to an AssuredUVS volume (copying to an AssuredUVS volume also allows you to gain access to smart provisioning functionality that offers "just in time" storage deployment that can defer purchase costs and make

Figure 2. Steps Required for Data Migration in AssuredUVS.

With AssuredUVS, data migration is an online process and is completely nondisruptive. IT groups can keep their core applications up and running for much of the time while the data is migrated to different physical storage in the background. There is no need to change the data structure and remapping takes seconds to minutes. AssuredUVS replaces complexity with simplicity. Long weekends and significant overtime are now a thing of the past.

Not satisfied with just any-to-any migration, however, AssuredUVS also allows IT groups to migrate their data into a more intelligent, virtualized layer. Once the data resides there, it is able to fulfill the true promise of data mobility. Organizational business strategies, such as tiered storage, disaster tolerance, and disaster recovery become simple to implement. Moreover, since AssuredUVS is completely technology and vendor neutral, customers are freed from vendor lock-in and empowered to choose lower cost, highly reliable, high performance storage (such as Dot Hill AssuredSAN) that meets their performance and cost requirements.

The virtualized software at the foundation of AssuredUVS offers a host of advanced services that subsequently enable IT organizations to realize a wide range of the opportunities available from flexible storage.

5.1 From Problem to Opportunity: Going Beyond Basic Data Migration with Dot Hill AssuredUVS

Achieving fast, reliable data migrations from point to point is a good starting goal for most IT organizations. This move alone will bring considerable ROI to the majority of installations. But, stopping here with a data migration solution does not go far enough. A robust data migration solution can also provide other benefits that help move IT organizations much closer to achieving the benefits of true data mobility.

When organizations try to solve their data migration issues, they should also be thinking about other opportunities that give IT the flexibility to adapt its infrastructure rapidly to business changes. Customers looking for advanced solutions to their data migration issues should be on the lookout for affordable solutions that can also offer the following types of added benefits:

- Easier management and implementation of tiered storage
- The ability to provide higher quality services and meet or exceed SLAs
- Reductions in the need for future data migrations
- The ability to conduct more trials of other storage systems or technologies without risk
- The ability to provide better protection and support for stored data and the needs of the business
- The ability to move closer to utility storage and a grid-based computing model

The following table provides more information about how AssuredUVS solution can help organizations explore these types of added opportunities.

Data Migration Opportunity	How the Dot Hill AssuredUVS Makes This Opportunity a Reality
1. Provide higher quality services with better ability to meet or exceed SLAs	Once data is migrated to a virtualized, logical layer, IT organizations will find it easier to track and report on their performance against service level agreements (SLAs). The powerful virtualization provided by AssuredUVS enables comprehensive tracking, alerting and reporting that can automatically notify IT groups when potential performance or capacity thresholds are close to being reached. AssuredUVS also has troubleshooting functions that help IT groups isolate any potential bottlenecks in the data path.

Data Migration Opportunity	How the Dot Hill AssuredUVS Makes This Opportunity a Reality
<p>2. Easier management and implementation of tiered storage</p>	<p>The foundation of the Dot Hill data migration solution is based on virtualization technology that allows data to not just be moved from one physical location to another, but also migrated into a more intelligent, logical abstraction layer. This capability allows organizations to see and manage all of their diverse, heterogeneous storage systems as one logical pool of storage.</p> <p>Besides the ability to consolidate, manage, and redistribute storage from one logical pool, AssuredUVS also allow IT teams to consolidate and redistribute the combined storage bandwidth and processing power of individual systems so that the appropriate amount of disk spindles and processors can be given to key applications with high demands.</p> <p>By implementing tiered storage infrastructures and migrating data to this type of virtualized platform, AssuredUVS also provides a range of added benefits:</p> <ul style="list-style-type: none"> • <i>Easy manipulation and creation of logical storage tiers</i>, each with different Quality of Service (QoS) characteristics, and each comprised of possibly several different physical storage devices from a variety of vendors. QoS characteristics regarding performance, capacity, data protection, recoverability, and availability are typically identified by SLAs to which IT has agreed to adhere regarding support for key applications or different categories of company data. • <i>Making lower-cost storage perform as if it is higher cost storage</i>. Internal customers may demand the best performance from the storage environment. While most organizations would translate that to a requirement to run an application on “Tier 1” storage, virtualization platforms offered by AssuredUVS make it possible for IT groups to provide the equivalent of Tier 1 performance from lower-priced, Tier 2 storage systems whose combined bandwidth has been consolidated by AssuredUVS. Organizations might even set up logical storage tiers to support the QoS needs of “Tier 1” production data, but might have the underlying physical composition of the storage be comprised of lower-cost Serial ATA disks that are also used for the company’s, more traditional “Tier 3” archival purposes. If performance is sufficient on this storage, data can still be retrieved seamlessly behind the scenes from the logical Tier 1 storage layer, independent of the physical systems where the data may actually reside. (Contact a Dot Hill representative for other examples of AssuredUVS’s flexibility for creating logical storage tiers.) • <i>Easier management of data migration to different tiers</i>. Underlying storage assets can be better utilized and quickly reassigned as needed by the administrator from within the virtualized platform, either on-the-fly in response to recent business changes (an application’s need for additional storage), or via formalized policy rules set by the administrator. Some database applications may require nothing less than “Tier 1” storage performance and capacity. For these, AssuredUVS’s virtualized treatment of storage tiers also allows the storage administrator to allocate more true “Tier 1” storage quickly in response to a DBA’s request for more capacity or better performance, while moving less used data to lower tiers. When business requirements demand nothing less than top performing storage at the highest logical and physical tier, AssuredUVS allows IT teams to meet this demand consistently with no risk of application downtime. • <i>Flexibility to add legacy or new storage from a variety of vendors</i> to support the tiered storage infrastructure. Back-end storage systems can be easily added or removed from a virtualized storage tier with no impact to production data that resides on the tier.

Data Migration Opportunity	How the Dot Hill AssuredUVS Makes This Opportunity a Reality
<p>3. Reduce the need for future migrations</p>	<p>Once data is migrated into a higher, virtualized layer enabled by AssuredUVS, the data resides in virtual volumes that might span several physical devices. Since the system performs its own load balancing when changes occur to the underlying physical storage, it frees IT groups to perform back-end maintenance on any device without taking applications down. IT teams can also easily replace or add new systems--without the need to migrate the data.</p>
<p>4. Can have more options to conduct trials of other storage systems or technologies, without risk</p>	<p>By migrating data from physical devices to a higher logical layer, IT has more opportunity to try devices from other vendors without fearing impact to production systems. New disk technologies storage solutions can be tried out in the background for IT groups to monitor their performance. Since AssuredUVS automatically balances and redistributes the data to whatever devices are specified, production data will not be adversely affected.</p>
<p>5. Provide better protection and support for stored data and the needs of the business</p>	<p>Once the IT administrator migrates data into a logical, virtualized pool of storage, the administrator can apply a variety of advanced services to the data. Such advanced services are part of the virtualization platform offered by the Dot Hill AssuredUVS.</p> <p>Suddenly, the data can be quickly “snapped” with snapshot functionality that may even replace current, more costly backup procedures. Disk-based snapshots, or point-in-time copies, do not require production systems to be shut down during backup. Stored in another virtual location on disk, such snapshots are transforming the face of IT services offered to the business, by allowing IT to perform rapid restores of critical data and provide a superior means of redirecting query-intensive reporting functions from the core production system to another read-only mount point for application data.</p> <p>Writeable copies of production data (called “virtual replicas” in AssuredUVS) can also be quickly snapped and reloaded onto another virtual volume on the system. These can then be used by IT to answer the need for application developers and testing teams to gain rapid, dedicated access to the latest samples of application data.</p> <p>For more robust disaster recovery needs, advanced services available from the virtualization layer also allow IT administrators to set up asynchronous or synchronous mirroring of critical data from one or more virtual volumes to another, whether located locally at a remote location. And AssuredUVS makes good use of Dot Hill’s highly reliable, high performance RAID by allowing it to be the low cost DR receptacle at the remote end.</p>
<p>6. Move the organization closer to a grid-based computing model with utility storage</p>	<p>IT organizations are hearing a lot about the upcoming move to a more grid-based computing environment. Such an environment is supposed to use commodity hardware components in such a way that their combined capabilities can be easily accessed and redistributed to wherever the demand for IT services is greatest. The virtualization technology provided by AssuredUVS allows underlying, component-based storage to be managed as a logical unit. This functionality is a key enabler for a move to this type of grid-centric model.</p>

6 Getting to ROI with Data Migration from Dot Hill AssuredUVS

As indicated earlier in research from the Enterprise Strategy Group, most organizations expect their data migration efforts to be difficult, painful, and significantly more expensive than anticipated—based on how these

projects have gone in the past. With Dot Hill's AssuredUVS, however, the data migration effort is finally able to be viewed in a new light.

For one thing, use of AssuredUVS platform gives organizations the flexibility to conduct complex data migration projects on either small or large scale.

- **Starting small.** Use of AssuredUVS allows a complex, data migration project to be broken up into smaller, more manageable stages, if desired. This allows IT organizations to be flexible and look at the prospect of reusing existing storage infrastructure during the initial migration before significant new purchases of storage are required.

For example, IT staff can start small and perform a data migration by department or smaller project only. If a long weekend comes up when the Exchange system will not be in use, the IT team can take advantage of AssuredUVS's flexibility to migrate just that application's data without disruption.

- **Starting big.** If an IT group chooses to start a large migration effort and devote resources to the task until it's completed, AssuredUVS platform can significantly shorten the time to completion from months to weeks while removing the risk of significant disruption to day-to-day production systems.

In general, use of AssuredUVS for data migration can provides demonstrable savings and ROI in the following ways:

- Postpones the need to purchase new storage, since older storage can be reused once data is migrated from it to AssuredUVS's virtualization layer.
- Reduces labor costs and minimizes overtime.
- Reduces the risk of application downtime during the migration process.
- Completes the migration in a shorter time – which means less weekend work and the ability to get a jump-start on other IT projects.
- In situations where a legacy site (housing a data center or network) is being replaced, such rapid data migration allows costs associated with the site to be terminated earlier.

One organization had already determined that its data migration project would require 72 weeks to complete and involve application downtime at various stages of the process. Utilizing the Dot Hill AssuredUVS, however, they were able to plan for only 10 weeks to perform the total migration, and to do so in a non-disruptive manner.

¹ “Data migration: Tales from the trenches,” by Alan Radding, *Storage Magazine*, September 2005.

² Research Brief: “Data Migration: Everyone is doing it but are they doing it right?” by Nancy Hurley, Enterprise Strategy Group, March 2005, <http://www.enterprisestrategygroup.com/ESGPublications/BriefPopup.asp?ReportID=374>.

³ Ibid.