ESG Lab Review™

Acopia ARX:
Transparent, Heterogeneous Data Migrations
for NAS Storage

A Product Review
by
ESG Lab
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ESG Validation Reports

The goal of the ESG Lab Validation reports is to educate customers about specific storage-related products including storage systems, backup-to-disk solutions, storage management applications, backup/recovery software, storage virtualization platforms, etc. The ESG Lab reports are not meant to replace the necessary evaluation process that end user customers should conduct. The ESG Lab reports are designed to provide insight to what is compelling about various products and how they can solve customer problems. ESG Lab reports also recommend areas we feel the vendor should improve upon. ESG Lab provides third-party expert perspective based on our own hands-on testing in a lab and interviews with customers using these products in production environments.

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Introduction
Acopia Networks is a pioneer in NAS Virtualization providing an intelligent solution that simplifies the management of unstructured (file) data across heterogeneous NAS storage systems. The Acopia Adaptive Resource Switch (ARX®) provides file virtualization technology on a high performance intelligent switch that scales with the needs of your business. The Acopia ARX reduces the complexity of managing dozens, hundreds or thousands of file systems. This report focuses on validating the Acopia ARX’s ability to perform data migrations between different NAS storage systems online and transparently, including scenarios when the NAS systems provided concurrent access to Windows, Unix and Linux clients.

ESG Research on Data Migrations
ESG has found that data migrations are extremely common with server and storage equipment replacements, relocation, consolidation, lease renewals and load balancing driving the need to migrate data on a regular basis. More recently, companies are migrating data to implement intelligent tiered storage environments moving infrequently accessed data to lower cost storage systems.

The problem is that the traditional methods of data migration are inherently disruptive as the process involves moving data from one NAS device to another and then redirecting applications. Acopia offers an alternative to various manual and disruptive migrations, alleviating the need for application downtime and weekend migrations.

Chart One: Data Migration Planning

ESG conducted a survey of over 550 end users responding across North America and EMEA on data migrations. The results of the survey confirmed that the majority of migrations are done on weekends and application downtime is the biggest overall issue. The results indicated there is a need for a change in how migrations are performed. The majority of users (75 percent) experienced problems with data migrations, with 58 percent reporting extended or unexpected downtime, and 36 percent experienced application performance issues (Chart 2). Many users consider migrating data to be a complex process; over 72 percent of respondents take more than two weeks to plan an implementation and over 40 percent of the migrations involve more than 5 people to complete.
As our research shows, data migrations can be very time consuming and costly, particularly for those organizations that need to perform migrations on a regular basis. While the general perception is that data migrations are a rare occurrence, a surprising 20 percent performed migrations on a weekly basis, and another 21 percent performed monthly migrations. The respondents that perform migrations on weekends overwhelming state they are trying to avoid application downtime, and avoid overall risk. Depending on how staff is paid those weekend migrations can mean costly overtime, or at the very least an unhappy group of employees.

Why This Matters

Data migrations are occurring frequently within organizations of all sizes on a global basis. Many companies plan downtime for these projects, which has an adverse impact on business. Additionally, these data migration projects typically take longer than originally planned, require additional IT people-hours, and run over budget. The Acopia ARX has the ability to provide online multi-protocol, multi-vendor data migration, effectively eliminating costly application downtime and IT expenses associated with manual data migration alternatives.
Acopia NAS Migrations

Large enterprises can have a number of NAS systems from more than one vendor. It is not uncommon to have a mix of NAS solutions from EMC, Microsoft and NetApp. Each of these NAS solutions has multiple file systems that have to be managed individually.

As discussed above, companies perform data migrations due to server and storage equipment replacements, relocation, consolidation, lease renewals, load balancing between NAS systems and to implement intelligent tiered storage environments.

The Acopia ARX products support the following data migration features:

- Migrate data without the use of stubs or redirection links
- Migration of files that are open with CIFS and/or NFS locks
- Transparent de-commissioning of NAS devices
- Adaptive and transparent tiered storage policies; demotion and promotion of files as needed
- Age and custom policy based data migration
- The ability to schedule policies to execute automatically
- High availability during data migrations through redundant ARX switches
The ARN Site Analyzer Tool
Acopia has also developed analysis tools to provide insight into any file storage environment. These tools are used to provide data profile information (e.g. file ages, file types, etc) and to identify potential issues when aggregating heterogeneous storage (e.g. different capabilities). The tools can also provide useful "what if" analysis for different policy configurations (e.g. tiered storage with ILM policy).

The complexity of many large enterprise infrastructures, often multi-vendor with multi-protocol access, makes data migration non-trivial. The following issues must be considered:

- File permissions mapped across CIFS and NFS are not handled the same by all NAS vendors
- Naming incompatibilities and collisions between Windows and Unix can be fairly common, made far worse in heterogeneous NAS environments since naming incompatibilities are handled differently by EMC and NetApp, for example
- Different approaches are needed to handle the migration of open CIFS and NFS files across multiple file systems.
- Since many large scale migrations can take weeks, its critical for the migration device(s) to have the ability to withstand a failure without affecting the migration

The ESG Lab Review focused on the above in order to educate customers on using the Acopia ARX for data migrations between heterogeneous NAS storage systems.

Why This Matters
The ARX addresses many of the complex (and often overlooked) issues associated with multi-protocol, multi-vendor data migration, such as different naming conventions, managing file permissions, eliminating collisions, migrating open files, surviving system failures, etc. The fact that Acopia has addressed these issues in a scalable manner, and in production deployments, should provide storage administrators with a level of assurance that ARX product family can support data migrations in complex enterprise NAS environments.
ESG Lab Review
The goal of the ESG Lab Review of the Acopia ARX was to focus on its ability to perform data migrations transparently and online between heterogeneous NAS systems, from EMC to NetApp in this case. The following were the objectives of the ESG Lab Review:

- Migrate data “cleanly”, without stubs or redirection links across multiple file systems
- Manage multi-protocol file permissions, including preservation of permissions across vendors
- Handle name collisions and incompatibilities
- Manage open files appropriately
- Perform adaptive ILM policy to migrate aged data to a second tier
- Survive an Acopia ARX switch failure without affecting data migration

ESG Lab testing involved configuring a high availability Acopia ARX switch pair to virtualize multi-protocol (CIFS and NFS) file systems on EMC Celerra and Network Appliance NAS devices. We then migrated data from the EMC Celerra to the NetApp filer, verifying both CIFS and NFS access was uninterrupted during the migration. Following the data migration we configured a tiered storage policy on the Acopia to transparently move data between two logical tiers on the NetApp filer. Finally, we repeated the tests and powered down the primary Acopia ARX switch in the midst of the migration.
Data Migration Process
The process of performing data migrations using Acopia can be driven through its GUI. The GUI used to perform data migrations is fairly intuitive and easy.

Figure Three: Network File Systems

- As Figure Three illustrates, on the left is the Acopia view of the network drive V.
- On the top right is the EMC network drive E.
- Note that the Acopia V drive and the EMC E drive both share the same directories and file.
- On the lower right is a new NetApp file system designated as network drive N.
- The next step is to migrate the data from EMC drive E to NetApp drive N.
Figure Four indicates the amount of capacity being used for the Acopia V drive. As you can see the total amount is 9.61 GB.

The NetApp FAS was added to the Acopia virtualization environment. The process of adding the NetApp file system was simple, and the provisioning task was performed online and transparent to the Windows and Linux application hosts. Figure Five illustrates that the Acopia network drive V dynamically expanded from 9.61 GB to 460 GB.
Since both the EMC network drive E: and the NetApp network drive N are managed under the Acopia network drive V: moving the data from one file system to the other remains transparent to users. This is an intuitive process in the Acopia GUI which simply involves choosing a source and a destination for the migration as shown in Figure Six.

**Figure Six: Transparent Data Migration through the Acopia GUI**

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**Why This Matters**

The process of performing data migrations is straight-forward and can be done using the Acopia GUI or via a command line. The Acopia system creates a global namespace for the NAS systems that are involved in the data migration. This allows administrators to move data in an automated and intuitive manner without disrupting access to the data being moved.
There are some complexities in performing multi-protocol data migrations in multi-vendor environments which are not immediately obvious. Two such complexities are the migration of open files and the naming inconsistencies that are inherent across different vendor implementations.

**Open Files**
We tested the data migration process with files being open in Windows and Linux during the data migration. The ARX migrated all open Linux/Unix files. For Windows open files the Acopia ARX offers a variety of different customer configurable options to resolve open files gracefully and to ensure data integrity throughout the process.

ESG Lab performed data migrations with both open Linux and Windows files and the Acopia ARX handled them seamlessly.

**Naming Conventions**
One of the key values of Acopia is providing a single name space for all of your NAS file systems whether they are CIFS or NFS-based. However, vendors handle file naming conventions differently which makes cross vendor migrations complex. The Acopia ARX has features built into the product to manage these naming inconsistencies across vendors.

**Why This Matters**
Many enterprises desire the ability to perform data migrations online and transparently, however this is difficult to achieve. Acopia understands the complexities and handles them behind the scenes. For example, the ARX deals with lock management issues for Unix and Windows so migrations can occur online. Another example is the way Acopia deals with naming conventions between CIFS and NFS environments, and between NAS vendor products. Acopia acts as the translator enabling data integrity and accessibility. This attention to detail and automated handling of many potential issues will please storage administrators who would otherwise be left having to manually resolve conflicts and potentially have to troubleshoot data loss or data corruption issues.
De-commission of Source File Systems
Once the source file system has been migrated to the target then the process of de-commissioning the source needs to be considered. Once the data migration is successful customers may want to keep the source for some period of time for insurance. Acopia will save the source data and the system administrator can remove it when he or she feels comfortable that the new system is running at 100 percent. At this stage Acopia will de-commission the source data once migrations are completed and validated.

Why This Matters
Once the data migration has been performed the process of de-commissioning the original source data is a requisite step. Customers may want the option of keeping the original source for a period of time as insurance that the migration was completed successfully over an extended period of time and that the new NAS storage system meets their needs. Once this has been verified then the source can be deleted. Acopia thought this process through and supports elegant de-commissioning of source data.

Adaptively Tier Storage
Once we had validated the multi-protocol migration from EMC to NetApp, an adaptive ILM policy to migrate aged data to a second tier was added. This was configured and monitored via the Acopia GUI. ESG Lab validated the policy by viewing the physical file systems directly and saw the files migrate from Tier 1 to Tier 2 once they met the age criteria we had configured through the GUI. Finally, we modified a file and watched it instantly migrate back to Tier 1. In both the migrations from Tier 1 to Tier 2 and Tier 2 back to Tier 1 we verified that no stubs or hard links were left on the source storage tier.

Why This Matters
Implementing policies provides an even greater level of intelligence for tiered storage. The ability demote files to a lower tier and then promote back to a higher tier are both critical to an efficient tiered storage environment. Acopia has policies that provide this capability performing demotion and promotion between different tiers transparently and online.
High Availability
The Acopia ARX supports clustering between ARX systems for high availability. In the validation test the Windows and Linux clients had live access to data while a data migration was started on the Acopia switch. During the data migration the Acopia switch performing the migration was failed. The second Acopia switch recovered data access to the clients and resumed the data migration process within 60 seconds. The switch over was performed with no manual intervention.

Figure Eight: Acopia ARX High Availability

Why This Matters
ESG Research found that data migrations typically take longer than expected consuming time and human resource. Acopia offers high availability to ensure that data migrations occur on time and without expensive application downtime.
ESG Lab Review Highlights

- Virtualized EMC Celerra multi-protocol share and validated access from both Windows and Unix
- Transparently added NetApp storage to "virtual file system" and validated increased workspace through clients
- Migrated all data from EMC to the NetApp and decommissioned EMC
  - Validated by viewing back-end shares directly, and by monitoring service through the Acopia GUI
  - Opened file in each client during migration, then closed and validated that files were migrated
- Added second (archive) Tier and validated through Acopia GUI and through clients
- Added adaptive ILM policy to migrate aged data to Tier 2
  - Configured and monitored via Acopia GUI
  - Validated by viewing back end shares directly
  - Modified file and watched it migrate back to Tier 1
- Transparently migrated all data from EMC to the NetApp while surviving an ARX switch failure
  - Configured and monitored via Acopia GUI
  - "flipped" primary switch performing the data migration
  - Monitored client access failover and validated data migration completion
  - Validated Acopia's ability to withstand switch failure without affecting data migration
- Validated the Acopia ARX's ability to address the complexities of heterogeneous (NetApp, EMC) multi-protocol migrations
  - Validated ARX automatically managed file attributes across CIFS/NFS that were not compatible between EMC and NetApp
  - Validated Acopia's ability to appropriately handle both CIFS and NFS open files during migration
  - Validated ARX's features for managing naming incompatibilities and collisions between heterogeneous NAS.
  - ARN Site Analyzer tool utilized to diagnose naming collision possibilities

ESG Lab's View
ESG Lab has done multiple projects with Acopia over the last couple of years and we are impressed with its ARX solution. ESG Lab ran performance testing and the results were impressive with the ARX1000 supporting throughput of over 400MBps (megabytes per second) and a single ARX6000 switch supporting throughput over 2GBps (gigabytes per second). ESG Lab also tested the Acopia policy-based migrations in a heterogeneous environment with NetApp FAS, EMC Celerra and EMC Centera. Additionally, ESG has spoken with a number of Acopia customers and we found that they are using the ARX as a strategic part of their NAS environments and business.

Data migrations play an important role when upgrading new NAS systems, performing load balancing between storage systems, and as part of an intelligent tiered storage strategy. The Acopia ARX makes it easy for users to perform data migrations while handling the complexities behind the scenes. It also enables the customer to have leverage with their NAS vendors, since Acopia gives them the ability to change NAS products much more easily than in the past. ESG has found through our research and ongoing communication with customers that there isn't enough awareness that such solutions exist. ESG Lab believes that companies that require a solution to perform data migrations even in complex and/or heterogeneous NAS environments should take a serious look at the Acopia ARX.