

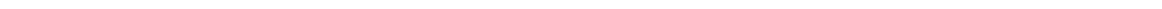
Virtual LUNs

Applied Technology

Abstract

This white paper describes the features, benefits, and use cases of Virtual LUN technology, available with EMC[®] CLARiiON[®] storage systems beginning with FLARE[®] Release 16. It provides an overview of data migration strategies and value propositions, and discusses how Virtual LUNs enable these strategies.

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Executive summary

To maintain a competitive advantage, organizations thrive on the value of their information. More and more companies are realizing this and are continuing to invest in their surrounding infrastructure. To execute that advantage at your company, the first step is to constantly have the right information accessible to your employees. Any disruption in availability can impede their ability to unlock the potential of your information, and also prevent you from getting the best return on investment.

At the same time, your information infrastructure is constantly changing. In a storage environment, systems are often being reconfigured to add capacity, consolidate storage, or optimize performance. All of these efforts add value to your organization; however they also may disrupt your ability to meet service levels. In addition, there is a need to align informational value with appropriate storage levels while reducing overall costs.

EMC® CLARiiON® with Virtual LUN technology provides the best method for data migration within an array without host or application disruption on the market. Virtual LUNs enable you to bring your entire ILM strategy to life by easily moving information throughout the storage system as its value changes over time. It can assist in system reconfiguration, performance improvement, and consolidation efforts all while helping you maintain your vital service levels. Best of all, Virtual LUNs enable this in a cost-effective manner, coming standard on CLARiiON arrays Release 16 or later, without the need for any additional software licenses.

Introduction

Virtual LUNs migrate data within a CLARiiON array without the need to bring applications down. This feature may be applied on a per-LUN basis, and any LUN can be migrated to any other LUN or metaLUN within the array. Virtual LUNs also allow the characteristics of the LUN being migrated to be changed, which is very valuable as information changes.

Virtual LUNs leverage the existing FLARE® operating environment, which provides industry-leading performance and data-integrity features. Virtual LUNs can be utilized on any FLARE release 16 or later, without the need for additional software licenses.

Audience

This paper is intended to give an overview of the Virtual LUN feature on the CLARiiON array and outline its features and business benefits. The intended audience includes customers, decision-makers, EMC staff and partners who are evaluating the differentiation of the CLARiiON platform. This paper will not give information on how to implement a LUN migration using Virtual LUNs. For that information, consult the white paper *EMC Virtual LUN Technology – A Detailed Review* on EMC.com and EMC Powerlink™.

Information Lifecycle Management

Information Lifecycle Management (ILM) is the practice of aligning the business value of information with the most appropriate and cost-effective infrastructure throughout its existence. The effective use of ILM allows users to lower the total cost of ownership (TCO) while still maintaining high service levels for the data and applications that are accessed the most. Costs can be reduced by moving data with less business value to cheaper infrastructure, while maintaining higher valued data on better performing and more expensive infrastructure. Figure 1 highlights the overall ILM strategy.

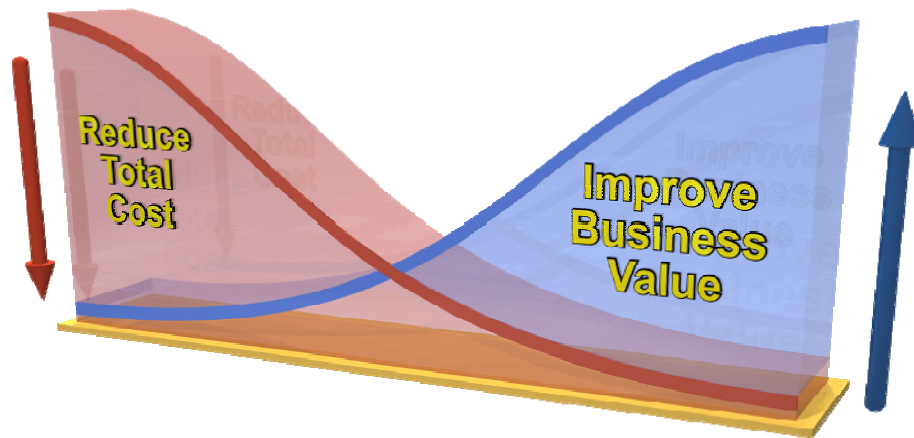


Figure 1. The ILM philosophy

Reducing total cost can be accomplished by swapping out higher-priced, under-utilized infrastructure with more cost-effective alternatives. Coupling this cost reduction with an increase in business value, however, proves a very difficult task. Companies must examine their “one size fits all” service level philosophy to determine which applications require the highest performance. Furthermore, the value of data flowing through those applications must also be examined to ensure that the most important information is receiving the best resources (see Figure 2).

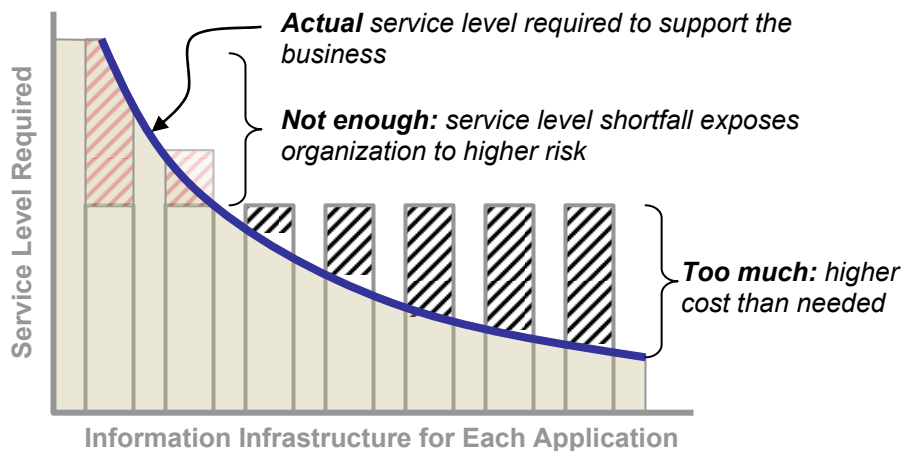


Figure 2. One-size-fits-all service level deployment

This type of environment can become increasingly complex and difficult to manage, but can also be extremely effective when executed correctly using the right products to meet your needs.

Tiered storage

Tiered storage is the practice of maintaining storage of varying performance and characteristics either among multiple arrays, or within the same array itself. This is typically the first step toward creating a complete and efficient storage environment. Tiered storage gives administrators the flexibility to utilize their resources effectively by aligning hardware levels to appropriate information value. For example, data “hot spots” can be placed into higher performing hardware, providing better performance and user experience. Tiered storage on its own, however, does not provide much benefit. Users must have the ability to freely move data among storage tiers to respond to rapidly changing information value and business needs. Most storage vendors focus on creating the hardware to create a tiered storage environment, but neglect the challenge of moving data without disrupting applications. This leads many

users to not realize all the benefits tiered storage can bring. Virtual LUNs work to migrate data between storage tiers *within the same array*. Virtual LUNs do not have the capability to move data between arrays. EMC has a number of products for migrating data between different storage arrays, such as EMC Invista™.

Data migration challenge

Data migration is many times overlooked in complex, expensive storage environments. This can be a critical mistake. ILM is based on properly aligning resources with the ever-changing value of information, and the storage system has to dynamically react over time. Data migration is an important technique both internally (within a CLARiiON array) and externally (between CLARiiON arrays). From within the array, data migration gives life to tiered storage, and without it information remains on storage levels that do not correspond to its value. The challenge is that migration is normally associated with system **downtime**, which adversely affects the ability to meet service level agreements (SLAs). Furthermore, many migration techniques require additional software licenses, adding greater expense. These issues prevent many users from effectively moving data because of their reluctance to disturb their system or create application downtime. As more and more information is stored digitally, users demand easier ways to migrate information without disrupting their systems. EMC's Virtual LUN technology is the answer.

Storage consolidation

Storage consolidation is another good way to lower overall storage costs and protect data more effectively. As a result, many organizations are turning toward consolidation to manage their information needs. Many times, however, consolidation can have a negative effect on performance. As more and more data shares the same array, users find it difficult to associate the most widely used information with the best performing hardware. This can prevent many customers from not taking advantage of all the benefits and cost savings that can be a result of effective consolidation.

If storage consolidation is to be effectively merged with ILM, then organizations must have the ability to migrate data throughout the array easily and without downtime. EMC's Virtual LUN technology enables this migration without the need for any additional software licenses.

Virtual LUN technology

EMC's unique Virtual LUN technology is a built-in feature on CLARiiON arrays that allows users to seamlessly migrate data between LUNs in the array without experiencing downtime. Until now, SnapView™ clones and SAN Copy™ were the only storage-based methods for migrating data within the system, but both of these methods interrupted host I/O, causing applications to go down until the migration was complete. Virtual LUNs allow a user to migrate data to LUNs with better performance or other characteristics within the array, providing a greater level of control over the system. The characteristics of a LUN or drive type that can be changed are:

- **RAID geometry**
 - RAID type
 - Number of disk spindles
 - Alignment offset
 - Stripe element size
 - LUN size
- **Drive type**
 - Fibre Channel → ATA or Low-Cost Fibre Channel (LC-FC)
 - ATA or Low-Cost Fibre Channel → Fibre Channel

Even better, all this is accomplished without the host ever knowing anything has changed. Virtual LUNs are available on all CLARiiON Release 16 or later systems, and are built into the FLARE operating environment. There is no need for additional software licenses or any installation steps to take advantage of Virtual LUNs. Figure 3 diagrams the Virtual LUN process.

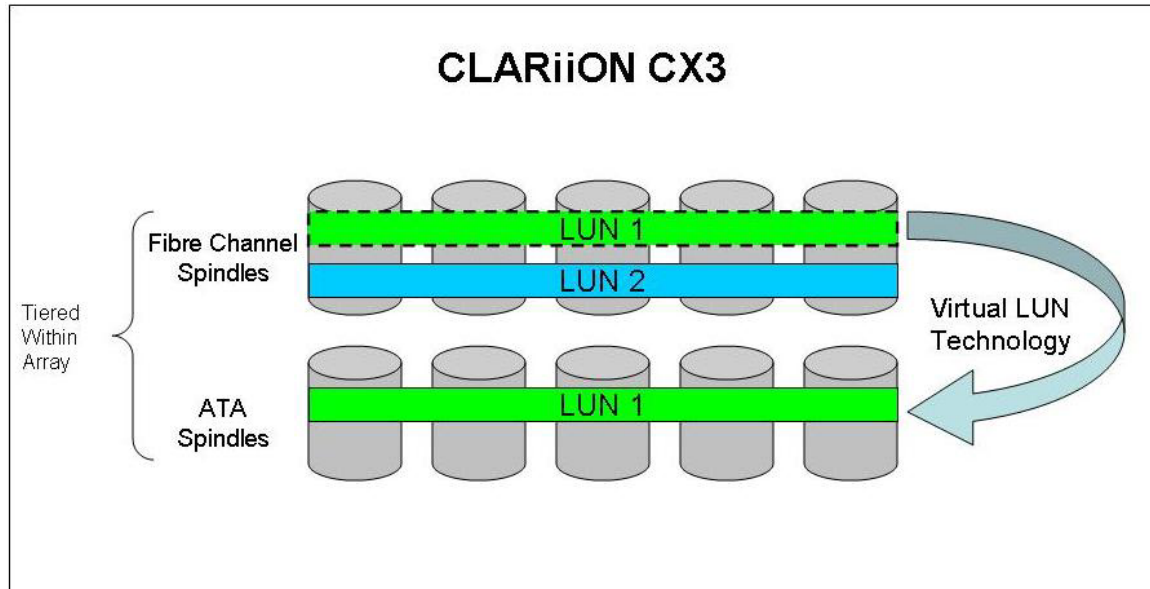


Figure 3. Virtual LUNs in action

Why is this valuable?

To make ILM a reality, organizations need to have the most control possible over where information resides within the array. ILM is about reducing cost **while** improving the business value of information. With effective data migration using Virtual LUNs, organizations have the ability to migrate information to

Virtual LUN technology helps deliver high levels of service to Avis customers

The Avis Group is the leading car rental company in Europe, Africa, the Middle East, and Asia. They operate in over 3,700 locations throughout over 108 countries worldwide. To maintain the high levels of service their customers have grown to expect, high availability is a must for their organization. They cannot be slowed by system downtime or poor performance. The EMC CLARiiON product line helps keep their information available at each location so their business can function without interruption. Avis currently deploys CLARiiON CX storage arrays at localized data centers throughout Europe and Asia.

Like any company, Avis struggles with system reconfiguration due to the potential downtime of their production systems. "Occasionally, we have requirements that we didn't have in the original scope," says Technical Architect Gavin Joliffe. "We need to reconfigure the system accordingly while keeping applications online." To solve this problem, Avis utilizes Virtual LUNs within its EMC CLARiiON storage arrays. "We have about 4 TB of ATA storage that we use as a staging area as new requirements come in. We can bring them online immediately in the staging area and then use Virtual LUNs to migrate their data to the correct storage without the host ever knowing anything."

Virtual LUNs bring value to Avis' customers by helping the company deliver the highest level of customer service without interruption. As their storage environment becomes increasingly complex, the CLARiiON's business continuity capabilities will play a greater role in Avis' information infrastructure.

appropriate storage levels. This lowers TCO, while still giving the best performance to the most valuable information in the system. Virtual LUNs accomplish this without any application downtime, giving you the ability to meet service levels. If migration efforts cause downtime, they are unable to maximize the increases in business value that an ILM strategy is designed to achieve. You may be able to reduce costs, but is it really worthwhile if your users cannot get to their data? Virtual LUNs ensure that business value can be maximized while still lowering costs, completing the ILM vision. This effective use of information provides organizations with a strategic advantage over competitors.

All methods of data migration that exist on the storage side require applications to be brought offline to complete, which can greatly limit a user's ability to effectively migrate data throughout a storage system. Host-based methods of data migration can take valuable resources away from applications and have a negative impact on performance. Virtual LUNs provide a simple interface to migrate data to change a number of characteristics, including RAID type, LUN size, and drive type (that is, FC to LC-FC or ATA).

Virtual LUN technology is unique to EMC CLARiiON systems. Many competitor migration products require the purchasing of additional software licenses, which reduce the cost savings an ILM strategy is attempting to achieve. EMC CLARiiONs with Virtual LUN technology provide out-of-the-box data migration without interruption at no extra cost.

Differentiation

You may be accustomed to migrating data in a number of different ways, including using EMC products such as SnapView, SAN Copy, and MirrorView™. Virtual LUNs are different than each of these methods.

Migration using SnapView or SAN Copy requires more overhead than Virtual LUNs, and cannot be completed until the application is brought offline. SnapView clones present the host with a *completely different* LUN after the migration is complete, whereas Virtual LUNs retain all of the characteristics of the original LUN, including its name and ID. MirrorView can be used only for remote replication between different arrays. These products are best used for replication, not migration.

In addition to these factors, there is no separate license charge with Virtual LUNs. Virtual LUN technology is built in to FLARE, the CLARiiON operating environment. EMC is currently the only storage vendor to offer seamless, uninterrupted migration of data, and does it all without charging additional license fees.

Use cases

Virtual LUNs can be applied in a number of scenarios:

Virtual LUN technology helps make ILM a reality at Preston Gates & Ellis, LLP

Preston Gates & Ellis LLP is a leading international law firm with more than 400 attorneys practicing in 11 locations worldwide. They rely on EMC CLARiiON technology to manage their information needs and deliver consistent results to their clients. Preston Gates & Ellis LLP understands how the value of information can change over time. Case documents are widely circulated during peak times, but as the case moves through its life cycle that information becomes less valuable to the firm. To support this, they implemented an ILM strategy where information flows throughout different storage tiers within the array.

Taking advantage of this ILM strategy, however, is not as simple as it sounds. Data needs to be moved nondisruptively throughout the array to ensure minimal downtime for users. Virtual LUN technology within the CLARiiON enables Preston Gates & Ellis LLP to make this vision a reality. "It is very important for us to be able to move data as it becomes stale," says Astolfo Rueda, Network Administrator for Preston Gates & Ellis. "Using Virtual LUNs, we don't have to bring the application down or do any configuration at the OS level to make that happen."

Virtual LUNs empower Preston Gates & Ellis LLP to maximize the business value of their systems while controlling costs and maintaining their service levels for application availability.

Reacting to changing information value

Virtual LUNs allow users to move data to cheaper or better performing arrays as the value of that data changes over time. For example, historical data within a database, which is not accessed very often, can be migrated from Fibre Channel to ATA drives. This “archiving” of data frees up the better performing Fibre Channel drives for the information that is most valuable to system users. Virtual LUNs allow all this to be done without the database having any knowledge that a transition is being done, and also without ever having to take the database offline. (The April 2006 white paper *Microsoft SQL Server Data Warehouse Deployments with EMC CLARiiON Storage Systems* on EMC.com and Powerlink provides more information.)

System reconfiguration

In many instances, a storage system will have to be reconfigured while running live. For example, users may need to add additional capacity to an array to respond to increasing storage demands. Or users may want to move an application using ATA capacity to Fibre Channel capacity to increase performance. Virtual LUNs allow the users to migrate the data stored on that array to other areas of the storage system during the reconfiguration while the host applications remain online. Furthermore, users can use Virtual LUNs to move data away from disks while a new disk-array enclosure (DAE) is added. Once the additional capacity has been added, Virtual LUNs can be used to bring the data back to the original DAE or elsewhere within the array.

Load balancing/improving performance

Over time, certain LUNs on a disk are likely to become “hot” with I/O activity, which will slow performance since there is a bottleneck in the system. Conversely, certain LUNs are just as likely to become “cool” with I/O activity, mostly because the value of that data is decreasing and it is ready to be archived. Virtual LUNs allow users to dynamically react to these occurrences without any disturbance to the storage system, or any additional overhead on the host side. “Hot” LUNs can be pushed to better performing or less-utilized disks quickly and easily, for immediate performance improvements.

Virtual LUNs give greater control to users with no disruption to the hosts, giving the power to react to your business needs quickly and easily.

Virtual LUN technology helps Kindred Healthcare minimize downtime and improve performance

Kindred Healthcare is a health care services company that through its subsidiaries operates hospitals, nursing centers, a contract rehabilitation services business, and institutional pharmacies across the United States. Kindred operates 6,363 licensed beds along with 253 nursing centers in 28 states. Kindred’s Pharmacy Division also operates 39 pharmacies in 24 states servicing substantially all of their hospitals. Kindred relies on EMC CLARiiONs to keep their operations running at all times. Running six CLARiiON arrays, including three CX700s, Kindred’s data center holds a total capacity of over 20 TB and connects to a network of over 275 hosts.

To David Hoffman, Storage Administrator for Kindred Healthcare, his customers are the operators of Kindred’s facilities. Keeping their information online as much as possible is a big concern, and David utilizes Virtual LUN technology to improve system performance or reconfigure his environment without any disruption. “Virtual LUNs allow us to migrate data from a RAID 5 group to a RAID 10 group to increase performance with zero downtime to the customer,” says David. “The process is easy to use, straightforward, and seamless to the end user.” David also speaks of how Virtual LUNs can make life easier in structured environments. “It also keeps the original LUN IDs, so we don’t have to change any of our documentation.”

Access to information in Kindred’s business is a must, and customers cannot afford downtime when someone’s health is on the line. Virtual LUNs allow Kindred to perform the tasks necessary to manage and optimize its environment while ensuring data availability to its end users.

How do Virtual LUNs work?

Migrating data using Virtual LUN technology could not be simpler. The migration UI is built into the Navisphere management console on the CLARiiON. You only need to point to the source LUN within the Navisphere UI that you wish to be migrated (the source LUN), and select **Migrate** (see Figure 4). The source LUN remains online during the entire migration process so that the host application can continue sending I/O traffic without interruption. Once the migration process has begun, you simply select the targeted destination LUN on the system. You may also select a migration rate of ASAP, High, Medium, or Low. Once a destination LUN is selected, the system takes care of the rest.

Additionally, Virtual LUNs keep track of how far along the source LUN is during the migration process to maintain sufficient recovery in the case of a failure. Virtual LUNs maintain a checkpoint file during the migration, so if a failure occurs, the system can restart the migration at the last known good checkpoint, ensuring data integrity.

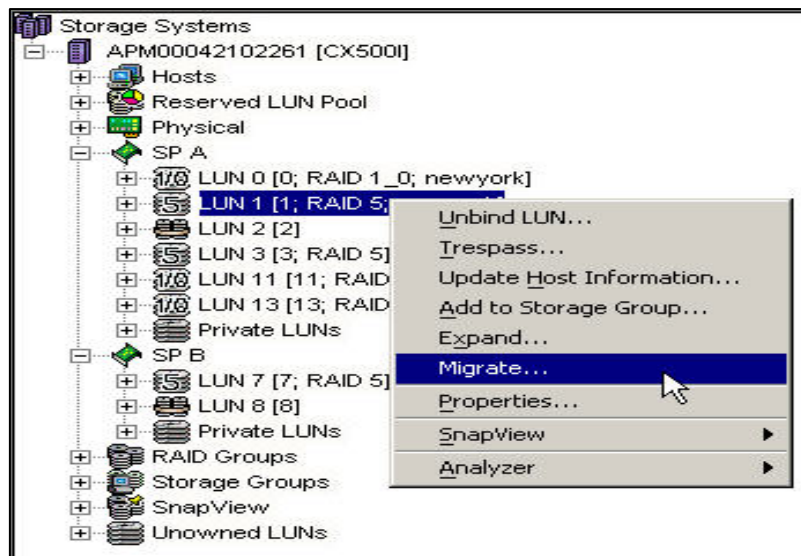


Figure 4. Virtual LUNs screenshot

Conclusion

Organizations today are under increasing pressure to reduce costs within their infrastructure, and an effective ILM strategy can help do this. However, in order to improve the business value of that information, organizations need to control it during every stage of its life cycle. With the power to quickly and easily migrate data within a storage array without interruption, an organization can increase its return on investment and lower the total cost of ownership by aligning hardware performance with data value, while increasing the business value of information. EMC CLARiiON systems with Virtual LUN technology make data migration a reality without ever disrupting applications.

Virtual LUNs enable painless data migration that allows users to change characteristics of LUNs, such as drive type, RAID type, and LUN size. This feature is useful in reacting to changing information value, where data needs to be “archived” within the array to make proper use of resources. This is the case when deploying data warehouses on CLARiiON arrays. In addition, Virtual LUNs can also be used to enable system reconfiguration, such as adding capacity or bringing new applications online before proper DAEs are installed. Furthermore, Virtual LUNs can be used to improve system performance by reacting to data “hot spots” and moving that information to underutilized disk spindles.

Virtual LUN technology is unique to the EMC CLARiiON. It gives you greater control over information, allowing you to realize its true potential. While other methods of data migration might discourage use because of application downtime, Virtual LUNs make migration simple and painless. In addition, it is

available standard with each EMC CLARiiON Release 16 or later and does not require any additional software licenses. Virtual LUNs further the ILM vision, and allows customers to drive more efficiency and value from their IT infrastructure.

References

- *Microsoft SQL Server Data Warehouse Deployments with EMC CLARiiON Storage Systems*
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