Dell Storage SC Series Live Migrate

Dell Storage Engineering
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A Dell Best Practices Guide
Revisions

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Executive summary

Current day data center administrators are challenged with balancing workloads and resources while containing costs. Just as server virtualization enabled the mobility of application workloads across the server boundary, Dell Storage SC Series Live Migrate enables the mobility of storage workloads across the SAN boundary. Applications are no longer married to an individual silo of storage; they can be moved to a location that best meets the current needs.

With Federation Live Migrate, we take a leap forward in workload mobility. SAN workloads can be seamlessly moved from one SC Series array to another, without application downtime or disruption, regardless of the operating system. Whatever the reason — migrating a heavy I/O workload to a faster or less-resource-bound SC Series array, retiring an older workload to a lower-cost SC Series storage solution, or rebalancing the federation and expanding it with a new SC Series array — Live Migrate will get it there.

Regardless of the reason for shifting the SAN workload, the process is the same. This process will run smoothly when the best practices discussed in this document are implemented.
1 Introduction to Live Migrate

Live Migrate moves a volume from one SC Series array to another without application downtime or disruption to I/O. It is not dependent on server-side agents, application integrations, or OS features, and is completely OS and application agnostic. This enables storage administrators to make more efficient use of an SC Series storage environment by providing the ability to move storage workloads to the most appropriate array for that workload and point in time.

Live Migrate utilizes some of the underlying existing Storage Center OS (SCOS) capabilities that power and are similar to Live Volume, an SC Series feature that enables SAN volume high availability. Live Volume creates synchronous or asynchronous live copies of data on separate SC Series arrays, transparently maintaining and swapping the primary host source. Live Migrate only provides a one-time migration of a volume from one SC Series array to another. Live Migrate is not dependent on Live Volume licensing, and licensing for Live Migrate is included at the base level.

1.1 Live Migrate states

Live Migrate moves a volume from one SC Series array to another without I/O or application disruption. During a Live Migrate, both the source and destination arrays can accept reads and writes for the volume being moved.

During a Live Migrate, the relationship between the server, source and destination arrays, volume, and where a read or write I/O is serviced, goes through several different states. The Live Migrate process has four significant phases:

- Before Live Migrate
- During data movement
- After role swap
- Completion

1.1.1 Before Live Migrate

Figure 1 illustrates the environment layout prior to Live Migrate configuration. The server (1), is connected with iSCSI, FC, or FCoE (2) to the source SC Series array (3), which currently hosts the volume (4). All I/O requests for the volume are serviced by the source array. If the server is not defined and connected to the destination SC Series array (5), then during the configuration of the Live Migrate for the volume, this will be detected and the administrator will be prompted to resolve the connection. If replication (6) between the source and destination is not configured, Live Migrate will prompt for this to be configured and a source replication QoS node to be created.
1.1.2 During data movement

Figure 2 shows that once Live Migrate is configured and running, the server (1) is mapped to both the source volume (3) on the source SC Series array and the newly created destination volume (4) on the destination SC Series array. Data is replicated from the source SC Series array to the destination one using the configured replication connection fabric (5). The source volume and destination volume appear to the server as a single volume with additional paths (2). The server cannot distinguish between the paths leading to the source volume and those leading to the destination volume. It will send I/O down any available path. Regardless of which array receives the I/O, it will be handled correctly. During the Live Migrate, but before the role swap, read I/O requests can be serviced by the array that receives the request. In the case of the destination array receiving a read request for a page that has yet to be replicated, the read request will be forwarded (6) to the source array. Write I/Os received by the source array are acknowledged and later replicated. Writes received by the destination array, are forwarded (6) to the source, acknowledged, and later replicated. The progress and sync status of the Live Migrate operation can be observed on the volume Summary screen and on the Live Migrate page under Replication and Live Volumes.

Figure 2 Data paths during a Live Migrate
1.1.3 After role swap

Once the destination SC Series array is in-sync with the source array as shown in Figure 3, all of the existing volume data resides on the destination array. New writes can be quickly acknowledged and replicated so that a role swap can be performed. By default, Live Migrate configures this to occur automatically, but it may be configured as a manual task. After the role swap, the volume (1) on the destination SC Series array becomes the target volume for all writes. Writes received by the source array are forwarded (2) to the destination array and acknowledged. Writes received by the destination array are acknowledged but not replicated back to the volume (3) on the source SC Series array. This is also the case with read I/Os.

![Figure 3](image3.png)  Data paths after the role swap

1.1.4 Completion

Once the role swap has occurred, new writes are no longer made to the source volume, but the server is still mapped to it. The storage administrator must mark the Live Migrate task as completed, which will offline the volume (1) and remove the mapping between the server and volume on the source SC Series array. At this point, the server is only mapped (2) to the volume (3) on the destination SC array, as shown in Figure 4. The original volume on the source SC Series array can now be deleted by the administrator.

![Figure 4](image4.png)  Configuration of environment after to Live Migrate
2 Requirements for Live Migrate

Live Migrate has the following requirements:

- Dell Storage Manager 2016 R2
- SCOS version 7.1
- No additional licensing is required, Live Migrate is included in the base licensing package
- Live Migrate is available on all SC Series platforms compatible with SCOS 7.1, excluding the SCv Series
- Replication must be configured between the primary and secondary SC Series arrays, including replication QoS node definitions on the primary SC Series array; these can be configured during Live Migrate configuration
- The server must be defined on both the primary and secondary SC Series arrays

Live Migrate has the following limitations:

- Live Migration is not available on SCv Series arrays
- A volume cannot be configured for Live Migrate if it is already configured for replication or Live Volume
- A volume configured for Live Migrate cannot be configured for replication or Live Volume until the Live Migrate is completed
- Live Migration is not supported with the VMware® vSphere® Virtual Volumes feature
Best practices for Live Migrate

Live Migrate is a simple-to-use feature of Dell Storage Manager that makes it easier to efficiently use and manage storage. However, it is important to understand what is occurring in the background, as discussed in section 1.1, “Live Migrate states”. Use the following best practices to help ensure smooth and efficient movement of data.

**Volume selection:** While Live Migrate does make it easier to move a data workload from one SC Series array to another, this does not mean that workloads should be moved without consideration. After all, it still takes time and resources to move the data. Therefore planning and attention should be exercised when selecting which workload to migrate. When choosing between several volumes to migrate, select the volume with the least amount of storage in Tier 1, RAID 5. This is because when Live Migrate replicates a volume, it leverages Live Volume asynchronous replication to perform the data movement, which by default replicates the data to the lowest tier available on the destination array. Depending on its configuration, the read performance of the array could be lower as reads would come from Tier 3. Writes on the destination SC Series array will go to Tier 1, RAID 10 as normal.

**Monitoring performance:** Because Live Migrate is not a part of the typical day-to-day I/O activity, it is important to monitor the impact this additional workload has on the environment and ensure it does not impact application performance. If either SC Series array becomes overburdened, corrective action should be taken. In most circumstances, adjusting the source replication QoS node to a lower percentage is sufficient corrective action, although at a cost of taking longer. In some circumstances, it may be necessary to perform Live Migrate during a period of lower I/O.

**Time of day:** Live Migrate is nondisruptive with regards to interruption of I/O or connectivity. However, the data replication, particularly the replication of current writes, places an additional load on both arrays and the switch fabric. Choosing to perform Live Migrate at a time of lower workload (for example, outside of normal business hours) will lower the impact this additional workload may have on other applications. It is also important to take into account other concurrent replications and replication QoS node settings.

**Transport type:** Replication between SC Series arrays can occur over any transport type they have in common. Local replication can therefore utilize iSCSI, FC, and FCoE protocols to transport the data. This is unlike remote replication which typically will only have iSCSI. It is recommended that administrators explicitly select a transport type, and not select All Available Transports. This ensures that replication will occur over a known route, and greatly eases troubleshooting should issues occur.

**Replication performance:** Regardless of the selected transport type, steps should be taken to ensure that sufficient bandwidth is available on the switch fabric, Ethernet or Fiber Channel, and that Dell and industry
best practices have been followed in creating the switch fabric. If utilizing iSCSI for replication, ensure that both arrays are configured with the same packet frame size and that the switching fabric meets or exceeds this.

**Replication QoS:** Replication QoS enables administrators to limit the amount of bandwidth consumed at a particular time of day or day of the week. All replications that are occurring at a particular point in time, that are configured to use a particular source replication QoS node, must share the limitations of that QoS, regardless of destination array. This can result in a Live Migrate taking longer than necessary, if, for example the QoS node used was designed to protect remote replication network links from bandwidth saturation. Create a separate source replication QoS node for use with Live Migrate, and other local migration needs, to avoid this issue.

**Automatically Swap Roles After In Sync:** It is recommended that this checkbox be left in its default checked state. This enables Live Migrate to present the volume on the destination array as the target volume, and take the volume on the source array offline. The benefit of this is that writes are only committed to the volume on the destination, and not replicated back to the original source volume. See section 1.1 for additional details.

**Deduplication:** It is not recommended to enable replication deduplication. This feature is beneficial when replicating volumes over lower bandwidth WAN links by reducing the amount of data to be transmitted, at a cost of increased load on the SC Series controller processor. Local replication, as is the case with Live Migrate, is not bandwidth bound.

**Data protection, disaster recovery:** While Live Migrate is nondisruptive from an I/O and application perspective, it can potentially affect backup/recovery and HA/DR procedures. It may be necessary to update those procedures to reflect the relocation of the volume to a different SC Series array.
A Additional resources

A.1 Technical support and resources

Dell.com/support is focused on meeting customer needs with proven services and support.

Dell TechCenter is an online technical community where IT professionals have access to numerous resources for Dell software, hardware and services.

Storage Solutions Technical Documents on Dell TechCenter provide expertise that helps to ensure customer success on Dell Storage platforms.

The Dell SC Series Portal is an online portal for existing customers. A valid portal account is required to access the Knowledge Center. Once logged in to the portal, go to “Knowledge Center”.