Creating SANLess Microsoft SQL Server Failover Cluster Instances with SIOS DataKeeper Cluster Edition and Fusion-io

Learn how deploying both DataKeeper Cluster Edition and Fusion-io can increase the availability and performance of Microsoft SQL Server using traditional clustered instances without the need for expensive shared storage.

By Allan Hirt, SQLHA LLC
The Current Storage State of SQL Server Failover Cluster Instances

Making SQL Server deployments resilient to failures is a goal most want to achieve. Whether you are trying to account for high availability and/or disaster recovery, there are various methods to achieve the end goal. One of the most popular approaches is to cluster the instance of SQL Server (also known as an FCI, or failover cluster instance) which is built on top of a Windows Server failover cluster (WSFC). An FCI is a feature built into SQL Server that is configured at the time SQL Server is installed.

One of the challenges of deploying a traditional FCI architecture is that it requires some sort of shared storage for data files as well as backups. The only things that are local to the servers, known as nodes, are the SQL Server binary files. This means that the shared disk or disks presented to the nodes that are used for an FCI are usually on some sort of storage area network (SAN) device. While the cost of SANs has come down considerably over the past few years compared to where they were over 10 years ago, a SAN still requires a significant investment by a company in all areas – one of the most challenging being its day-to-day upkeep. Furthermore, a SAN in production is usually a shared resource, so there is a chance that the database may not get the performance it needs if the SAN is not configured properly. The architecture is similar to the one in Figure 1.

As seen in Figure 1, there are two nodes and a single FCI. The way a WSFC works is that the role, sometimes known as a resource group, containing all of the resources related to that FCI, will be owned by a specific node. That is why there is a solid line going from Node 1, which currently owns SQLIns A, and a dashed line from Node 2, which will only host those resources after a failover. This is called shared-nothing cluster in the Microsoft world.

Figure 1. Traditional two-node WSFC with one FCI.
While SQL Server 2012 and soon, SQL Server 2014, do change the game a little bit when it comes to shared storage, the reality is that some form of non-local storage to each WSFC node is required.

SQL Server 2012 introduced two features to make FCI deployment easier: the ability to use Server Message Block (SMB) 3.0 shares – effectively network-based storage – for data, log, and backup files as well as the capability to have tempdb created on the local node. SQL Server 2014 takes this a step further and introduces support for Cluster Shared Volumes (CSVs), which have historically only been used with Hyper-V virtual machines.

For those who do not want or need the potential complexity of deploying a SAN, cannot afford a shared storage-based solution, or need more I/O horsepower than a traditional SAN-based solution, there have not really been any options to get the availability benefit of an FCI.

**DataKeeper, Fusion-io, and No Shared Storage WSFCs**

DataKeeper replicates disks by sending block-level I/O to the other server over a network. This is a similar mechanism to the one hardware-based storage units utilize when mirroring storage between units. The solution is easy to deploy and administer – just install DataKeeper on each node and configure the replication for the disk volumes. Disks must first complete their initial synchronization before they can be used in the WSFC.

Fusion-io solutions are an increasingly popular option for many SQL Server deployments to increase I/O throughput for databases. Fusion-io products such as the ioDrive are installed locally in each server, or node, of the WSFC. A large Fusion ioDrive can be allocated into multiple logical volumes, each of which can be individually mirrored to another server via DataKeeper. DataKeeper does require a small amount of space for files known as bitmaps which keep track of the disk changes. The bitmap files add resiliency to the solution. Should a problem occur and the bitmap files are intact, the mirror may not need to be resynchronized. This can save a considerable amount of time and effort for large SQL Server databases.

Figure 2 shows the architecture of a DataKeeper WSFC with Fusion ioDrives. In addition to the traditional networks required for the WSFC, it is recommended that you configure a dedicated network for the DataKeeper replication traffic for isolation and performance. A dedicated network is optional.

![Figure 2. WSFC architecture utilizing DataKeeper and Fusion-io for storage](image-url)
Figure 3 shows a DataKeeper volume in the Available Storage pool in a WSFC after its configuration.

![DataKeeper volume in a WSFC](image)

**Figure 3.** DataKeeper volume in a WSFC

One difference in using DataKeeper versus a traditional SAN is evident in a WSFC deployment. If a Fusion ioDrive is divided into multiple logical drives, DataKeeper has the ability to only mirror a single logical partition. For example, if a Fusion ioDrive was partitioned into drives M, S, and T, if you only want to mirror Drive S and present it to the WSFC, that is possible. Figure 4 shows the Fusion-io configuration which spawned the volume in Figure 3. This means that you can create a multiple instance failover cluster configuration with as many or as few Fusion ioDrives as you need.

![Fusion-io disk configuration in Windows](image)

**Figure 4.** Fusion-io disk configuration in Windows

If you are using a traditional SAN solution, the entire volume (or LUN) is presented to the WSFC. That means that if more than one logical drive was carved out on the volume, only a single FCI could use it. An example of how this looks to the WSFC is shown in Figure 5.

![Multiple logical disks on one volume](image)

**Figure 5.** Multiple logical disks on one volume
The best part about this solution is that there is virtually nothing you have to learn. This will not take months for any administrator to get up to speed; if you currently deploy and understand WSFCs and FCIs, this is nearly plug-and-play.

**Deploy Your Way**

SIOS and Fusion-io have teamed up to make deployment even easier. Whether you prefer Dell, HP, or SuperMicro for hardware, you can purchase a pre-configured SANLess Server Appliance which has two servers, the Fusion ioDrives, and DataKeeper Cluster Edition. The Windows Server license is included with the appliance’s price, but you would need to purchase the SQL Server licensing as well as any required support for Windows and SQL Server from Microsoft.


Buying an appliance is not the only way to configure this solution. If you want to fit your cluster nodes with Fusion ioDrives and configure DataKeeper, you can do that as well.

**SQL Server FCIs and DataKeeper**

Because DataKeeper presents the storage to the WSFC as if it were a traditional shared drive on a SAN, there is nothing special anyone installing a SQL Server FCI would need to do. As seen in Figure 6, the DataKeeper volume from Figure 3 is available for selection during SQL Server Setup in the same way a traditional disk would appear.

![Figure 6. Disk selection screen during the FCI installation](image)

DataKeeper is also SQL Server version as well as application and hardware agnostic. As long as DataKeeper is supported by your version of Windows, and the application is supported by Microsoft SQL Server, DataKeeper just works whether you need to implement an older version of SQL Server or the latest and greatest.
Conclusion

DataKeeper Cluster Edition is an already proven solution for WSFCs which has now been extended to utilize Fusion ioDrives to give SQL Server databases and the instances they are housed in not only the performance they need, but also provide businesses with the availability they require. The DataKeeper/Fusion-io solution delivers on the tenets of mission critical, and when deploying the SANLess Server Appliance, getting up and running could not be easier. If your company wants the protection of a WSFC and FCI without the complexity of having to deal with traditional shared storage, contact SIOS today.