

Intel® Modular Server Storage

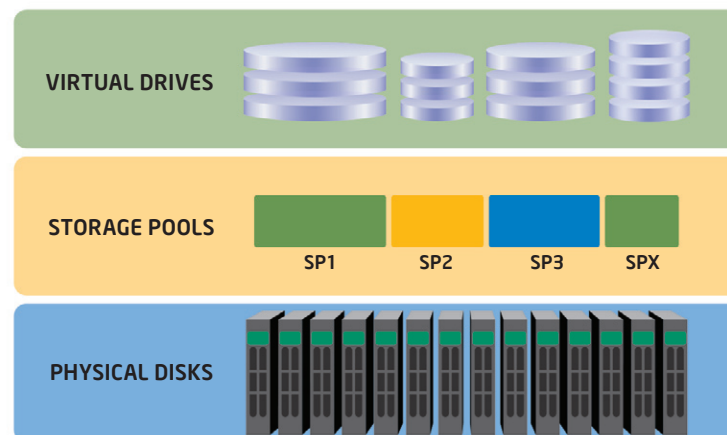
Best Practice & Recommendations

This guide will try to tackle some of the important considerations in SAN configuration and application deployment on the Intel® Modular Server. Each application environment can vary widely and therefore this guide should only be used as a reference rather than a manual. You may need to customize certain recommendations to fit your specific environment. This guide assumes you have a working knowledge of the Intel Modular Server.

The Intel Modular Server has a SAN integrated into the system. Instead of working directly with physical disks, you will be creating virtual drives (LUNs) and assigning them to server slots in the system. With this in mind you must change the approach normally taken with storage configuration. For example, when configuring a rack server with a RAID controller and 3 disks, your choice is relatively straight forward - create a RAID 5 array from the 3 disks.

With the Modular Server, you have significantly more flexibility as you will be building storage pools from the physical disks, and any of the (up to) six compute modules in the system can access those storage pools. The relationship between storage pools and compute modules in the system is "many to many," which means a storage pool can be accessed by any of the six compute modules simultaneously and that any of the six compute modules can access multiple storage pools simultaneously. The storage pool should be considered synonymous with a traditional RAID array.

The Intel Modular Server has an additional layer above the storage pool referred to as the virtual drive. The virtual drive is synonymous with a LUN - found in SAN storage systems. The virtual drive is carved out of the storage pool and assigned to the individual compute modules. When a virtual drive is assigned to a compute module, the compute module sees this as a local SAS disk as if it were directly attached, just like a common hard disk.



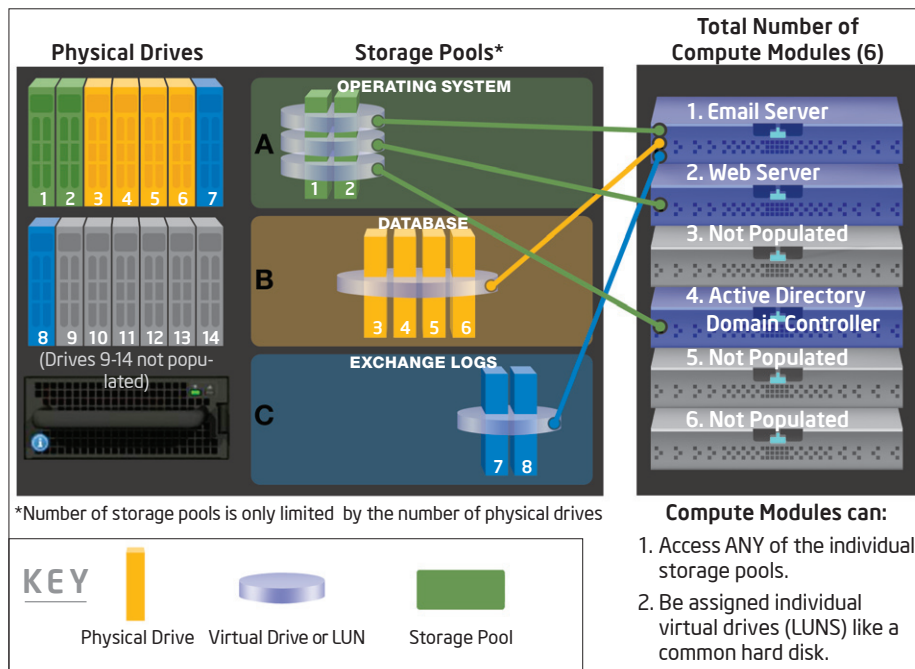
The question asked most frequently is, "How do I configure my storage pools?" Should you take all available hard drives and put them into 1 big storage pool and then carve out the virtual drives that you need? The answer is probably no.

If you have two or more compute modules in the system the best practice is to segregate storage pools by common workloads. For example, you might want to set up an Email Server, Web Server and Active Directory Domain Controller in the system on 3 compute modules, and we will assume you have 8 disks installed. In this example we can identify 3 different I/O workloads:

1. **Operating Systems - large blocks, random & sequential**
2. **Exchange Database - small blocks, random**
3. **Exchange Logs - small blocks, sequential**

Therefore, to optimize this environment you would create 3 storage pools containing virtual drives to host the above applications:

1. **Storage Pool 1 = 2 disks, 3 virtual drives, RAID 1**
2. **Storage Pool 2 = 4 disks, 1 virtual drive, RAID 5 or 6**
3. **Storage Pool 3 = 2 disks, 1 virtual drive, RAID 1**



What we have done above is physically separate the Database, Log files and Operating System workloads and therefore one will not interfere with the other. If you were to create a single storage pool and put your Operating System, Database and Log files in here, then the Operating System would likely slow down your Database and cause a performance bottleneck. Similarly, your Database may hold up your Log files and cause additional latencies.

Above you will have noticed that we put 3 Operating Systems onto the same physical disks. The important thing here is that the workloads are similar and therefore if you do have to group applications/operating systems together (since you won't have a limitless number of disks to segregate) it is best to do it where the workload is similar.

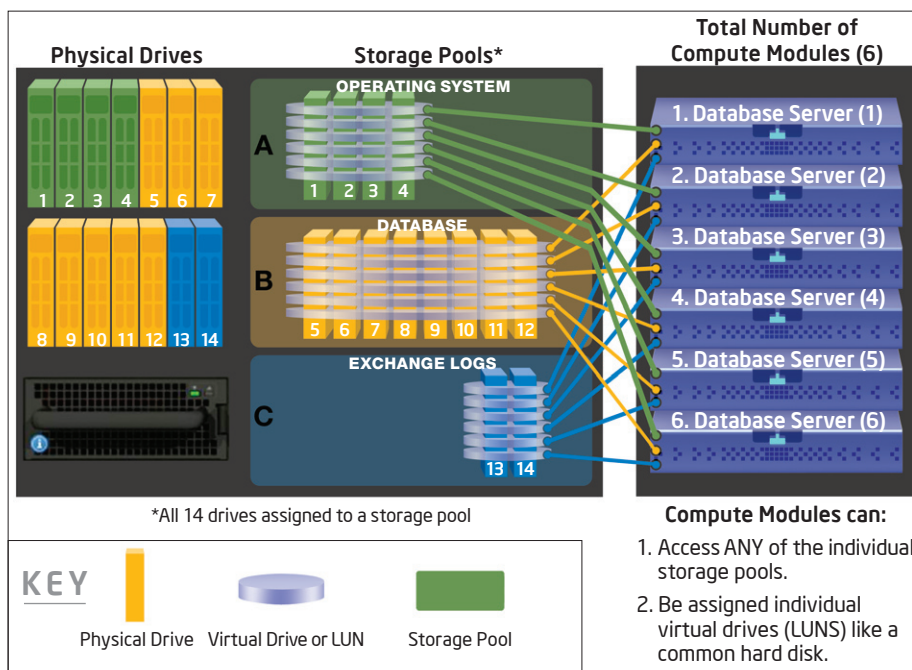
As an example, let us assume you have a Modular Server with 6 compute modules and you will be deploying a database server on each compute module. Although this is an unlikely deployment, it will serve the purpose for this example. We will assume 14 disks are installed in the system. In this case, the best configuration would be to create 3 storage pools, OS, Database and Logs. Inside each of these storage pools you will be carving out 6 virtual drives, since you will need an OS, Database and Log file for each of the 6 compute modules. Essentially you will take the above storage pool configuration but expand it:

1. Storage Pool 1 = 4 disks, 6 virtual drives, RAID 10

2. Storage Pool 2 = 2 disks, 6 virtual drives, RAID 1

3. Storage Pool 3 = 8 disks, 6 virtual drives, RAID 5 or 6

Total number of disk drive requirements will depend on a number of factors. Please consult with the Microsoft Exchange Optimization Guidelines <http://technet.microsoft.com/en-us/library/bb125079.aspx>



In this example we have increased the Operating System storage pool to 4 disks, which should provide adequate I/O and capacity. We have also increased the disks in the storage pool hosting the exchange database, to provide increased IOPS.

Another common deployment on the Intel Modular Server is virtualization. With the advent of many virtual machines running on a single server, the above recommendations do not change. You will still create storage pools based on common read/write profiles and carve out virtual drives which are assigned to the host server and are presented to the virtual machines. The only consideration is that you will have additional application servers (virtual machines) accessing storage pools and you should scale your number of physical drives accordingly. This may result in a requirement to add external storage onto the Intel Modular Server via either SAS or iSCSI expansion.

Using the above scenarios, you should now better understand how to configure your storage pools and virtual drives. Although your applications, number of compute modules and disks may be different from the above examples, you can apply this logic to almost any application environment.

For more information on the Intel® Modular Server, visit:

www.intel.com/go/mft <<http://www.intel.com/go/mft>>

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