

# Virtual SAN Hardware Quick Reference Guide

The purpose of this document is to provide sample server configurations as directional guidelines for use with VMware® Virtual SAN™. Use these guidelines as your first step toward determining the configuration for Virtual SAN.

## How to use this document

1. Determine your workload profile requirement for your use case
2. Refer to Ready Node profiles to determine the approximate configuration that meets your needs
3. Use VSAN Hardware Compatibility Guide to pick a Ready Node aligned with the selected profile from the OEM server vendor of choice

## Virtual SAN 6.0 All Flash Hardware Guidance

	READY NODE PROFILES		
	AF-8 SERIES	AF-6 SERIES	AF-4 SERIES
<b>Number of VMs per Node*</b>	Up to 120	Up to 60	Up to 30
<b>IOPs per Node</b>	Up to 80K	Up to 50K	Up to 25K
<b>Raw Storage Capacity per Node</b>	12 TB	8 TB	4 TB
<b>CPU**</b>	2x12 core	2x12 core	2 * 10 core
<b>Memory</b>	384 GB	256 GB	128 GB
<b>Capacity Tier Flash</b>	12x1 TB SSD Endurance Class A or above Performance Class C or above	8x1 TB SSD Endurance Class A or above Performance Class C or above	4x1 TB SSD Endurance Class A or above Performance Class C or above
<b>Caching Tier Flash</b>	2x400 GB SSD Endurance Class D or above Performance Class F or above	2x200 GB SSD Endurance Class C or above Performance Class D or above	1 * 200 GB SSD Endurance Class C or above Performance Class C or above
<b>IO Controller***</b>	Queue Depth >= 512	Queue Depth >=512	Queue Depth >=256
<b>NIC</b>	10 GbE	10 GbE	10GbE

\* VM density can vary based on use case

\*\* Assumes latest generation CPU architecture

\*\*\* Pass through mode recommended; additional controller may be required depending on maximum number of drives supported by the controller

## Virtual SAN 6.0 Hybrid Hardware Guidance

READY NODE PROFILES				
	HY-8 SERIES	HY-6 SERIES	HY-4 SERIES	HY-2 SERIES
Number of VMs per Node*	Up to 100	Up to 50	Up to 30	Up to 20
IOPs per Node	Up to 40K	Up to 20K	Up to 10K	Up to 4K
Raw Storage Capacity per Node	12 TB	8 TB	4 TB	2 TB
CPU**	2x12 core	2x10 core	2x8 core	1x6 core
Memory	384 GB	256 GB	128 GB	32 GB
Capacity Tier HDD	12x1 TB SAS 10K RPM	8x1 TB NL-SAS 7.2K RPM	4x1 TB NL-SAS 7.2K RPM	2x1 TB NL-SAS 7.2K RPM
Caching Tier Flash	2x400 GB SSD Endurance Class >=D Performance Class >=E	2x200 GB SSD Endurance Class >=C Performance Class >=D	1x200 GB SSD Endurance Class >=C Performance Class >=D	1x200 GB SSD or Endurance Class >=B Performance Class >=B
IO Controller***	Queue Depth >= 512	Queue Depth >=256	Queue Depth >=256	Queue Depth >=256
NIC	10 GbE	10 GbE	10 GbE	1 GbE

\* VM density can vary based on use case

\*\* Assumes latest generation CPU architecture

\*\*\* Pass through mode recommended; additional controller may be required depending on maximum number of drives supported by the controller

## Sizing Assumptions Used For Virtual San Node Profiles

Average VM Instance Size	<ul style="list-style-type: none"> <li>• 2 vCPU; 6GB vRAM;</li> <li>• 2x60GB vmdk</li> </ul>
IOPS Mix Assumption	<ul style="list-style-type: none"> <li>• 70% Read, 30% Write 4K Block Size (Server- All)</li> <li>• 30% Read, 70% Write (VDI - 8-Series)</li> </ul>
Memory & Storage Utilization	<ul style="list-style-type: none"> <li>• Memory Utilization : 70%</li> <li>• Storage Utilization: 70%</li> </ul>
Disk Group Caching Tier to Capacity Tier Ratio	<ul style="list-style-type: none"> <li>• Disk Group Ratio: 1 SSD, 1 to 7 HDDs</li> <li>• &gt;=10% anticipated used capacity</li> </ul>
ESXi Boot	<ul style="list-style-type: none"> <li>• &gt;=4GB USB/SD Card or</li> <li>• 1 Dedicated HDD or</li> <li>• &gt;=16GB SATADOM with endurance of 512-1024 TBW sequential</li> </ul>
Network	<ul style="list-style-type: none"> <li>• Minimum two server side network adapter uplinks</li> <li>• (Dual port NIC) recommended for redundancy</li> </ul>
SAS Expanders	<ul style="list-style-type: none"> <li>• SAS Expanders are supported only on a per platform basis. Check Ready Node listings for support. In absence of SAS expander support for a Ready Node, only 8 drives supported per controller. Add an extra controller if &gt;8 drives are required.</li> </ul>

## Design Considerations Used For Virtual SAN Node Profiles

<b>Controller Queue Depth</b>	Controller queue depth impacts the rebuild/resync times. A low controller queue depth may impact the availability of your production VMs during rebuild/resync. A minimum queue depth of 256 is required in Virtual SAN. Some profiles require minimum queue depth of 512 as noted above.
<b>Number of disk groups</b>	The number of disk groups impacts fault isolation as well as rebuild/resync times. <ul style="list-style-type: none"> <li>• Fault isolation: Configuring more than 1 disk group allows better tolerance against SSD failures since data is spread across more disk groups.</li> <li>• Rebuild/resync times: Configuring more than 1 disk group allows faster rebuilds/resyncs.</li> </ul>
<b>Number of capacity drives (HDDs in Hybrid config / SSD in All Flash Configs) in a disk group</b>	The number of capacity tier drives in a disk group has an impact of the performance of Virtual SAN. While a single capacity tier drive is the minimum requirement for a disk group, for better performance when there are more VMs, and better handling of rebuild/resync activities, we recommend configuring more than 1 capacity tier drive per caching tier SSD per our guidance above.
<b>Class of SSDs</b>	The class of SSD you choose has a direct impact on the performance of your overall system.
<b>Balanced vs Unbalanced cluster</b>	An unbalanced cluster can impact Virtual SAN performance as well as the rebuild/resync times. A balanced cluster delivers more predictable performance even during hardware failures. In addition, performance impact during resync/rebuild is minimal when the cluster is balanced.
<b>1G vs 10G Ethernet</b>	The choice of 1G vs 10G Ethernet has an impact of the Virtual SAN performance. Both 1G and 10G networks are supported. For larger, higher performing workloads, 10G interconnect is recommended.
<b>De-duplication, Compression and Erasure Coding Considerations</b>	The sizing does not account for De-duplication, Compression and Erasure Coding. Please visit Virtual <a href="#">SAN Sizing Calculator</a> . If you want to size with storage efficiency turned on and then pick the right Ready Node profile.

## Performance Classes for SSDs

SSD PERFORMANCE CLASS	WRITES PER SECOND
B	5,000 - 10,000
C	10,000 - 20,000
D	20,000 - 30,000
E	30,000 - 100,000
F	100,000+

## Endurance Classes for SSDs

SSD ENDURANCE CLASS	SSD TIER	TB WRITES IN 5 YEARS
A	VSAN All Flash - Capacity	365
B	VSAN Hybrid - Caching	1825
C	VSAN All Flash - Caching for Medium workloads	3650
D	VSAN All Flash - Caching for High workloads	7300

OLD PROFILE NAME	NEW PROFILE NAME
<b>Hybrid Profiles</b>	
Hybrid-Server-Low	HY-2 Series
New Hybrid Profile	HY-4 Series
Hybrid-Server-Medium	HY-6 Series
Hybrid-Server-High	HY-8 Series
Hybrid-VDI-Linked Clones	HY-8 Series
Hybrid-VDI-Full Clones	HY-8 Series
<b>All Flash Profiles</b>	
All Flash-Server-Medium	AF-6 Series
All Flash-Server-High	AF-8 Series
All Flash-VDI-Linked Clones	AF-8 Series
All Flash-VDI-Full Clones	AF-8 Series

## Additional Resources

For more detail on Virtual SAN Design guidance, see

1. [Virtual SAN Ready Node Configurator](#)
2. [Virtual SAN Hardware Guidance](#)
3. [Virtual SAN Design and Sizing Guide](#)
4. [Virtual SAN Sizing Calculator](#)
5. [VSAN Assessment Tool](#)

