

Synology NAS for VMware White Paper

Based on DSM 6.0

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Introduction

This article will give you some technical tips on how to use your Synology NAS as an iSCSI storage for a VMware environment, and will cover the following topics:

- Sizing recommendations
- Multi-path I/O connectivity
- Managing performance

Sizing Recommendations

The first two questions to ask when selecting a Synology NAS as a VMware storage are probably "How do I select a model of Synology NAS?" and "How many HDDs and SSDs do I need?"

In deploying a VMware environment, it is crucial to know whether a storage system can meet workload requirements. The number of IOPS (Input/Output Operations Per Second) usually serves as a starting point measure for this purpose. In this section, we will provide resources for estimating the IOPS of a production environment as well as information on random IOPS of Synology NAS servers.

Estimating Workload

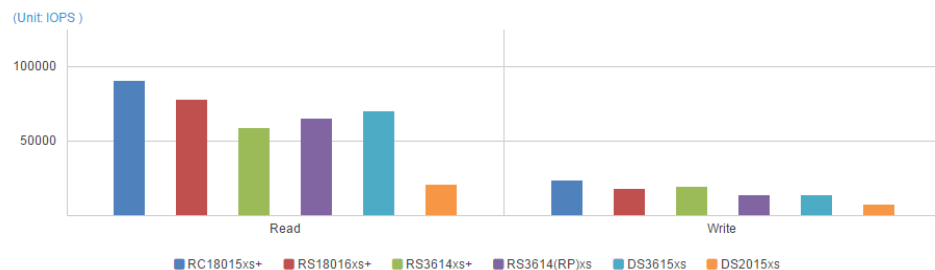
To estimate the workload of your production environment, you can visit the Official Synology Blog for useful techniques on [How to measure IOPS for VMware](#) and [How to measure IOPS for Windows](#). There are also third-party tools, such as VeeamONE or others (available by searching "VMware server monitoring"), which provide a user-friendly GUI for IT administrators to obtain performance data as well as capacity and health information of their virtualized environments.

Measuring Storage Performance

Workloads of virtualized environments mostly involve random IOPS. The number of random IOPS is usually an indicator of storage performance, which can help decide on a storage system that best meets workload demands. Information on maximum random IOPS of Synology NAS models is available on Synology's Product Performance Page, here partially duplicated below for quick reference.

4 X 10GbE / 2 X 10GbE Environment - iSCSI Random IOPS (4KB)

Model	RC18015xs+	RS18016xs+	RS3614xs+	RS3614(RP)xs	DS3615xs	DS2015xs
Read	89292.61	76887.00	57485.06	64367.32	69361.46	19462.58
Write	22736.99	16864.89	18080.75	12410.54	12758.83	6455.10



The figure above illustrates the maximum random read/write IOPS of Synology XS/XS+ Series models fully loaded with SSDs in a 10GbE environment. Actual performance might be slower with hard disk drives installed, with roughly 75 read random IOPS per SATA disk and 150 read random IOPS per SAS drive. Write performance will be 75% slower than read performance if RAID 5 is used.

Overall performance can be calculated by multiplying the IOPS per disk by the number of disks installed. Enabling SSD cache is strongly recommended, as it usually delivers a three times performance gain or more, depending on the workload type. For example, 10 SATA drives together with two SSDs for cache will provide approximately 2,250 random read IOPS ($75 * 10 * 3 = 2250$). For more information about SSD cache, please read [Using Synology SSD Technology to Enhance System Performance](#) .

Please note that the numbers above are just a rough estimate. A rule of thumb recommends reserving 20% or more as a buffer to allow subsequent adjustments based on the performance of the environment. The generally accepted industry-standard for datastore latency is 20 ms or less. In case of high latencies on an individual VMware datastore, consider expanding the size of SSD cache or using dedicated volumes consisting entirely of SSDs for these iSCSI LUNs to store VMs.

Connecting a VMware Host to Synology iSCSI

To ensure the network quality of an iSCSI storage, including its reliability and performance, we recommend dedicating two or more physical network interfaces to the iSCSI traffic between your VMware host and Synology NAS, especially when 1GbE network ports are used. We also recommend using iSCSI Software HBAs (Host Bus Adapters), since our compatibility tests were conducted with iSCSI Software HBAs.

When there are multiple network ports, it is required to configure iSCSI MPIO (Multipath I/O) to achieve load balance and high availability for the iSCSI storage network. Note that there should be one IP address per network interface and that link aggregation should not be configured. There are two methods to configure iSCSI MPIO: via port binding or in separate domains.

Method 1: Port Binding

This is the simplest way to configure MPIO, with the following prerequisites:

- An iSCSI Software HBA is used.
- All VMkernel ports used for iSCSI and for Synology NAS ports are in the same local network and in the same IP subnet.
- All VMkernel ports are in the same vSwitch.

You can refer to this tutorial to do it.

- [How to Use Port Binding to Configure Multipathing on VMware for Synology NAS](#)

For more detailed information on port binding, consult the resources below.

- [Considerations for using software iSCSI port binding in ESX/ESXi](#)
- [Configuring iSCSI port binding with multiple NICs in one vSwitch for VMware ESXi 5.x and 6.0.x](#)
- [Multipathing Configuration for Software iSCSI Using Port Binding](#)

Method 2: Separate Domains

This method should be used in the following scenarios:

- Target iSCSI network ports are on different local networks and IP subnets.
- VMkernel ports used for iSCSI are on different vSwitches.

You can refer to this tutorial to do it.

- [How to Use iSCSI Targets on VMware ESXi Server with Multipath Support](#)

Two physical switches are recommended for the connectivity between the ESX host and the Synology Storage array to prevent single switch failure that can cause an outage to the virtual infrastructure. If Jumbo Frames are used, you must set the correct MTU size end-to-end, including the ESX server VMkernel ports for iSCSI traffic, any physical switch ports to which the VMkernel NICs are connected, and the Synology iSCSI interfaces.

After configuring MPIO, you can check the network utilization in Resource Monitor in Synology DSM or Performance of ESXi host in vSphere Client.

Managing Performance

In DSM 6.0, you can view the performance of each iSCSI LUN in Resource Monitor, including throughput, IOPS, and latency. Below is an example of what you will see when viewing the performance of an iSCSI LUN.



Generally speaking, the bottleneck of iSCSI storage is bound by disk I/O when hard disk drives are installed, as disk latency is usually higher than network latency. If the return value of network latency is too high, something is probably wrong with the network, and you can check the network environment (such as network cables and Ethernet switches) to identify the problem. As for random IOPS workloads, a rule of thumb says the average latency should be less than 20ms when no backup task is in progress. If your latency has been higher than 20ms for a long time, consider improving performance by adding disks or SSD cache for the iSCSI LUN.

In addition, you can view the pattern of your workload, including the block size and queue depth. This helps you get an insight into the workload of your virtualized environment.

Summary

In this article, you have acquired an overview of evaluating the workload of your virtualized environment and planning the performance required for Synology NAS. You have also learned how to configure of iSCSI Multipath I/O to make sure the bandwidth of all interfaces on your Synology NAS can be used at the same time.