



Test methodology

FlexPod

NetApp
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Table of Contents

- Test methodology 1
- Test plan 1
- Test environment 1

Test methodology

Test plan

The GenerationIO tool (GenIO) is used by Epic to validate that storage is production ready. This test focuses on performance by pushing storage to its limits and determining the headroom on storage controllers by ramping up until requirements fail.

The tests performed here are focused on determining headroom as well as using Adaptive Quality of Service (AQOS) to protect critical Epic workloads. For AFF A300 testing, two servers are used with GenIO loaded on both to drive I/O on the storage controllers. Three servers are used with GenIO loaded on all three to drive I/O on the AFF A700 storage controllers. Three servers are used because of server performance limits, and three servers are required for an AFF A700.

Test environment

Hardware and software

For this study, we configured three Red Hat Linux virtual machines (VMs) on VMware ESXi 6.5 running on Cisco UCS B200-M5s. We connected the ESXi hosts to the AFF storage controller nodes with Cisco MDS-series switches by using 16Gb FC on the server side and 16Gb FC on the storage side. The AFF A700 nodes were connected to one DS2446 disk shelf with 3.8TB SSDs by following NetApp cabling best practices.

The three tables below list the hardware and software components that we used for the Epic performance test configuration.

The following table lists Epic Test hardware and software components.

Hardware and software components	Details
Operating system for VM	RHEL 7.4 VMs
Operating system on server blades	VMware ESXi 6.5
Physical server	Cisco UCS B200 M5 x 3
Processors per server	Two 20-core Intel Xeon Gold 6148 2.4Ghz
Physical memory per server	768GB
FC network	16Gb FC with multipathing
FC HBA	FC vHBA on Cisco UCS VIC 1340
Dedicated public 1GbE ports for cluster management	Two Intel 1350GbE ports
16Gb FC switch	Cisco MDS 9148s
40GbE switch	Cisco Nexus 9332 switch

The following table lists NetApp AFF A700 and AFF A300 storage system hardware and software.

Hardware and software components	AFF A700 details	AFF A300 details
Storage system	AFF A700 controller configured as a high-availability (HA) active-active pair	AFF A300 controller configured as a high-availability (HA) active-active pair
ONTAP version	9.4	9.5
Total number of drives	36	24
Drive size	3.8TB	3.8TB
Drive type	SSD	SSD
FC target ports	Eight 16Gb ports (four per node)	Eight 16Gb ports (four per node)
Ethernet ports	Four 10Gb ports (two per node)	Four 10Gb ports (two per node)
Storage virtual machines (SVMs)	One SVM across both node aggregates	One SVM across both node aggregates
Ethernet logical interfaces (LIFs)	Four 1Gb management LIFs (two per node connected to separate private VLANs)	Four 1Gb management LIFs (two per node connected to separate private VLANs)
FC LIFs	Four 16Gb data LIFs	Four 16Gb data LIFs

The following table lists NetApp AFF A700 and AFF A300 storage system layout.

Storage layout	AFF A700 details	AFF A300 details
SVM	Single SVM for Epic application databases	Single SVM for Epic application databases
Aggregates	Two 20TB each	Two 30TB each
Volumes for production	Sixteen 342GB volumes per RHEL VM	Sixteen 512GB volumes per RHEL VM
LUNs for production	Sixteen 307GB LUNs, one per volume	Sixteen 460GB LUNs, one per volume
Volumes for journal	Two 95Gb volumes per RHEL VM	Two 240Gb volumes per RHEL VM
LUNs for journal	Two 75Gb LUNs, one per volume	Two 190Gb LUNs, one per volume

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