NexentaEdge 2.0 Configuration Guidelines

Nexenta Certification Team

March, 2017

www.nexenta.com

Table of Contents

Preface

Intended Audience

This document is intended for Nexenta partners and Nexenta customer-facing organizations. The latest version of this document is available through the Nexenta Partner Portal.

Comments

For comments and inquiries, send email to pm@nexenta.com. Refer to specific pages, sections, and paragraphs whenever possible.

Copyright, Trademarks, and Compliance

Document History

Date	Description
4/25/2017	Initial version for NexentaEdge 2.0

1 Overview

1.1 Introduction

NexentaEdge is a multi-service scale-out storage system for Object, Block and File storage services, that runs on industry standard x86 servers, scales from hundreds of terabytes to petabyte configurations, and includes advanced data management functionality such as cluster-wide inline deduplication and compression. It is ideally suited for next generation private cloud infrastructure, container-converged infrastructure and petabyte scale cold and active archives repositories.

This document is intended for Nexenta Partners and Nexenta customer-facing organizations looking to deploy NexentaEdge 2.0. The latest version of the NexentaEdge 2.0 Configuration Guidelines is posted on Partner Portal.

1.2 NexentaEdge Architecture

NexentaEdge is a truly distributed, scale-out architecture, consisting of four or more physical servers interconnected using a dedicated 10 Gigabit Ethernet (10 GbE) network for cluster communication. The connected servers form a cluster that maintains redundancy and resilience of data throughout the system using strong cryptographic checksums for data integrity, and replication or erasure coding technology to ensure hardware-level redundancy.

NexentaEdge clusters can be deployed as either all-flash, hybrid, or all-disk configurations. All-disk cluster configurations may only provide object services. All-flash and hybrid configurations can deliver block, file and object services.

A NexentaEdge cluster consists of the following components:

- Data nodes that provide Key/Value data store for deduplicated, compressed user data
- Networking infrastructure – NexentaEdge requires a minimum of 10 GbE and IPv6 capable networking
- Gateway services deployed as containers on the underlying hardware infrastructure. Gateway services connect the storage system to the front-end clients and applications through any of the supported access protocols: Block (iSCSI or Native Block Devices) or object (S3 and Swift)

Partners looking to offer NexentaEdge storage solutions have the flexibility to utilize a wide variety of industry-standard x86 server configurations as server platforms. The main requirement is for the hardware to be fully supported by the versions of the Linux Operating Systems that NexentaEdge 2.0 support, generally later versions of RedHat Linux, CentOS or Ubuntu. Please see the Release Notes for NexentaEdge 2.0 for additional details.

1.2.1 Data Nodes

Data nodes are utilized by NexentaEdge to store data and metadata. These servers are required to be directly connected to the back-end NexentaEdge Replicast storage network, but do not have to be connected to the front-end (client) network. NexentaEdge requires each Data node to have at least four drives (hard drives or solid state drives), but a node can have many more.

Note: For any NexentaEdge configurations that present Block or File storage to clients, the Data nodes must have at least one SSD that can be used for journaling, caching and metadata storage.
For object-only configurations the SSD is recommended for high performance environment, but not necessary for cold storage environment.

1.2.2 Gateway Services

The Gateway services are the connection point between the client applications and the NexentaEdge cluster. These services run the iSCSI block services, NFS services or object storage API gateways, and are responsible for translating to/from these standard access protocols and storing or retrieving the data from the Data nodes inside the cluster.

Gateway services are generally deployed as Docker containerized services on a subset of the physical servers in the cluster. The physical servers that run Gateway services are the only servers that need to be connected to both the front-end (client) network as well as the back-end NexentaEdge Replicast storage network. These servers may either be dedicated to running a particular set of Gateway services, or they can also act as Data nodes in the NexentaEdge cluster in what are called Mixed Mode or Container-Converged deployments.

1.2.3 Mixed Mode Configuration

NexentaEdge can function in so called, mixed-mode, where both Gateway and Data Node services run on the same physical hardware. In these configurations it is important that the system is adequately sized for both services
For a mixed-mode server 2x 10GbE network interfaces are needed for Replicast (Storage Backend) and at least 1x 10GbE network interface for public / client traffic, each server must therefor have at least 3 physical 10GbE interfaces.
In addition to the additional network requirement the memory requirements of these servers also increase and it should be considered to be that of a individually sized Gateway Node + that of a Data Node.

1.2.4 Network Equipment

NexentaEdge requires a dedicated network for storage communication within the cluster.
This network can be either physical or a dedicated untagged VLAN and it must fulfill these requirements:

- 10 Gigabit Ethernet
- IPv6 capable
- Multicast support
- The network must support Layer 2 traffic between all nodes
- Flow Control (Pause Frames) turned on for both Rx/Tx
- Jumbo Frame support

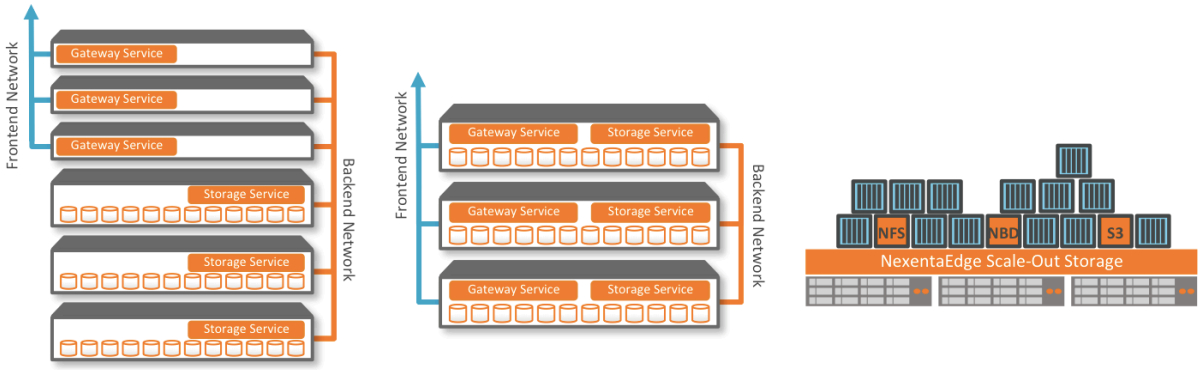
To ensure that the networking equipment is capable of supporting a high-performance, low-latency network, Nexenta provides a list of tested networking equipment in section 2.1.1.

1.3 Deployment Scenarios

NexentaEdge is a scale-out storage system that has been designed to scale from servers in a single rack to many racks of servers providing a redundant storage system. Best practices for production deployment is to distribute the NexentaEdge servers across multiple racks to ensure that there is redundancy and resilience to failures across components, servers, and racks.

NexentaEdge nodes can be deployed in three main deployment scenarios:

- Dedicated nodes where Gateway services and Storage services run on baremetal servers
- Mixed nodes allow the Gateway and Storage services to co-exist on a baremetal server with both public and private networks
- The Container Converged model allows deployment utilizing Docker container technologies to run both NexentaEdge services as well as Application containers directly on the same baremetal servers

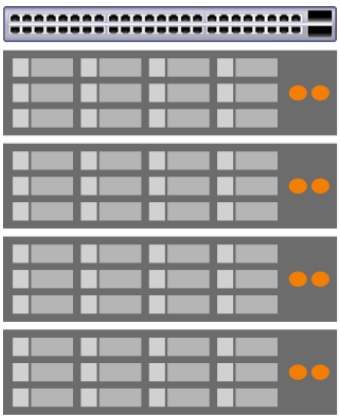


Dedicated Nodes | Mixed Nodes | Container-Converged

1.3.1 An example Proof of Concept Environment

At a minimum, a proof of concept environment must consist of at least four physical servers running NexentaEdge, and one 10 Gigabit Ethernet switch utilized for storage networking. At least one of the servers must be capable of running both Gateway and Data services in mixed-mode, or container converged as described in NexentaEdge Architecture section.

This type of configuration should be considered as the minimal building block for NexentaEdge, but any component can be scaled independently. The performance characteristic of the proof of concept environment is directly related to the number of hard drives and SSD's per server. To improve the performance the number of hard drives and SSD's should be increased to at least 10+2 per server before increasing the number of data nodes.



10 Gigabit Ethernet Switch

1x Combined Gateway and Data nodes

- 256 GB RAM
- Intel Xeon E5 v2/v3 CPU
- Dual 10 GbE
- 5 HDD + 1 SSD

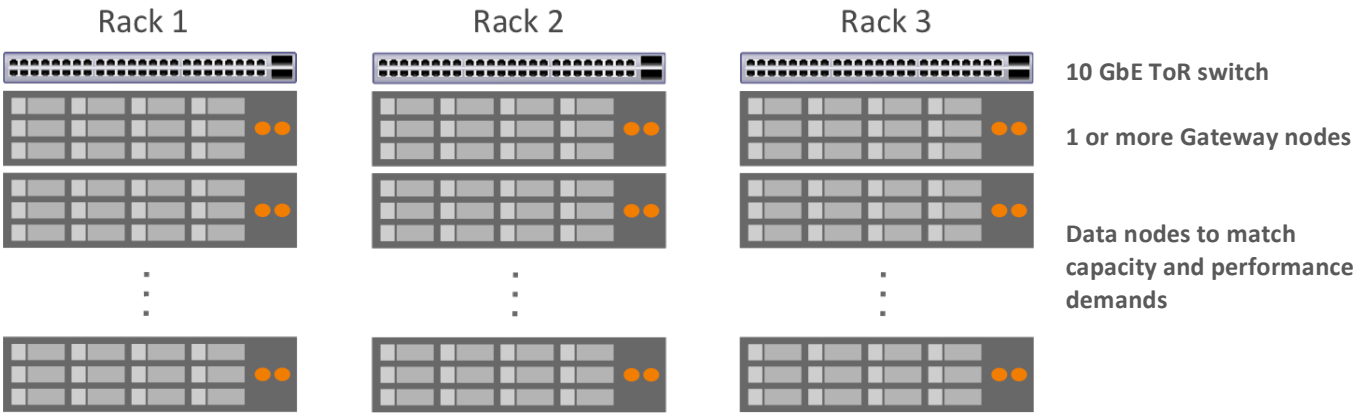
3x Data nodes

- 128 GB RAM
- Intel Xeon E5 v2/v3 CPU
- 1x 10 GbE
- 5 HDD + 1 SSD

1.3.2 An example multi-rack Production deployment

When NexentaEdge is deployed in production, it is recommended to distribute the servers across multiple failure domains, across multiple racks, to ensure that failure of any given component cannot affect availability of data or services. Properly configured, this type of configuration allow services to survive multiple component, server, rack, and network failures up until only a single copy of the data remains online.

To configure a fully redundant system, each server rack should contain as many Data node as required to store one copy of the data and at least one Gateway node, both connected to a 10 Gigabit Ethernet top of rack switch.
For large environments where a complete copy of the data cannot fit on the data nodes in a single rack additional configuration may be required, please contact your Nexenta Sales Engineer for further guidance.



1.4 NexentaEdge Solutions

1.4.1 Configuration Guidelines

A configuration from the NexentaEdge Configuration Guidelines comprises of specific servers and storage enclosure configurations from a specific server vendor. There is some flexibility in tailoring your components within reasonable limits to meet capacity and performance requirements. The configurations in this document are the minimum recommended configurations by Nexenta and designed to optimize capacity, performance and cost.

Nexenta and hardware technology partners (such as Cisco, Dell, HPE, Lenovo, Micron, Supermicro and others) collaborate to certify NexentaEdge software in each configuration. In some cases, hardware technology partners offer consolidated SKUs for these configurations to simplify ordering and support of NexentaEdge solutions.

Leveraging these tested configurations provide the fastest path to market for Nexenta Partners.

1.4.2 Recommended Hardware

NexentaEdge provides a large amount of flexibility for building the physical servers to meet specific needs.
As such, NexentaEdge can be deployed with a wide variety of memory, disk, and caching configurations, but care should be taken to balance the various components of the system for best performance and capacity.

The various configurations below include flexibility to choose different CPUs, memory, disk and solid-state device sizes and ratios based on the specific need.

Even with this built in flexibility of the NexentaEdge platform, note these general guidelines:

- If the Gateway and Data node services run on the same node
  - The CPU must be replaced with a more powerful version and the amount of RAM must be increased
  - Additional 10GbE network ports must be made available, at least 1x frontend (public network) and 2x backend (storage network)
- If the cluster is utilized for smaller random I/O (typical of block services) all data nodes must have at least one SSD device assigned for journaling and cache
- A rule of thumb for sizing SSDs
  - Maintain at least 5% of the data capacity for journaling and caches
  - Maintain a ratio of 1x SSD per every 5 HDD in the system
- For capacity-based Object storage solutions, using SSD devices is generally not necessary for acceleration
- SSDs should be intended for mixed-use or write-intensive workloads and rated for at least 3-10 DWPD. Smaller SSD’s must be capable of sustaining a higher number of daily overwrites to maintain the same performance over time.

2 Network Equipment

2.1 Network Requirements

NexentaEdge makes extensive use of modern networking technologies such as IPv6 and multicasting. As a result, the networking equipment must fulfill the requirements listed below for successful deployments.
As a general guideline, most name brand enterprise class 10GbE switches meet the requirements below, but care should be taken to configure the switch ports appropriately.

- Both switches and network interface cards must support 10 Gigabit Ethernet (10 GbE) or above
- The network infrastructure must support IPv6 and IPv6 multicasting
- All network switches assigned to the NexentaEdge storage network must be non-blocking enterprise class switches
- Each network port (switch and host) configured for NexentaEdge must have:
    - Jumbo frame support (Maximum Transfer Unit size larger than 9000)
    - Flow Control (Pause Frames) for both Receive and Transmit must be turned on

If the network switch supports advanced capabilities such as Multicast Listener Discovery (MLD) snooping, Data Center Bridging (DCB), Priority Flow Control (PFC) and Enhanced Transmission Selection (ETS), these capabilities can be leveraged by NexentaEdge to improve the networking performance and reliability. Please contact Nexenta Sales Engineering for additional information.

2.1.1 Network Switches tested with NexentaEdge

The following network switches have been tested and certified to work with NexentaEdge.
Most enterprise class non-blocking 10GbE switches should pass the criteria for supporting NexentaEdge and can be certified.

Vendor	Model
Arista	DCS-7124 DCS-7150
Cisco	Nexus 5548UP Nexus 5596T Nexus 5672UP Nexus 56128P
Dell Networking	S4810 S4048-ON with Pluribus ONVL
Mellanox	SX1024 SX1012 SX1410 SN2xxx
Pluribus Networking	Freedom E68-M
Supermicro	SSE-X24S

Note: It is not recommended to run NexentaEdge with low-end/low-cost networking equipment as low end equipment generally does not work well with IPv6 and multicasting, and does not guarantee non-blocking transfers.

3 Cisco Configurations

3.1 Cisco All-Flash Configurations

NexentaEdge All-Flash configurations deliver high IOPS and low latency for small random IO workloads that are typical of databases, enterprise applications and high performance private cloud (VMware, OpenStack and Container) environments.

3.1.1 Cisco C240 All-Flash

	NexentaEdge Cisco C240 All-Flash
Controller	1x Cisco C240 M4SX
CPU	E5-2690 v4 2.6GHz, 14 cores, 2 socket
DRAM	Minimum 256GB
Boot Drive	2x 480GB internal SSD
SAS HBA	Cisco 12Gbps SAS Modular Pass-through Controller
NIC	Minimum of 4x 10Gbe ports required for NexentaEdge Recommended: 2x Intel X520 10GbE Dual Port SFP+ or 2x Intel X540 10GbE Dual Port Base T
Max Capacity	Up to 38TB
Data Device #	24
Flash Device	Up to 1.6TB 2.5” SAS SSD

Note 1: BIOS version for Cisco C240 M4SX is C240M4.2.0.6a.0.051220151501 or later.
Note 2: SSD boot devices can be replaced by 2x 1TB 7.2k HDD 2.5” drives if desired.
Note 3: When deploying All-Flash configurations, ensure that the endurance of the SSDs used in the configuration is aligned with the expected write workload on the system. Best practice is to use SSDs rated between 3 DPWD to 10 DWPD.

3.2 Cisco Hybrid Configurations

NexentaEdge Hybrid configurations deliver great performance and capacity optimized solutions that are best suited for mixed read/write workloads with small random IO that are typical of private cloud (VMware, OpenStack and Hyper-V) storage backend, generic file services and high performance backup and archive use cases.

3.2.1 Cisco C240 / C3260 Hybrid

	NexentaEdge Cisco C240 Hybrid	NexentaEdge Cisco C3260 Hybrid
Controller	1x Cisco C240 M4SX	1x Cisco C3260 Single-Node
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket	
DRAM	Minimum 128GB	Minimum 256GB
Boot Drive	2x 1TB 7.2k HDD 2.5”	
SAS HBA	Cisco 12Gbps SAS Modular Pass-through Controller	
NIC	Minimum of 2x 10Gbe ports required for NexentaEdge Recommended: 1x Intel X520 10GbE Dual Port SFP+ or 1x Intel X540 10GbE Dual Port Base T	Minimum of 4x 10Gbe ports required for NexentaEdge Recommended: 1x 40 GbE QSFP port with a 4x10GbE splitter cable
Max Capacity	Up to 100 TB	Up to 500 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB	
Data Device #	10	50
Flash Device	2x 2.5” SAS SSD	10x 2.5” SAS SSD

Note 1: BIOS version for Cisco C240 M4SX is C240M4.2.0.6a.0.051220151501 or later.
Note 2: To ensure optimal long-term performance and reliability the flash devices must be rated at least 10 DWPD.
Note 3: Total flash capacity should be at a minimum 5% of the total data device capacity.

3.3 Cisco All-Disk Configurations

NexentaEdge All-Disk configurations provide capacity optimized solutions that are best suited for Object Storage workloads, from read-mostly to cold data storage with erasure coding.

All-Disk configurations of NexentaEdge do not support sharing data through Block interfaces such as iSCSI or Native Block Devices.

3.3.1 Cisco C240 / C3260 All-Disk

	NexentaEdge Cisco C240 All-Disk	NexentaEdge Cisco C3260 All-Disk
Controller	1x Cisco C240 M4SX	1x Cisco C3260 Single-Node
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket	
DRAM	Minimum 128GB	Minimum 256GB
Boot Drive	2x 1TB 7.2k HDD 2.5”	
SAS HBA	Cisco 12Gbps SAS Modular Pass-through Controller	
NIC	Minimum of 2x 10Gbe ports required for NexentaEdge Recommended: 1x Intel X520 10GbE Dual Port SFP+ or 1x Intel X540 10GbE Dual Port Base T	Minimum of 4x 10Gbe ports required for NexentaEdge Recommended: 1x 40 GbE QSFP port with a 4x10GbE splitter cable
Max Capacity	Up to 100 TB	Up to 600 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB	
Data Device #	10	60

Note 1: BIOS version for Cisco C240 M4SX is C240M4.2.0.6a.0.051220151501 or later.

4 Dell Reference Architectures

4.1 Dell All-Flash Configurations

NexentaEdge All-Flash configurations deliver high IOPS and low latency for small random IO workloads that are typical of databases, enterprise applications and high performance private cloud (VMware, OpenStack and Container) environments.

4.1.1 Dell R730 and R730xd All-Flash

	NexentaEdge Dell R730 All-Flash	NexentaEdge Dell R730xd All-Flash
Controller	1x Dell R730	1x Dell R730xd
CPU	E5-2690 v4 2.6GHz, 14 cores, 2 socket	
DRAM	Minimum 256GB	
Boot Drive	2x 480GB SSD	
SAS HBA	H730 (For boot and data drives, H730 data drives must be in pass through mode only)	
NIC	Minimum of 4x 10Gbe ports required for NexentaEdge Recommended: 2x Intel X520 10GbE SFP+ or 2x Intel X540 10GbE RJ45	
Max Capacity	Up to 53 TB	Up to 92TB
Data Device #	14	24
Flash Device	1.92TB SSD MU 12Gb 2.5” 3.84TB SSD MU 12Gb 2.5”	

Note 1: BIOS for R730xd and R730 systems with the v4 CPU is 2.0.2 or later.
Note 2: SSD boot devices can be replaced by 2x 1TB 7.2k HDD 2.5” drives if desired.
Note 3: When deploying All-Flash configurations, ensure that the endurance of the SSDs used in the configuration is aligned with the expected write workload on the system. Best practice is to use SSDs rated between 3 DPWD to 10 DWPD.

4.2 Dell Hybrid Configurations

NexentaEdge Hybrid configurations deliver great performance and capacity optimized solutions that are best suited for mixed read/write workloads with small random IO that are typical of private cloud (VMware, OpenStack and Hyper-V) storage backend, generic file services and high performance backup and archive use cases.

4.2.1 Dell R730xd Hybrid

	NexentaEdge Dell R730xd Hybrid
Controller	1x Dell R730xd
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket
DRAM	Minimum 128GB
Boot Drive	2x 1TB 7.2k HDD 2.5”
SAS HBA	H730 (For boot and data drives, H730 data drives must be in pass through mode only)
NIC	Minimum of 2x 10Gbe ports required for NexentaEdge Recommended: 1x Intel X520 10GbE SFP+ or 1x Intel X540 10GbE RJ45
Max Capacity	Up to 140 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB
Data Device #	14
Flash Device	2x 2.5” SAS SSD

Note 1: BIOS for R730xd and R730 systems with the v4 CPU is 2.0.2 or later.
Note 2: To ensure optimal long-term performance and reliability the flash devices must be rated at least 10 DWPD.
Note 3: Total flash capacity should be at a minimum 5% of the total data device capacity.

4.3 Dell All-Disk Configurations

NexentaEdge All-Disk configurations provide capacity optimized solutions that are best suited for Object Storage workloads, from read-mostly to cold data storage with erasure coding.

All-Disk configurations of NexentaEdge do not support sharing data through Block interfaces such as iSCSI or Native Block Devices.

4.3.1 Dell R730xd All-Disk

	NexentaEdge Dell R730xd All-Disk
Controller	1x Dell R730xd
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket
DRAM	Minimum 128GB
Boot Drive	2x 1TB 7.2k HDD 2.5”
SAS HBA	H730 (For boot and data drives, H730 data drives must be in pass through mode only)
NIC	Minimum of 2x 10Gbe ports required for NexentaEdge Recommended: 1x Intel X520 10GbE SFP+ or 1x Intel X540 10GbE RJ45
Max Capacity	Up to 160 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB
Data Device #	16

Note 1: BIOS for R730xd and R730 systems with the v4 CPU is 2.0.2 or later.

5 HPE Reference Architectures

5.1 HPE All-Flash Configurations

NexentaEdge All-Flash configurations deliver high IOPS and low latency for small random IO workloads that are typical of databases, enterprise applications and high performance private cloud (VMware, OpenStack and Container) environments.

5.1.1 HPE DL380 All-Flash

	NexentaEdge HPE DL380 All-Flash
Controller	1x HPE DL380 G9
CPU	E5-2690 v4 2.6GHz, 14 cores, 2 socket
DRAM	Minimum 256GB
Boot Drive	2x 480GB rear mounted SSD
SAS HBA	HPE Flexible Smart Array P440ar
NIC	Minimum of 4x 10Gbe ports required for NexentaEdge Recommended: 2x HPE 10GbE Dual Port 530SFP or 2x HPE 10GbE Dual Port 530T
Max Capacity	Up to 92TB
Data Device #	24
Flash Device	Up to 3.84TB 2.5” SAS SSD

Note 1: SSD boot devices can be replaced by 2x 1TB 7.2k HDD 2.5” drives if desired.
Note 2: When deploying All-Flash configurations, ensure that the endurance of the SSDs used in the configuration is aligned with the expected write workload on the system. Best practice is to use SSDs rated between 3 DPWD to 10 DWPD.

5.2 HPE Hybrid Configurations

NexentaEdge Hybrid configurations deliver great performance and capacity optimized solutions that are best suited for mixed read/write workloads with small random IO that are typical of private cloud (VMware, OpenStack and Hyper-V) storage backend, generic file services and high performance backup and archive use cases.

5.2.1 HPE DL380 Hybrid

	NexentaEdge HPE DL380 Hybrid
Controller	1x HPE DL380 G9
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket
DRAM	Minimum 128GB
Boot Drive	2x 1TB 7.2k HDD 2.5”
SAS HBA	HPE Flexible Smart Array P440ar
NIC	Minimum of 2x 10Gbe ports required for NexentaEdge Recommended: 1x HPE 10GbE Dual Port 530SFP or 1x HPE 10GbE Dual Port 530T
Max Capacity	Up to 130 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB
Data Device #	13
Flash Device	2x 2.5” SAS SSD

Note 1: To ensure optimal long-term performance and reliability the flash devices must be rated at least 10 DWPD.
Note 2: Total flash capacity should be at a minimum 5% of the total data device capacity.

5.2.2 HPE Apollo 4500 Hybrid

	NexentaEdge HPE Apollo 4530 Hybrid	NexentaEdge HPE Apollo 4510 Hybrid
Controller	1x HPE Apollo 4530	1x HPE Apollo 4510 Single-Node
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket (per node)	
DRAM	Minimum 128GB per node	Minimum 256GB
Boot Drive	2x 1TB 7.2k HDD 2.5”	
SAS HBA	Internal	
NIC	Minimum of 2x 10Gbe ports required for NexentaEdge per node Recommended: 1x Intel X520 10GbE Dual Port SFP+ or 1x Intel X540 10GbE Dual Port Base T	Minimum of 4x 10Gbe ports required for NexentaEdge Recommended: 2x Intel X520 10GbE Dual Port SFP+ or 2x Intel X540 10GbE Dual Port Base T
Max Capacity	Up to 130TB per node	Up to 600 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB	
Data Device #	13 per node	60
Flash Device	2x 2.5” SAS SSD	8x 2.5” SAS SSD

Note 1: To ensure optimal long-term performance and reliability the flash devices must be rated at least 10 DWPD.
Note 2: Total flash capacity should be at a minimum 5% of the total data device capacity.

5.3 HPE All-Disk Configurations

NexentaEdge All-Disk configurations provide capacity optimized solutions that are best suited for Object Storage workloads, from read-mostly to cold data storage with erasure coding.

All-Disk configurations of NexentaEdge do not support sharing data through Block interfaces such as iSCSI or Native Block Devices.

5.3.1 HPE DL380 All-Disk

	NexentaEdge HPE DL380 All-Disk
Controller	1x HPE DL380 G9
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket
DRAM	Minimum 128GB
Boot Drive	2x 1TB 7.2k HDD 2.5”
SAS HBA	HPE Flexible Smart Array P440ar
NIC	Minimum of 2x 10Gbe ports required for NexentaEdge Recommended: 1x HPE 10GbE Dual Port 530SFP or 1x HPE 10GbE Dual Port 530T
Max Capacity	Up to 150 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB
Data Device #	15

5.3.2 HPE Apollo 4500 All-Disk

	NexentaEdge HPE Apollo 4530 All-Disk	NexentaEdge HPE Apollo 4510 All-Disk
Controller	1x HPE Apollo 4530	1x HPE Apollo 4510 Single-Node
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket (per node)	
DRAM	Minimum 128GB per node	Minimum 256GB
Boot Drive	2x 1TB 7.2k HDD 2.5”	
SAS HBA	Internal	
NIC	Minimum of 2x 10Gbe ports required for NexentaEdge per node Recommended: 1x Intel X520 10GbE Dual Port SFP+ or 1x Intel X540 10GbE Dual Port Base T	Minimum of 4x 10Gbe ports required for NexentaEdge Recommended: 2x Intel X520 10GbE Dual Port SFP+ or 2x Intel X540 10GbE Dual Port Base T
Max Capacity	Up to 150TB per node	Up to 680 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB	
Data Device #	15 per node	68

6 Lenovo Reference Architectures

6.1 Lenovo All-Flash Configurations

6.1.1 Lenovo X3650-M5 All-Flash

NexentaEdge All-Flash configurations deliver high IOPS and low latency for small random IO workloads that are typical of databases, enterprise applications and high performance private cloud (VMware, OpenStack and Container) environments.

	NexentaEdge Lenovo X3650-M5 All-Flash
Controller	1x Lenovo X3650-M5
CPU	E5-2690 v4 2.6GHz, 14 cores, 2 socket
DRAM	Minimum 256GB
Boot Drive	2x 480GB rear mounted SSD
SAS HBA	1x N2215
NIC	Minimum of 4x 10Gbe ports required for NexentaEdge Recommended: 2x Intel X520 10GbE Dual Port SFP+ or 2x Intel X540 10GbE Dual Port Base T
Max Capacity	Up to 99TB
Data Device #	26
Flash Device	Up to 3.84TB 2.5” SAS SSD

Note 1: SSD boot devices can be replaced by 2x 1TB 7.2k HDD 2.5” drives if desired.
Note 2: When deploying All-Flash configurations, ensure that the endurance of the SSDs used in the configuration is aligned with the expected write workload on the system. Best practice is to use SSDs rated between 3 DPWD to 10 DWPD.

6.2 Lenovo Hybrid Configurations

NexentaEdge Hybrid configurations deliver great performance and capacity optimized solutions that are best suited for mixed read/write workloads with small random IO that are typical of private cloud (VMware, OpenStack and Hyper-V) storage backend, generic file services and high performance backup and archive use cases.

6.2.1 Lenovo X3650-M5 Hybrid

	NexentaEdge Lenovo X3650-M5 Hybrid
Controller	1x Lenovo X3650-M5
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket
DRAM	Minimum 128GB
Boot Drive	2x 1TB 7.2k HDD 2.5”
SAS HBA	1x N2215
NIC	Minimum of 2x 10Gbe ports required for NexentaEdge Recommended: 1x Intel X520 10GbE Dual Port SFP+ or 1x Intel X540 10GbE Dual Port Base T
Max Capacity	Up to 120 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB
Data Device #	12
Flash Device	2x 2.5” SAS SSD

Note 1: To ensure optimal long-term performance and reliability the flash devices must be rated at least 10 DWPD.
Note 2: Total flash capacity should be at a minimum 5% of the total data device capacity.

6.3 Lenovo All-Disk Configurations

NexentaEdge All-Disk configurations provide capacity optimized solutions that are best suited for Object Storage workloads, from read-mostly to cold data storage with erasure coding.

All-Disk configurations of NexentaEdge do not support sharing data through Block interfaces such as iSCSI or Native Block Devices.

6.3.1 Lenovo X3650-M5 All-Disk

	NexentaEdge Lenovo X3650-M5 All-Disk
Controller	1x Lenovo X3650-M5
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket
DRAM	Minimum 128GB
Boot Drive	2x 1TB 7.2k HDD 2.5”
SAS HBA	1x N2215
NIC	Minimum of 2x 10Gbe ports required for NexentaEdge Recommended: 1x Intel X520 10GbE Dual Port SFP+ or 1x Intel X540 10GbE Dual Port Base T
Max Capacity	Up to 140 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB
Data Device #	14

7 Supermicro Reference Architectures

7.1 Supermicro All-Flash Configurations

NexentaEdge All-Flash configurations deliver high IOPS and low latency for small random IO workloads that are typical of databases, enterprise applications and high performance private cloud (VMware, OpenStack and Container) environments.

7.1.1 SuperMicro X10 All-Flash

	NexentaEdge SuperMicro All-Flash 1RU	NexentaEdge SuperMicro All-Flash 2RU
Controller	1x SYS-1028U-TNRT+	1x SSG-2028R-E1CR24L
CPU	E5-2690 v4 2.6GHz, 14 cores, 2 socket	
DRAM	Minimum 256GB	Minimum 256GB 384 GB recommended
Boot Drive	1x 480GB SSD	2x 480GB rear mounted SSD
SAS HBA	2x AOC-S3008L-L8e	Onboard LSI 3008
NIC	Minimum of 4x 10GbE ports required for NexentaEdge Recommended: 2x AOC-STG-I2T (RJ45) or 2x AOC-STGN-I2S (SFP+) and 2x AOC-E10GSFPR (transceiver)	
Max Capacity	Up to 34TB	Up to 92TB
Data Device #	9	24
Flash Device	Up to 3.84TB 2.5” SAS SSD	Up to 3.84TB 2.5” SAS SSD

Note 1: For Intel v4 CPUs, motherboard BIOS must be 2.0 or later.
Note 2: SSD boot devices can be replaced by 1TB 7.2k HDD 2.5” drives if desired.
Note 3: When deploying All-Flash configurations, ensure that the endurance of the SSDs used in the configuration is aligned with the expected write workload on the system. Best practice is to use SSDs rated between 3 DPWD to 10 DWPD.

7.2 Supermicro Hybrid Configurations

NexentaEdge Hybrid configurations deliver great performance and capacity optimized solutions that are best suited for mixed read/write workloads with small random IO that are typical of private cloud (VMware, OpenStack and Hyper-V) storage backend, generic file services and high performance backup and archive use cases.

7.2.1 SuperMicro X10 Hybrid

	NexentaEdge SuperMicro Hybrid		
Controller	1x SSG-6028R-E1CR12L	1x SSG-6048R-E1CR36L	1x SSG-6048R-E1CR72L
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket		
DRAM	Minimum 128GB	Minimum 256GB	
Boot Drive	2x 1TB 7.2k HDD 2.5”		
SAS HBA	Onboard LSI 3008		3x AOC-S3008L-L8E-P
NIC	Minimum of 2x 10GbE ports required for NexentaEdge	Minimum of 2x 10GbE ports required for NexentaEdge 4x 10GbE recommended for high-throughput/large capacity environments	
Max Capacity	Up to 100 TB	Up to 300 TB	Up to 600 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB		
Data Device #	10	30	60
Flash Device	2x 2.5” SAS SSD	6x 2.5” SAS SSD	12x 2x 2.5” SAS SSD

Note 1: For Intel v3 CPUs, motherboard BIOS for the SMC X10 RA must be 1.01 or later. For Intel v4 CPUs, motherboard BIOS must be 2.0 or later.
Note 2: To ensure optimal long-term performance and reliability the flash devices must be rated at least 10 DWPD.
Note 3: Total flash capacity should be at a minimum 5% of the total data device capacity.

7.3 Supermicro All-Disk Configurations

NexentaEdge All-Disk configurations provide capacity optimized solutions that are best suited for Object Storage workloads, from read-mostly to cold data storage with erasure coding.

All-Disk configurations of NexentaEdge do not support sharing data through Block interfaces such as iSCSI or Native Block Devices.

7.3.1 SuperMicro X10 All-Disk

	NexentaEdge SuperMicro All-Disk		
Controller	1x SSG-6028R-E1CR12L	1x SSG-6048R-E1CR36L	1x SSG-6048R-E1CR72L
CPU	E5-2630 v4 2.2 GHz 10-core, 2 socket		
DRAM	Minimum 64GB	Minimum 128GB	Minimum 256GB
Boot Drive	2x 1TB 7.2k HDD 2.5”		
SAS HBA	Onboard LSI 3008		3x AOC-S3008L-L8E-P
NIC	Minimum of 2x 10GbE ports required for NexentaEdge	Minimum of 2x 10GbE ports required for NexentaEdge 4x 10GbE recommended for high-throughput/large capacity environments	
Max Capacity	Up to 120 TB	Up to 360 TB	Up to 720 TB
Data HDD	3.5” 7.2k SAS HDD – 2TB 3.5“ 7.2k SAS HDD – 4TB 3.5” 7.2k SAS HDD – 6TB 3.5“ 7.2k SAS HDD – 8TB 3.5“ 7.2k SAS HDD – 10TB		
Data Device #	12	26	72

Note 1: For Intel v4 CPUs, motherboard BIOS must be 2.0 or later.

8 About Nexenta

Nexenta is the global leader in Open Source-driven Software-Defined Storage (OpenSDS). Founded in 2005 with 6,000+ customers and more than 1,500 petabytes of storage under management, our privately held company delivers **100% Software**-based storage solutions, providing organizations with **Total Freedom** to choose an easy-to-use, secure and ultra-low cost storage solution to fit their needs. Nexenta enables everyday apps; from the Internet of Things to Big Data; from OpenStack to Containers – and all types of Clouds – Private, Public, and Hybrid. Founded around an open source platform and industry-disrupting vision, Nexenta delivers its award- and patent-winning software-only unified storage management solutions 24x7 - around the globe - service and support. Nexenta has an **All Love** approach with its global partner network, including solution integration with top hardware partners to deliver validated and certified OpenSDS solutions to fit your business requirements.

For more information, visit www.nexenta.com, Twitter, Facebook, LinkedIn and YouTube.