



Technical Report

## FlexPod Technical Specifications

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### **Important**

Before ordering a complete FlexPod<sup>®</sup> configuration, check the NetApp<sup>®</sup> FlexPod website at [www.netapp.com/us/technology/flexpod](http://www.netapp.com/us/technology/flexpod) for the latest version of these technical specifications.

## TABLE OF CONTENTS

<b>1</b>	<b>Overview</b>	<b>5</b>
<b>2</b>	<b>Definition of FlexPod Rules</b>	<b>5</b>
<b>3</b>	<b>Data ONTAP Modes of Operation</b>	<b>5</b>
<b>4</b>	<b>Minimum Hardware Requirements</b>	<b>5</b>
<b>5</b>	<b>Minimum Software Requirements</b>	<b>6</b>
<b>6</b>	<b>Connectivity Requirements</b>	<b>6</b>
<b>7</b>	<b>Other Requirements</b>	<b>6</b>
<b>8</b>	<b>Optional Features</b>	<b>7</b>
8.1	Requirements for Classic Fibre Channel Protocol SAN Boot Option	7
8.2	Requirements for Fibre Channel over Ethernet SAN Boot Option	7
8.3	Requirements for iSCSI Boot Option	7
8.4	Additional Information	8
<b>9</b>	<b>Cisco Components</b>	<b>9</b>
9.1	Cisco UCS B-Series Chassis Option	9
9.2	Cisco UCS B-Series Blade Options	9
9.3	Cisco UCS C-Series Rack Options	9
9.4	Cisco UCS Fabric Interconnect Options	10
9.5	Cisco Nexus 5000 Series Switch Options	10
9.6	Cisco Nexus 6000 Series Switch Options	11
9.7	Cisco Nexus 7000 Series Switch Options	11
9.8	Cisco Fabric Extenders	11
9.9	Cisco Software Licensing for Storage Protocols	11
9.10	Cisco Support Licensing Options	12
<b>10</b>	<b>NetApp Components</b>	<b>12</b>
10.1	NetApp Storage Controller Options	12
10.2	NetApp Ethernet Expansion Modules	13
10.3	NetApp Disk Shelves and Disks	13
10.4	NetApp Software Licensing Options	14
10.5	NetApp Support Licensing Options	15
<b>11</b>	<b>Power and Cabling Requirements</b>	<b>15</b>
11.1	Power Requirements	15
11.2	Minimum Cable Requirements	17

<b>12 Legacy Equipment.....</b>	<b>18</b>
<b>Appendix: Technical Specifications and Reference .....</b>	<b>18</b>
Cisco UCS B-Series Blade Server Chassis.....	19
Cisco UCS Fabric Extender Modules for Cisco UCS B-Series Blade Server Chassis.....	19
Cisco UCS B-Series Blade Servers.....	19
Cisco UCS C-Series Rack Servers.....	20
Cisco UCS CNA or VIC Adapters for Cisco UCS B-Series Blade Server .....	21
Cisco UCS Fabric Interconnects.....	23
Cisco Nexus 5000 Series Switches .....	23
Cisco Nexus 6000 Series Switches .....	24
Cisco Nexus 7000 Series Switches .....	24
Cisco Nexus Fabric Extenders .....	25
Small Form-Factor Pluggable Modules .....	25
NetApp Storage Controllers.....	26
NetApp Ethernet Adapters.....	28
NetApp Disk Shelves.....	28
NetApp Disk Drives .....	29
Additional Validated Connectivity Options .....	30
<b>Version History .....</b>	<b>31</b>

## LIST OF TABLES

Table 1) Cisco UCS B-Series chassis option. ....	9
Table 2) Cisco UCS B-Series blade options.....	9
Table 3) Cisco UCS C-Series rack options.....	9
Table 4) Cisco UCS fabric interconnect options. ....	10
Table 5) Cisco Nexus 5000 series switch options. ....	10
Table 6) Cisco Nexus 6000 series switch options. ....	11
Table 7) Cisco Nexus 7000 series switch options. ....	11
Table 8) Cisco Nexus FEX. ....	11
Table 9) Cisco software licensing options. ....	12
Table 10) Cisco support licensing options.....	12
Table 11) NetApp storage controller options. ....	13
Table 12) NetApp 10GbE adapter options.....	13
Table 13) NetApp disk shelf options.....	14
Table 14) NetApp disk drive options.....	14
Table 15) NetApp software licensing options. ....	15

Table 16) NetApp support licensing options. ....	15
Table 17) Power ports required per device.....	15
Table 18) Minimum number of cables required for each device. ....	17
Table 19) Legacy equipment. ....	18
Table 20) Cisco UCS B-Series blade server chassis options. ....	19
Table 21) Cisco UCS FEX modules for the Cisco UCS B-Series blade server chassis. ....	19
Table 22) Cisco UCS B-Series blade server options. ....	19
Table 23) Cisco UCS B-Series blade server options datasheets. ....	20
Table 24) Cisco UCS C-Series rack server options (part 1 of 2). ....	20
Table 25) Cisco UCS C-Series rack server options (part 2 of 2). ....	21
Table 26) Cisco UCS C-Series rack server options datasheets. ....	21
Table 27) Cisco UCS CNA adapters for Cisco UCS B-Series blade server. ....	22
Table 28) Cisco UCS VIC adapters for Cisco UCS B-Series blade server. ....	22
Table 29) Cisco UCS CNA and VIC adapters for Cisco UCS B-Series blades datasheets. ....	22
Table 30) Cisco UCS fabric interconnect options. ....	23
Table 31) Cisco UCS fabric interconnect options datasheets.....	23
Table 32) Cisco Nexus 5000 series switch options. ....	23
Table 33) Cisco Nexus 5000 series switch options datasheets. ....	23
Table 34) Cisco Nexus 6000 series switch options. ....	24
Table 35) Cisco Nexus 6000 series switch options datasheets. ....	24
Table 36) Cisco Nexus 7000 series switch options part 1. ....	24
Table 37) Cisco Nexus 7000 series switch options part 2. ....	24
Table 38) Cisco Nexus 7000 series switch datasheets. ....	25
Table 39) Cisco Nexus FEX. ....	25
Table 40) Ethernet SFP modules for Cisco Nexus 5000, 6000, and 7000 series switches and Cisco UCS fabric interconnects. ....	25
Table 41) FC SFP modules for Cisco Nexus 5000 series switches and Cisco UCS fabric interconnects. ....	26
Table 42) NetApp storage controller options. ....	26
Table 43) NetApp storage controller options datasheets. ....	27
Table 44) Legacy equipment options. ....	28
Table 45) NetApp 10GbE adapters. ....	28
Table 46) NetApp disk shelf options. ....	28
Table 47) NetApp disk shelf options. ....	29

## LIST OF FIGURES

Figure 1) FCoE SAN connectivity. ....	8
Figure 2) iSCSI boot scenario. ....	30
Figure 3) FC boot scenario. ....	31

## 1 Overview

FlexPod is a predesigned, best practice data center architecture that is built on the Cisco Unified Computing System™ (Cisco UCS®), the Cisco Nexus® family of switches, and NetApp fabric-attached storage (FAS) or V-Series systems. FlexPod is a suitable platform for running a variety of virtualization hypervisors as well as bare metal operating systems and enterprise workloads. FlexPod delivers not only a baseline configuration, but also the flexibility to be sized and optimized to accommodate many different use cases and requirements.

## 2 Definition of FlexPod Rules

The FlexPod design allows a flexible infrastructure that encompasses many different components and software versions. Use the rule sets in sections 4, 5, 6, 7, and 8 as a guide to building or assembling a valid FlexPod configuration. The numbers and rules listed are only the minimum requirements for FlexPod; they can be expanded in the included product families as required for different environments and use cases.

## 3 Data ONTAP Modes of Operation

NetApp Data ONTAP® is the common operating system that is installed on every NetApp storage system and is configured to operate as clustered Data ONTAP or in either 7-Mode. FlexPod is validated with both modes of operation, with clustered Data ONTAP providing a highly scalable storage architecture that enables nondisruptive operations, nondisruptive upgrades, and an agile data infrastructure. For more information about NetApp clustered Data ONTAP 8, refer to [NetApp Data ONTAP 8: Clustering to Achieve Enterprise Scale](#).

## 4 Minimum Hardware Requirements

This section lists the hardware requirements for FlexPod.

**Note:** You must use Cisco UCS servers. Both C-Series and B-Series servers have been used in validated designs. You can choose B-Series servers, which require the chassis and blades, or the C-Series servers, which require the rack mount servers and Cisco Nexus Fabric Extenders (FEX).

- Two Cisco Nexus switches in a redundant configuration. These can consist of products from the Cisco Nexus 5000 or 7000 family of switches
- Two Cisco UCS 6100 or 6200 series fabric interconnects in a redundant configuration
- Cisco UCS Servers (B-Series or C-Series)
  - One Cisco UCS 5000 B-Series blade chassis plus two Cisco UCS B-Series blade servers plus two 2104, 2204, or 2208 FEX modules
  - or
  - Two Cisco UCS C-Series rack mount servers plus two 2232 FEX modules
- Two NetApp FAS controllers in an HA pair configuration
  - Requires two 10 Gigabit Ethernet (10GbE) ports per controller.
  - If using clustered Data ONTAP, a cluster interconnect switch approved by NetApp is required. For more information, refer to [Cluster Management and Interconnect Switches](#).
- One NetApp disk shelf with any supported disk type

## 5 Minimum Software Requirements

This section lists the software requirements for FlexPod:

- NetApp Data ONTAP:
  - 7-Mode requires 7.3.5 or later, including Data ONTAP 8.X
  - Clustered Data ONTAP requires Data ONTAP 8.1.1 or later
- Cisco UCS Manager 1.3 or later, including Cisco UCS 2.X
- Cisco® NX-OS version 5.0(3)N1(1c) or later, including NX-OS 5.1.X for Cisco Nexus 5000 series switches
- For Cisco Nexus 7000 series switches:
  - The 4-slot chassis requires Cisco NX-OS Software Release 6.1.(2) or later
  - The 9-slot chassis requires Cisco NX-OS Software Release 5.2 or later
  - The 10-slot chassis requires Cisco NX-OS Software Release 4.0 or later
  - The 18-slot chassis requires Cisco NX-OS Software Release 4.1 or later

**Note:** All software must be listed and supported in the [NetApp Interoperability Matrix Tool](#) (IMT). Certain software features might require more recent versions of code than the minimums listed.

## 6 Connectivity Requirements

This section lists the connectivity requirements for FlexPod:

- NetApp storage controllers must be directly connected to the Cisco Nexus switches.
- The Cisco UCS fabric interconnect appliance ports cannot be used.
- No additional equipment can be placed inline between the core FlexPod components.
- Virtual port channels (vPCs) are required from the Cisco Nexus 5000 or 7000 series switches to the fabric interconnects.
- vPCs are required from the Cisco Nexus 5000, 6000 or 7000 series switches to the NetApp storage controllers.
- FCoE port channels for end-to-end FCoE designs are encouraged
- Jumbo frame support must be enabled throughout the environment.
- A separate 100MbE/GbE out-of-band management network is required.

## 7 Other Requirements

This section lists other requirements:

- All hardware components and software must be listed and supported on the [NetApp Interoperability Matrix](#).
- If V-Series components are used, they must be listed and supported in the [V-Series support matrix](#).
- Valid support contracts are required for all equipment, including:
  - SMARTnet® support for Cisco equipment
  - SupportEdge Premium support for NetApp equipment

## 8 Optional Features

For FlexPod architecture, NetApp recommends leveraging storage area network (SAN) technologies to allow stateless computing as well as for certain data access. Multiple SAN options are available and valid in a FlexPod configuration, and each has different requirements. The following subsections describe the minimum requirements based on the SAN protocol used.

### 8.1 Requirements for Classic Fibre Channel Protocol SAN Boot Option

This subsection describes the requirements for classic Fibre Channel Protocol (FCP) SAN boot option. The prescribed requirements for classic FCP SAN boot option are:

- A Storage Protocols Service Package license for the Cisco Nexus 5000 series switches (FC\_FEATURES\_PKG) is required.
- SAN links are required between the fabric interconnect and the Cisco Nexus 5000 series switch, and SAN port channels are recommended between the links for further redundancy.
- The Cisco Nexus 5010, 5020, and 5548P model switches require a separate Fibre Channel (FC) or Universal Port (UP) module for connectivity into the Cisco UCS fabric interconnect as well as into the NetApp storage controller.
- Each NetApp storage controller requires a minimum of 2x2/4/8GB FC ports for connectivity.
- Requires FCP license on the NetApp storage controller.

**Note:** The use of the Cisco Nexus 7000 family of switches precludes the use of classic Fibre Channel.

### 8.2 Requirements for Fibre Channel over Ethernet SAN Boot Option

This subsection describes the requirements for the Fibre Channel over Ethernet (FCoE) SAN boot option:

- A Storage Protocols Service Package license for the Cisco Nexus 5000, 6000 or 7000 series switches (FC\_FEATURES\_PKG) is required.
- FCoE SAN links are required between the fabric interconnect and the Cisco Nexus 5000, 6000 or 7000 series switches, and FCoE port channels are recommended between the links for further redundancy.
- The Cisco Nexus 5010, 5020, 5548P, and 6001P require a separate FC or UP module for connectivity into the Cisco UCS fabric interconnect.
- Each NetApp storage controller requires a dual-port unified target adapter (UTA) add-on card for FCoE connectivity.
- Requires FCP license on the NetApp storage controller.
- If using the Cisco Nexus 7000 series switches or the Cisco Nexus 6004 switch, a line card capable of supporting FCoE is required.
- If using the Cisco Nexus 7000 series switches or the Cisco Nexus 6004 switch and want to deploy Cisco Nexus 1110x, a line card capable of supporting 1GbE is required.

### 8.3 Requirements for iSCSI Boot Option

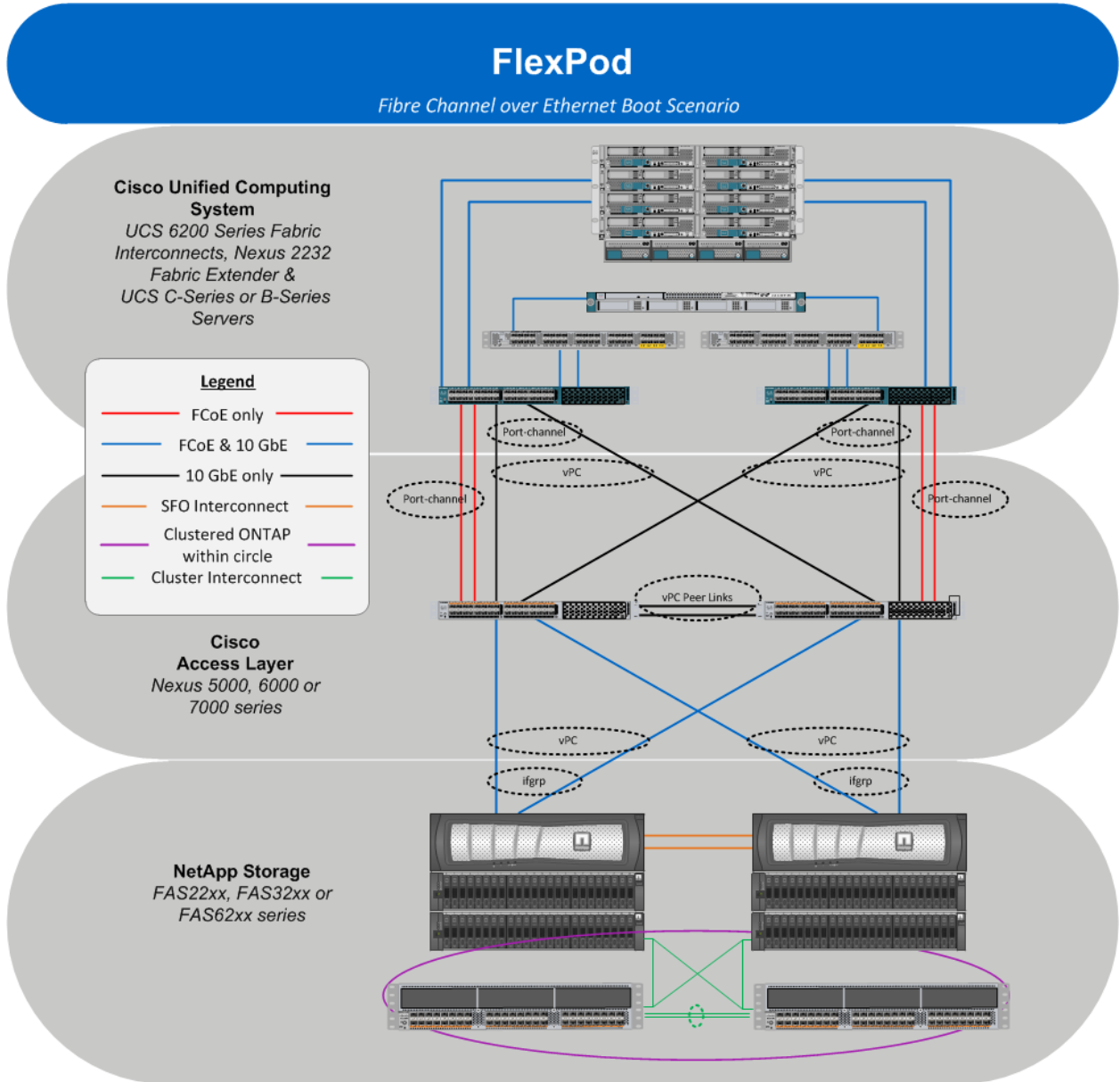
This subsection describes the requirements for the iSCSI boot option:

- Requires iSCSI license on the NetApp storage controller.
- Requires adapter in the Cisco UCS server capable of iSCSI boot.
- Requires a two-port 10Gb/s Ethernet adapter on the NetApp storage controller.

## 8.4 Additional Information

For information about the configuration required and validated in the FlexPod architecture, refer to [FlexPod Data Center with VMware vSphere 5.1](#). Figure 1 illustrates the connectivity deployed for an FCoE SAN. For additional validated connectivity options, refer to section “Additional Validated Connectivity Options.”

Figure 1) FCoE SAN connectivity.



**Note:** When deploying a system running clustered Data ONTAP, a pair of cluster interconnect switches (shown in Figure 1 in the purple circle) is required. If deploying Data ONTAP operating in 7-Mode, none of the connections or cluster interconnect switches shown in the purple circle are required.



## 9 Cisco Components

Cisco has contributed substantially to the FlexPod design and architecture, covering both the compute and networking layers of the solution. This section describes the Cisco UCS and Cisco Nexus options that are available for FlexPod. FlexPod supports both the Cisco UCS B-Series and C-Series servers.

### 9.1 Cisco UCS B-Series Chassis Option

If you intend to use Cisco UCS B-Series blades, you must have a Cisco UCS B-Series chassis. If you intend to use Cisco UCS C-Series rack mount servers, a chassis is not required, but a Cisco Nexus FEX is required. Table 1 describes the Cisco UCS B-Series chassis option.

Table 1) Cisco UCS B-Series chassis option.

Cisco UCS Chassis	Part Number	Technical Specifications
Cisco UCS 5108	N20-C6508	<a href="http://www.cisco.com/en/US/products/ps10279/index.html">www.cisco.com/en/US/products/ps10279/index.html</a>

### 9.2 Cisco UCS B-Series Blade Options

Cisco UCS B-Series blades are available in half- and full-width varieties, with various CPU, memory, and input/output (I/O) options. The part numbers listed in Table 2 are for the base server; they do not include the CPU, memory, disk drives, or mezzanine adapter cards. Multiple configuration options are available and supported in FlexPod.

Table 2) Cisco UCS B-Series blade options.

Cisco UCS Blade	Part Number	Technical Specifications
Cisco UCS B22 M3	UCSB-B22-M3	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-706100.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-706100.html</a>
Cisco UCS B200-M3	UCSB-B200-M3	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/B200M3_SpecSheet.pdf">www.cisco.com/en/US/prod/collateral/ps10265/ps10280/B200M3_SpecSheet.pdf</a>
Cisco UCS B230 M2	B230-BASE-M2	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ps11583/data_sheet_c78-646961.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ps11583/data_sheet_c78-646961.html</a>
Cisco UCS B420 M3	UCSB-B420-M3	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-706603.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-706603.html</a>
Cisco UCS B440-M2 High-Performance	B440-BASE-M2	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ps11584/at_a_glance_c45-646963.pdf">www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ps11584/at_a_glance_c45-646963.pdf</a>

### 9.3 Cisco UCS C-Series Rack Options

Cisco UCS C-Series blades are available in one, two, and four rack unit (RU) varieties, with various CPU, memory, and I/O options. The part numbers listed in Table 3 are for the base server; they do not include CPUs, memory, disk drives, PCIe cards, or the Cisco FEX. Multiple configuration options are available and supported in FlexPod.

Table 3) Cisco UCS C-Series rack options.

Cisco UCS C-Series Rack Server	Part Number	Technical Specifications
Cisco UCS C22 M3	UCSC-C22-M3S	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706101.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706101.html</a>

Cisco UCS C-Series Rack Server	Part Number	Technical Specifications
Cisco UCS C220 M3	UCSC-C220-M3S	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/C220M3_SFF_SpecSheet.pdf">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/C220M3_SFF_SpecSheet.pdf</a>
Cisco UCS C24 M3	UCSC-C24-M3S	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706103.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706103.html</a>
Cisco UCS C240 M3	UCSC-C240-M3S	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/C240M3_SFF_SpecSheet.pdf">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/C240M3_SFF_SpecSheet.pdf</a>
Cisco UCS C260 M2	C260-BASE-2646	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/c260m2_specsheet.pdf">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/c260m2_specsheet.pdf</a>
Cisco UCS C420 M3	UCSC-BASE-M3-C420	<a href="http://www.cisco.com/en/US/products/ps12770/index.html">www.cisco.com/en/US/products/ps12770/index.html</a>
Cisco UCS C460 M2	UCSC-BASE-M2-C460	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps11587/spec_sheet_c17-662220.pdf">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps11587/spec_sheet_c17-662220.pdf</a>

## 9.4 Cisco UCS Fabric Interconnect Options

Redundant fabric interconnects are required in the FlexPod architecture. The part numbers shown in Table 4 are for the base fabric interconnects; they do not include the power supply unit (PSU), Small Form-Factor Pluggable Plus (SFP+) modules, or expansion modules.

When adding multiple Cisco UCS chassis to a pair of fabric interconnects, remember that both an architectural and a port limit can be reached that determine the maximum number of chassis in that environment. For more information about these upper limits, refer to the [Cisco UCS Fabric Interconnect Technical Specifications](#).

Table 4) Cisco UCS fabric interconnect options.

Cisco UCS Fabric Interconnect	Part Number	Technical Specifications
Cisco UCS 6248UP	UCS-FI-6248UP	<a href="http://www.cisco.com/en/US/products/ps11548/index.html">www.cisco.com/en/US/products/ps11548/index.html</a>
Cisco UCS 6296UP	UCS-PSU-6296UP-AC	<a href="http://www.cisco.com/en/US/products/ps12275/index.html">www.cisco.com/en/US/products/ps12275/index.html</a>

## 9.5 Cisco Nexus 5000 Series Switch Options

Redundant Cisco Nexus 5000, 6000, or 7000 series switches are required in the FlexPod architecture. The part numbers listed in Table 5 are for Cisco Nexus 5000 series chassis; they do not include SFP modules, add-on FC, or Ethernet modules.

Table 5) Cisco Nexus 5000 series switch options.

Cisco Nexus 5000 Series Switch	Part Number	Technical Specifications
Cisco Nexus 5548UP	N5K-C5548UP-FA	<a href="http://www.cisco.com/en/US/products/ps11681/index.html">www.cisco.com/en/US/products/ps11681/index.html</a>
Cisco Nexus 5548P	N5K-C5548P-FA	<a href="http://www.cisco.com/en/US/products/ps11215/index.html">www.cisco.com/en/US/products/ps11215/index.html</a>
Cisco Nexus 5596UP	N5K-C5596UP-FA	<a href="http://www.cisco.com/en/US/products/ps11577/index.html">www.cisco.com/en/US/products/ps11577/index.html</a>

## 9.6 Cisco Nexus 6000 Series Switch Options

Redundant Cisco Nexus 5000, 6000, or 7000 series switches are required in the FlexPod architecture. The part numbers listed in Table 6 are for Cisco Nexus 6000 series chassis; they do not include SFP modules, add-on FC, or Ethernet modules.

Table 6) Cisco Nexus 6000 series switch options.

Cisco Nexus 6000 Series Switch	Part Number	Technical Specifications
Cisco Nexus 6001	N6K-C6001-64P	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps12806/ps12869/data_sheet_c78-726128.html">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps12806/ps12869/data_sheet_c78-726128.html</a>
Cisco Nexus 6004	N6004-B-24Q	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps12806/ps12807/data_sheet_c78-723667.html">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps12806/ps12807/data_sheet_c78-723667.html</a>

## 9.7 Cisco Nexus 7000 Series Switch Options

Redundant Cisco Nexus 5000 or 7000 series switches are required in the FlexPod architecture. The part numbers listed in Table 7 are for the Cisco Nexus 7000 series chassis; they do not include SFP modules, line cards, or power supplies but includes fan trays.

Table 7) Cisco Nexus 7000 series switch options.

Cisco Nexus 7000 Series Switch	Part Number	Technical Specifications
Cisco Nexus 7004	N7K-C7004	<a href="http://www.cisco.com/en/US/products/ps12735/index.html">http://www.cisco.com/en/US/products/ps12735/index.html</a>
Cisco Nexus 7009	N7K-C7009	<a href="http://www.cisco.com/en/US/products/ps11565/index.html">http://www.cisco.com/en/US/products/ps11565/index.html</a>
Cisco Nexus 7010	N7K-C7010	<a href="http://www.cisco.com/en/US/products/ps9512/index.html">http://www.cisco.com/en/US/products/ps9512/index.html</a>
Cisco Nexus 7018	N7K-C7018	<a href="http://www.cisco.com/en/US/products/ps10098/index.html">http://www.cisco.com/en/US/products/ps10098/index.html</a>
Cisco Nexus 7706	N77-C7706	<a href="http://www.cisco.com/en/US/products/ps13482/index.html">http://www.cisco.com/en/US/products/ps13482/index.html</a>
Cisco Nexus 7710	N77-C7710	<a href="http://www.cisco.com/en/US/products/ps13102/index.html">http://www.cisco.com/en/US/products/ps13102/index.html</a>
Cisco Nexus 7718	N77-C7718	<a href="http://www.cisco.com/en/US/products/ps13103/index.html">http://www.cisco.com/en/US/products/ps13103/index.html</a>

## 9.8 Cisco Fabric Extenders

Redundant Cisco Nexus 2232 FEX are required in the FlexPod architecture when C-Series servers are used. Table 8 lists the part number for Cisco Nexus FEX.

Table 8) Cisco Nexus FEX.

FEX	FEX Part Number	Technical Specifications
Cisco Nexus 2232PP	N2K-C2232PP-10GE	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps10110/data_sheet_c78-507093.html">www.cisco.com/en/US/prod/collateral/switches/ps9441/ps10110/data_sheet_c78-507093.html</a>

## 9.9 Cisco Software Licensing for Storage Protocols

The Cisco Nexus 5500 Storage Services license is required to enable the FC or FCoE protocol for SAN boot implementations.

**Note:** The licenses required and the part numbers for those licenses vary based on the options you select in each piece of the FlexPod solution. For example, software license part numbers vary depending on the number of ports and which Cisco Nexus 5000 or 7000 series switches that you choose. Consult your sales representative for exact part numbers.

Table 9 lists the Cisco software licensing options.

**Table 9) Cisco software licensing options.**

Cisco Software Licensing	Part Number	License Guide
Cisco Nexus 5500 Storage License, 8-, 48-, and 96-port	N55-8P-SSK9/N55-48P-SSK9/N55-96P-SSK9	<a href="http://www.cisco.com/en/US/docs/switches/datacenter/s/nx-os/licensing/guide/b_Cisco_NX-OS_Licensing_Guide_chapter_01.html">http://www.cisco.com/en/US/docs/switches/datacenter/s/nx-os/licensing/guide/b_Cisco_NX-OS_Licensing_Guide_chapter_01.html</a>
Cisco Nexus 5010/5020 Storage Protocols License	N5010 -SSK9/N5020-SSK9	
Cisco Nexus 6000 FC Features License	N6K-16P-10GE-SSK9/ N6K-4P-40GE-SSK9	
Cisco Nexus 7000 Storage Enterprise License	N7K-SAN1K9	

## 9.10 Cisco Support Licensing Options

Valid SMARTnet support contracts are required on all Cisco equipment in the FlexPod architecture.

**Note:** The licenses required and the part numbers for those licenses should be verified by your sales representative because they can differ for different products.

Table 10 lists the Cisco support licensing options.

**Table 10) Cisco support licensing options.**

Cisco Support Licensing	License Guide
SMARTnet 24x7x4	<a href="http://www.cisco.com/warp/public/cc/serv/mkt/sup/tsssv/opmsup/smtton/smnet_qa.pdf">www.cisco.com/warp/public/cc/serv/mkt/sup/tsssv/opmsup/smtton/smnet_qa.pdf</a>

## 10 NetApp Components

NetApp storage controllers provide the storage foundation in the FlexPod architecture for both boot and application data storage. This section lists the different NetApp options in the FlexPod architecture.

### 10.1 NetApp Storage Controller Options

Redundant NetApp FAS or V-Series controllers are required in the FlexPod architecture. The controllers run either clustered Data ONTAP or Data ONTAP 7-Mode. When ordering the storage controllers, the preferred software version can be preloaded on the controllers. For clustered Data ONTAP, a complete cluster is ordered; a complete cluster includes both a pair of storage controllers and a cluster interconnect.

**Note:** The part numbers listed in Table 11 are for an empty controller. Different options and configurations are available based on the selected storage platform. Consult your sales representative for details on these additional components.

Table 11) NetApp storage controller options.

Storage Controller	FAS Part Number	Technical Specifications
FAS 6290/V6290	FAS-V62XX-CHASSIS-R6-C	<a href="http://www.netapp.com/us/products/storage-systems/fas6200/fas6200-tech-specs.aspx">http://www.netapp.com/us/products/storage-systems/fas6200/fas6200-tech-specs.aspx</a>
FAS 6250/V6250	FAS-V62XX-CHASSIS-R6-C	<a href="http://www.netapp.com/us/products/storage-systems/fas6200/fas6200-tech-specs.aspx">http://www.netapp.com/us/products/storage-systems/fas6200/fas6200-tech-specs.aspx</a>
FAS 6220/V6220	FAS-V62XX-CHASSIS-R6-C	<a href="http://www.netapp.com/us/products/storage-systems/fas6200/fas6200-tech-specs.aspx">http://www.netapp.com/us/products/storage-systems/fas6200/fas6200-tech-specs.aspx</a>
FAS 3250/V3250	FAS-V32XX-CHASSIS-R6- C	<a href="http://www.netapp.com/us/products/storage-systems/fas3200/fas3200-tech-specs.html">www.netapp.com/us/products/storage-systems/fas3200/fas3200-tech-specs.html</a>
FAS 3220/V3220	FAS-V32XX-CHASSIS-R6-C	<a href="http://www.netapp.com/us/products/storage-systems/fas3200/fas3200-tech-specs.html">www.netapp.com/us/products/storage-systems/fas3200/fas3200-tech-specs.html</a>
FAS 2240	Based on individual options chosen	<a href="http://www.netapp.com/us/products/storage-systems/fas2000/fas2000-tech-specs.html">www.netapp.com/us/products/storage-systems/fas2000/fas2000-tech-specs.html</a>
FAS 2220	Based on individual options chosen	<a href="http://www.netapp.com/us/products/storage-systems/fas2000/fas2000-tech-specs.html">www.netapp.com/us/products/storage-systems/fas2000/fas2000-tech-specs.html</a> <a href="http://www.netapp.com/us/products/storage-systems/fas3200/fas3200-tech-specs.html">www.netapp.com/us/products/storage-systems/fas3200/fas3200-tech-specs.html</a>

**Note:** For V-Series part numbers refer to the [V-Series technical specifications](#).

## 10.2 NetApp Ethernet Expansion Modules

Table 12 lists the NetApp 10GbE and FCoE adapter options.

Table 12) NetApp 10GbE adapter options.

Component	Part Number	Technical Specifications
NetApp X1160A	X1160A-R6	<a href="http://hww.netapp.com/Resources/generatedPDFs/AdapterCards-8.2-Clustered-Data-ONTAP-FAS.pdf">http://hww.netapp.com/Resources/generatedPDFs/AdapterCards-8.2-Clustered-Data-ONTAP-FAS.pdf</a>  <a href="https://library.netapp.com/ecm/ecm_download_file/ECMP1368525">https://library.netapp.com/ecm/ecm_download_file/ECMP1368525</a>
NetApp X1117A	X1117A-R6	
NetApp X1139A	X1139A-R6	
NetApp X1140A	X1140A-R6	
NetApp X1143A	X1143A-R6	

## 10.3 NetApp Disk Shelves and Disks

A minimum of one NetApp disk shelf is required for storage controllers. V-Series controllers can also use third-party arrays, but their performance depends on the performance of those third-party drives. The NetApp shelf type selected determines which drive types are available within that shelf. For example, the DS4243 shelf supports SAS, SATA, and SSD drives, but not FC drives.

**Note:** The FAS2240 is offered as a configuration that includes dual storage controllers plus disks housed within the same chassis. This configuration is offered with SATA or SAS drives; therefore, additional external disk shelves are not needed unless performance or capacity requirements dictate more spindles.

**Note:** All disk shelf part numbers are for the empty shelf with two AC PSUs. Consult your sales representative for additional part numbers.

**Note:** Disk drive part numbers vary according to the size and form factor of the disk you intend to purchase. Consult your sales representative for additional part numbers.

Table 13 lists the NetApp disk shelf options.

**Table 13) NetApp disk shelf options.**

Disk Shelf	Part Number	Technical Specifications
DS2246	X559A-R6	<a href="http://www.netapp.com/us/products/storage-systems/disk-shelves-and-storage-media/disk-shelves-tech-specs.html">www.netapp.com/us/products/storage-systems/disk-shelves-and-storage-media/disk-shelves-tech-specs.html</a>
DS4243	X556A-R6	<a href="http://www.netapp.com/us/products/storage-systems/disk-shelves-and-storage-media/disk-shelves-tech-specs.html">www.netapp.com/us/products/storage-systems/disk-shelves-and-storage-media/disk-shelves-tech-specs.html</a> <a href="http://media.netapp.com/documents/ds-3096.pdf">http://media.netapp.com/documents/ds-3096.pdf</a>
DS4246	X24M-R6	<a href="http://www.netapp.com/us/products/storage-systems/disk-shelves-and-storage-media/disk-shelves-tech-specs.html">www.netapp.com/us/products/storage-systems/disk-shelves-and-storage-media/disk-shelves-tech-specs.html</a>
DS4486	210-05399	<a href="http://www.netapp.com/us/products/storage-systems/disk-shelves-and-storage-media/disk-shelves-tech-specs.html">www.netapp.com/us/products/storage-systems/disk-shelves-and-storage-media/disk-shelves-tech-specs.html</a>

Table 14 lists the NetApp disk drive options.

**Table 14) NetApp disk drive options.**

Component	Part Number	Technical Specifications
900GB SAS	X417A-R6	<a href="http://support.netapp.com/NOW/knowledge/docs/hardware/NetApp/cl_syscfg/scgx8.0.1/comp_fgx.pdf">http://support.netapp.com/NOW/knowledge/docs/hardware/NetApp/cl_syscfg/scgx8.0.1/comp_fgx.pdf</a>  <a href="http://hwu.netapp.com/Drives/Index">http://hwu.netapp.com/Drives/Index</a>
600GB SAS	X412A-R5	
450GB SAS	X411A-R5	
300GB SAS	X410A-R5	
200GB SSD	X446A-R6	
400GB SSD	X438A-R6	
800GB SSD	X447A-R6	
1.6TB SSD	X439A-R6	
500GB SATA	X310A-R5	
1TB SATA	X302A-R5	
2TB SATA	X306A-R5	
3TB SATA	X308A-R5	

## 10.4 NetApp Software Licensing Options

Table 15 lists the NetApp software licensing options.

Table 15) NetApp software licensing options.

NetApp Software Licensing	Part Number	Technical Specifications
SW, Complete BNDL, 3240A, -C	SW-3240A-COMP-BNDL-C	<a href="https://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml">https://now.netapp.com/NOW/knowledge/docs/ontap/ontap_index.shtml</a>
SW, Data ONTAP Essentials, 3240A, -C	SW-3240A-ONTAP8-C	

## 10.5 NetApp Support Licensing Options

SupportEdge premium licenses are required, and the part numbers for those licenses vary based on the options selected in the FlexPod design. For example, software license part numbers are different depending on which FAS controller you choose. Consult your sales representative for exact part numbers of the individual support licenses.

Table 16 lists the NetApp support licensing options.

Table 16) NetApp support licensing options.

NetApp Support Licensing	Part Number	Technical Specifications
SupportEdge Premium 4 hours onsite - months: 36	CS-O2-4HR	<a href="http://www.netapp.com/us/support/supportedge.html">www.netapp.com/us/support/supportedge.html</a>

## 11 Power and Cabling Requirements

This section describes the minimum power and cabling requirements for a FlexPod design.

### 11.1 Power Requirements

The power requirements described are based on U.S. specifications and assume the use of alternating current (AC) power. Other countries may have different power requirements. Direct current (DC) power options are also available for most components. For additional data on the maximum power required as well as other detailed power information, consult the detailed technical specifications for each hardware component.

For detailed Cisco UCS power data, refer to the [Cisco UCS Power Calculator](#). Table 17 lists the power ports required per device.

Table 17) Power ports required per device.

Cisco UCS Chassis	Power Ports Required
Cisco UCS 5108	4x C19 for each Cisco UCS 5000 series chassis
Cisco UCS Fabric Interconnects	Power Ports Required
Cisco UCS 6248UP	2 C13/C14 power cables for each fabric interconnect
Cisco UCS 6296UP	

Cisco Nexus 5000 Series Switches		Power Ports Required
Cisco Nexus 5548UP		2 C13/C14 power cables for each Cisco Nexus 5000 series switch
Cisco Nexus 5548P		
Cisco Nexus 5596UP		
Cisco Nexus 6000 Series Switches		Power Ports Required
Cisco Nexus 6001		Consult Cisco Power supply data sheet as some installations require additional considerations: <a href="http://www.cisco.com/en/US/docs/switches/datacenter/nexus6000/hw/installation/guide/techspec.html#wp1098443">http://www.cisco.com/en/US/docs/switches/datacenter/nexus6000/hw/installation/guide/techspec.html#wp1098443</a>
Cisco Nexus 6004		
Cisco Nexus 7000 Series Switches		Power Ports Required
Cisco Nexus 7004		Consult Cisco Power supply data sheet as some installations require additional considerations: <a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/data_sheet_c78-602255.html">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/data_sheet_c78-602255.html</a>
Cisco Nexus 7009		
Cisco Nexus 7010		
Cisco Nexus 7018		
Cisco Nexus 7706		
Cisco Nexus 7710		
Cisco Nexus 7718		
NetApp FAS Controllers		Power Ports Required (Per HA Pair)
FAS6290		4 C13/C14
FAS6250		4 C13/C14
FAS6220		4 C13/C14
FAS3250		4 C13/C14
FAS3220		4 C13/C14
FAS2240		4 C13/C14 or 2 C13/C14 depending on the controller/ chassis configuration
FAS2220		2 C13/C14
NetApp Disk Shelves		Power Ports Required
DS2246		2 C13/C14
DS4243		4 C13/C14
DS4246		4 C13/C14
DS4486		4 C13/C14

**Note:** Cisco UCS blades do not require individual power connections.



## 11.2 Minimum Cable Requirements

This section describes the minimum cable requirements. Most FlexPod implementations require additional cables, but the number varies based on the deployment size and scope.

Table 18 lists the minimum number of cables required for each device.

**Table 18) Minimum number of cables required for each device.**

Cisco UCS Chassis	Cables Required
Cisco UCS 5108	<ul style="list-style-type: none"> <li>At least two twinax cables per Cisco UCS 2104XP/2204XP/2208XP module</li> </ul>
Cisco UCS Fabric Interconnects	Cables Required
Cisco UCS 6248UP	<ul style="list-style-type: none"> <li>Two Cat5e cables for management ports</li> <li>Two Cat5e cables for the L1, L2 interconnects, per pair of fabric interconnects</li> </ul>
Cisco UCS 6296UP	<ul style="list-style-type: none"> <li>At least four twinax cables per fabric interconnect</li> <li>At least four FC cables per fabric interconnect</li> </ul>
Cisco Nexus 5000 Series Switches	Cables Required
Cisco Nexus 5548UP	<ul style="list-style-type: none"> <li>At least two 10GbE fiber or twinax cables per switch</li> </ul>
Cisco Nexus 5548P	<ul style="list-style-type: none"> <li>At least two FC cables per switch</li> </ul>
Cisco Nexus 5596UP	
Cisco Nexus 6000 Series Switches	Cables required
Cisco Nexus 6001	<ul style="list-style-type: none"> <li>At least two 10GbE fiber or twinax cables per switch</li> </ul>
Cisco Nexus 6004	<ul style="list-style-type: none"> <li>At least two FC cables per switch for FCoE port channels</li> </ul>
Cisco Nexus 7000 Series Switches	Cables Required
Cisco Nexus 7004	<ul style="list-style-type: none"> <li>At least two 10GbE fiber or twinax cables per switch</li> </ul>
Cisco Nexus 7009	<ul style="list-style-type: none"> <li>At least two FC cables per switch for FCoE port channels</li> </ul>
Cisco Nexus 7010	
Cisco Nexus 7018	
Cisco Nexus 7706	
Cisco Nexus 7710	
Cisco Nexus 7718	
NetApp FAS Controllers	Cables Required
FAS6290	<ul style="list-style-type: none"> <li>A pair of SAS or SATA cables per storage controller</li> </ul>
FAS6250	<ul style="list-style-type: none"> <li>At least two FC cables per controller, if using legacy FC</li> </ul>
FAS6220	<ul style="list-style-type: none"> <li>At least two 10GbE cable per controller</li> </ul>

FAS3250	<ul style="list-style-type: none"> <li>• At least one GbE cable for management per controller</li> <li>• If deploying clustered Data ONTAP, eight short twinax cables are required per pair of cluster interconnect switches</li> </ul>
FAS3220	
FAS2240	
FAS2220	
<b>NetApp Disk Shelves</b>	<b>Cables Required</b>
DS2246	<ul style="list-style-type: none"> <li>• Two SAS, SATA, or FC cables per disk shelf</li> </ul>
DS4243	
DS4246	
DS4486	

## 12 Legacy Equipment

FlexPod is a flexible solution that allows the customer to leverage existing gear and new gear currently for sale by Cisco and NetApp. Occasionally both Cisco and NetApp EOL certain models of equipment. Even though these models of equipment are no longer for sale, customers who bought one of these models prior to the EOS date can leverage that equipment in a FlexPod configuration. Table 19 shows the equipment models that are supported in FlexPod, but that are no longer for sale.

Table 19) Legacy equipment.

Legacy Equipment	
Cisco UCS B200 M1	Cisco UCS 6120XP
Cisco UCS B250 M1 Extended Memory	Cisco UCS 6140XP
Cisco UCS B230 M1	Cisco Nexus 5010
Cisco UCS B440 M1 High-Performance	Cisco Nexus 5020
Cisco UCS C200 M1	NetApp FAS6280/V6280
Cisco UCS C210 M1	NetApp FAS6240/V6240
Cisco UCS C250 M1	NetApp FAS6220/V6220
Cisco UCS B200 M2	NetApp FAS6080/V6080
Cisco UCS C200 M2	NetApp FAS6040/V6040
Cisco UCS C210 M2	NetApp FAS3170/V3170
Cisco UCS 2104XP FEX	NetApp FAS3160/V3160
Cisco UCS C250 M2 Extended Memory	NetApp FAS3140/V3140

## Appendix: Technical Specifications and Reference

This appendix describes some additional important technical specifications for each of the FlexPod components.

## Cisco UCS B-Series Blade Server Chassis

Table 20 lists Cisco UCS B-Series blade server chassis options.

Table 20) Cisco UCS B-Series blade server chassis options.

Component	Cisco UCS 5100 Series Blade Server Chassis
Rack units	6
Maximum full-width blades	4
Maximum half-width blades	8
Capable of unified fabric	Yes
Midplane I/O	Up to 80GB/sec of I/O bandwidth per server
I/O bays for fabric extenders	Two bays for Cisco UCS 2104XP, 2204XP, and 2208XP fabric extenders

For more information, refer to the [Cisco UCS 5100 Series datasheet](#).

## Cisco UCS Fabric Extender Modules for Cisco UCS B-Series Blade Server Chassis

Table 21 lists Cisco UCS FEX modules for the Cisco UCS B-Series blade server chassis.

Table 21) Cisco UCS FEX modules for the Cisco UCS B-Series blade server chassis.

Component	Cisco UCS 2204XP FEX	Cisco UCS 2208XP FEX
Midplane ports	16x10GB/sec	32x10GB/sec
Uplink ports	4x10GB/sec, SFP+	8x10GB/sec, SFP+
Hardware forwarding performance	160GB/sec	160GB/sec
Jumbo frames support	Yes	Yes
Cisco VM-FEX support	Yes	Yes

For more information, refer to the following Cisco UCS 2200 Series Fabric Extenders datasheet: [http://www.cisco.com/en/US/prod/collateral/ps10265/ps10276/data\\_sheet\\_c78-675243.pdf](http://www.cisco.com/en/US/prod/collateral/ps10265/ps10276/data_sheet_c78-675243.pdf)

## Cisco UCS B-Series Blade Servers

Table 22 lists the Cisco UCS B-Series blade server options.

Table 22) Cisco UCS B-Series blade server options.

Component	Cisco UCS B22 M3	Cisco UCS B200-M3	Cisco UCS B230 M2	Cisco UCS B420 M3	Cisco UCS B440-M2 High-Performance
Number of processor sockets	2	2	2	4	4
Processor support	Intel® Xeon® E5-2400	Intel Xeon E5-2600	Intel Xeon E7-2800 series	Intel Xeon E5-4600	Intel Xeon E7-4800 series

Component	Cisco UCS B22 M3	Cisco UCS B200-M3	Cisco UCS B230 M2	Cisco UCS B420 M3	Cisco UCS B440-M2 High-Performance
Memory capacity	12 DIMMs for a maximum of 192GB	24 DIMMS for a maximum of 768GB	32 DIMMs for a maximum of 512GB	48 DIMMs for a maximum of 1.5TB	32 DIMMs for a maximum of 1TB
Memory size and speed	16GB DDR3 RDIMMs	16GB DDR3; 1600MHz	4, 8, and 16GB DDR3; 1066MHz	32GB DDR3 RDIMMs	4, 8, and 16GB DDR3; 1066MHz
SAN boot support	Yes	Yes	Yes	Yes	Yes
Mezzanine I/O adapter slots	1	1	1	2	2
I/O max throughput	80Gbps	80Gbps	20Gbps	160Gbps	40Gbps
Form factor	Half width	Half width	Half width	Full width	Full width
Max servers per chassis	8	8	8	4	4

Table 23 lists the Cisco UCS B-Series blade server options datasheets.

**Table 23) Cisco UCS B-Series blade server options datasheets.**

Component	Cisco UCS Datasheet
Cisco UCS B22-M3	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-706100.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-706100.html</a>
Cisco UCS B200-M3	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ps12288/data_sheet_c78-700625.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ps12288/data_sheet_c78-700625.html</a>
Cisco UCS B230-M2	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ps11583/data_sheet_c78-646961.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ps11583/data_sheet_c78-646961.html</a>
Cisco UCS B420-M3 High-Performance	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-706603.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-706603.html</a>
Cisco UCS B440-M2 High-Performance	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ps11584/data_sheet_c78-646960.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ps11584/data_sheet_c78-646960.html</a>

## Cisco UCS C-Series Rack Servers

Table 24 lists the Cisco UCS C-Series rack server options.

**Table 24) Cisco UCS C-Series rack server options (part 1 of 2).**

Component	Cisco UCS C22 M3	Cisco UCS C220 M3	Cisco UCS C24 M3
Processor support	1 or 2 Intel Xeon E5-2400	1 or 2 Intel E5-2600 series	2 Intel Xeon E5-2400
Maximum memory capacity	192GB	256GB	192GB
PCIe slots	4	2	5

Component	Cisco UCS C22 M3	Cisco UCS C220 M3	Cisco UCS C24 M3
Form factor	1 RU	1 RU	2 RU

Table 25 lists the Cisco UCS C-Series rack server options.

**Table 25) Cisco UCS C-Series rack server options (part 2 of 2).**

Component	Cisco UCS C240 M3	Cisco UCS C260 M2	Cisco UCS C420 M3	Cisco UCS C460 M2
Processor support	1 or 2 Intel E5-2600 series	2 Intel Xeon E7-2800 series	2 or 4 Intel Xeon E5-4600 series	2 or 4 Intel Xeon E7-8800/4800
Maximum memory capacity	384GB	1TB	1.5TB	2TB
PCIe slots	5	7	7	10
Form Factor	2 RU	2 RU	2 RU	4 RU

Table 26 lists the Cisco UCS C-Series rack server options datasheets.

**Table 26) Cisco UCS C-Series rack server options datasheets.**

Component	Cisco UCS Datasheet
Cisco UCS C22 M3	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706101.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706101.html</a>
Cisco UCS C220 M3	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps12369/data_sheet_c78-700626.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps12369/data_sheet_c78-700626.html</a>
Cisco UCS C24 M3	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706103.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706103.html</a>
Cisco UCS C240 M3	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps12370/data_sheet_c78-700629.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps12370/data_sheet_c78-700629.html</a>
Cisco UCS C260 M2	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps11588/data_sheet_c78-648148.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps11588/data_sheet_c78-648148.html</a>
Cisco UCS C420 M3	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-717325.html">http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-717325.html</a>
Cisco UCS C460 M2	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps11587/data_sheet_c78-648154.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps11587/data_sheet_c78-648154.html</a>

## Cisco UCS CNA or VIC Adapters for Cisco UCS B-Series Blade Server

All currently validated FlexPod architectures use a Cisco UCS virtual interface card (VIC). Other adapters are supported if they are listed in the NetApp [IMT](#) and are compatible with your deployment of FlexPod, but they might not deliver all features outlined in corresponding reference architectures.

Table 27 and Table 28 list the Cisco UCS converged network adapters (CNAs) and VIC adapters for Cisco UCS B-Series blade servers.

Table 27) Cisco UCS CNA adapters for Cisco UCS B-Series blade server.

Component	Cisco UCS CNA M72KR-E Emulex	Cisco UCS CNA M72KR-Q Qlogic	Cisco UCS CNA M73KR-E Emulex	Cisco UCS CNA M73KR-Q QLogic
Uplink ports	2x10GB/sec FCoE	2x10GB/sec FCoE	2x10GB/sec FCoE	2x10GB/sec FCoE
Performance (per port)	250,000 IOPS	250,000 IOPS	250,000 IOPS	250,000 IOPS
Power	18W	4.5W	4.5W	14.36W

Table 28) Cisco UCS VIC adapters for Cisco UCS B-Series blade server.

Component	Cisco UCS 1225 Virtual Interface Card (VIC)	Cisco UCS 1240 Virtual Interface Card (VIC)	Cisco UCS 1280 Virtual Interface Card (VIC)
Uplink ports	2x10GB/sec FCoE	4x 10GB/sec FCoE	8x 10Gb/sec FCoE
Performance (per port)	10GB/sec line rate; >600,000 IOPS	10GB/sec line rate	10GB/sec line rate
Power	12W	12W	12W
Blade ports	256 virtual interfaces (Ethernet and FC)	256 virtual interfaces (8 reserved for internal use)	256 virtual interfaces (8 reserved for internal use)
Hardware offload	FCoE	FCoE	FCoE
SR-IOV support	Yes	Yes	Yes

Table 29 lists the Cisco UCS CNA and VIC adapters for Cisco UCS B-Series blades datasheets.

Table 29) Cisco UCS CNA and VIC adapters for Cisco UCS B-Series blades datasheets.

Component	Cisco UCS Datasheet
Cisco UCS CNA M72KR-E Emulex	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-703582.html">http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-703582.html</a>
Cisco UCS CNA M72KR-Q Qlogic	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-623738.html">www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-623738.html</a>
Cisco UCS CNA M73KR-E Emulex	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ucs_kre_emulex_ds.pdf.pdf">http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/ucs_kre_emulex_ds.pdf.pdf</a>
Cisco UCS CNA M73KR-Q QLogic	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-703587.html">http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/data_sheet_c78-703587.html</a>
Cisco UCS 1225 VIC	<a href="http://www.cisco.com/en/US/products/ps12571/index.html">www.cisco.com/en/US/products/ps12571/index.html</a>
Cisco UCS 1240 VIC	<a href="http://www.cisco.com/en/US/prod/collateral/modules/ps10277/ps12377/data_sheet_c78-699459.html">www.cisco.com/en/US/prod/collateral/modules/ps10277/ps12377/data_sheet_c78-699459.html</a>
Cisco UCS 1280 VIC	<a href="http://www.cisco.com/en/US/prod/collateral/ps10277/ps11551/data_sheet_c78-677682.html">www.cisco.com/en/US/prod/collateral/ps10277/ps11551/data_sheet_c78-677682.html</a>

## Cisco UCS Fabric Interconnects

Table 30 lists the Cisco UCS fabric interconnect options.

Table 30) Cisco UCS fabric interconnect options.

Component	Cisco UCS 6248UP	Cisco UCS 6296UP
Form factor	1U	2U
Total ports	48	96
Number of fixed SFP+ ports	32	48
Throughput	960GB/sec	1.92TB/sec
Expansion slots	1	3

Table 31 lists the Cisco UCS fabric interconnect options datasheets.

Table 31) Cisco UCS fabric interconnect options datasheets.

Component	Cisco UCS Datasheet
Cisco UCS 6248UP	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps11544/data_sheet_c78-675245.html">www.cisco.com/en/US/prod/collateral/ps10265/ps11544/data_sheet_c78-675245.html</a>
Cisco UCS 6296UP	<a href="http://www.cisco.com/en/US/prod/collateral/ps10265/ps11544/data_sheet_c78-675245.html">www.cisco.com/en/US/prod/collateral/ps10265/ps11544/data_sheet_c78-675245.html</a>

## Cisco Nexus 5000 Series Switches

Table 32 lists the Cisco Nexus 5000 series switch options.

Table 32) Cisco Nexus 5000 series switch options.

Component	Cisco Nexus 5548UP	Cisco Nexus 5548P	Cisco Nexus 5596UP
Form factor (RU)	1	1	2
Maximum ports	48	48	96
Fixed ports 1/10GB and FCoE	32	32	48
Maximum support for FEX modules	24	24	24
Maximum 1/10GB and FCoE ports	48	48	96
Layer 3 daughter card supported	Yes	Yes	No
Layer 3 module supported	No	No	Yes

Table 33 lists the Cisco Nexus 5000 series switch options datasheets.

Table 33) Cisco Nexus 5000 series switch options datasheets.

Component	Cisco Nexus Datasheet
Cisco Nexus 5548UP	<a href="http://www.cisco.com/en/US/products/ps11681/index.html">http://www.cisco.com/en/US/products/ps11681/index.html</a>

Component	Cisco Nexus Datasheet
Cisco Nexus 5548P	<a href="http://www.cisco.com/en/US/products/ps11215/index.html">http://www.cisco.com/en/US/products/ps11215/index.html</a>
Cisco Nexus 5596UP (2U)	<a href="http://www.cisco.com/en/US/products/ps11577/index.html">http://www.cisco.com/en/US/products/ps11577/index.html</a>

## Cisco Nexus 6000 Series Switches

Table 34 lists the Cisco Nexus 6000 series switch options.

Table 34) Cisco Nexus 6000 series switch options.

Component	Cisco Nexus 6001	Cisco Nexus 6004
Form factor (RU)	1	4
Maximum 1 or 10 GbE ports	64	384
Maximum 40GB ports	4	96

Table 35 lists the Cisco Nexus 6000 series switch options datasheets.

Table 35) Cisco Nexus 6000 series switch options datasheets.

Component	Cisco Nexus Datasheet
Cisco Nexus 6001	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps12806/ps12869/data_sheet_c78-726128.pdf">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps12806/ps12869/data_sheet_c78-726128.pdf</a>
Cisco Nexus 6004	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps12806/ps12807/data_sheet_c78-723667.pdf">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps12806/ps12807/data_sheet_c78-723667.pdf</a>

## Cisco Nexus 7000 Series Switches

Table 36 and Table 37 lists the Cisco Nexus 7000 series switch options.

Table 36) Cisco Nexus 7000 series switch options part 1.

Component	Cisco Nexus 7004	Cisco Nexus 7009	Cisco Nexus 7010	Cisco Nexus 7018
Form factor (RU)	7	14	21	25
Maximum 1 or 10 GbE ports	96	336	384	768
Maximum 40GB ports	12	42	48	96
Maximum 100GB ports	4	14	16	32

Table 37) Cisco Nexus 7000 series switch options part 2.

Component	Cisco Nexus 7706	Cisco Nexus 7710	Cisco Nexus 7718
Form factor (RU)	9	14	26
Maximum 1 or 10 GbE ports	192	384	768
Maximum 40GB ports	96	192	384



Component	Cisco Nexus 7706	Cisco Nexus 7710	Cisco Nexus 7718
Maximum 100GB ports	48	96	192

Table 38 lists the Cisco Nexus 7000 series switch options datasheets.

**Table 38) Cisco Nexus 7000 series switch datasheets.**

Component	Cisco Nexus Datasheet
Cisco Nexus 7004	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/ps9512/Data_Sheet_C78-437762.html">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/ps9512/Data_Sheet_C78-437762.html</a>
Cisco Nexus 7009	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/ps9512/Data_Sheet_C78-437762.html">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/ps9512/Data_Sheet_C78-437762.html</a>
Cisco Nexus 7010	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/ps9512/Data_Sheet_C78-437762.html">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/ps9512/Data_Sheet_C78-437762.html</a>
Cisco Nexus 7018	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/ps9512/Data_Sheet_C78-437762.html">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/ps9512/Data_Sheet_C78-437762.html</a>
Cisco Nexus 7706	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/data_sheet_c78-728187.html">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/data_sheet_c78-728187.html</a>
Cisco Nexus 7710	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/data_sheet_c78-728187.html">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/data_sheet_c78-728187.html</a>
Cisco Nexus 7718	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/data_sheet_c78-728187.html">http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/data_sheet_c78-728187.html</a>

## Cisco Nexus Fabric Extenders

Table 39 lists the details of Cisco Nexus FEX.

**Table 39) Cisco Nexus FEX.**

Component	Cisco Nexus 2232PP
Speed	10GbE
Fixed 10GbE and FCoE ports	32
Fixed 10GbE and FCoE uplinks	8
Form factor	1 RU
Datasheet	<a href="http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps10110/data_sheet_c78-507093.html">www.cisco.com/en/US/prod/collateral/switches/ps9441/ps10110/data_sheet_c78-507093.html</a>

## Small Form-Factor Pluggable Modules

Table 40 lists the Ethernet SFP modules for Cisco Nexus 5000, 6000, and 7000 series switches and Cisco UCS fabric interconnects.

**Table 40) Ethernet SFP modules for Cisco Nexus 5000, 6000, and 7000 series switches and Cisco UCS fabric interconnects.**

Component	Cisco SFP-10G-SR	Cisco SFP-10G-LR	Cisco SFP-10G-ER
Bandwidth	10GB/sec	10GB/sec	10GB/sec

Component	Cisco SFP-10G-SR	Cisco SFP-10G-LR	Cisco SFP-10G-ER
Maximum distance	26m	10km	40km
Wavelength	850nm	1310nm	1550nm
Cable type	MMF	SMF	SMF
Part number	SFP-10G-SR	SFP-10G-LR	SFP-10G-ER

For more information, refer to the [Cisco Nexus Ethernet SFP Specifications](#).

**Note:** If you are using a Cisco Nexus or Cisco UCS Unified Port (UP) model switch, no expansion modules are required.

Table 41 lists the FC SFP modules for Cisco Nexus 5000, 6000, and 7000 series switches and Cisco UCS fabric interconnects.

Table 41) FC SFP modules for Cisco Nexus 5000 series switches and Cisco UCS fabric interconnects.

Component	Cisco DS-SFP-FC4G-SW	Cisco DS-SFP-FC4G-LW	Cisco DS-SFP-FC8G-SW	Cisco DS-SFP-FC8G-LW
Bandwidth	4GB/sec	4GB/sec	8GB/sec	8GB/sec
Maximum distance	860m	10km	520m	10km
Wavelength	850nm	1310nm	850nm	1310nm
Cable type	MMF	SMF	MMF	SMF
Part number	DS-SFP-FC4G-SW	DS-SFP-FC4G-LW	DS-SFP-FC8G-SW	DS-SFP-FC8G-LW

For more information, refer to the [Cisco Nexus FC SFP Specifications](#).

**Note:** If you are using a Cisco Nexus or Cisco UCS UP model switch, no expansion modules are required.

## NetApp Storage Controllers

Table 42 lists the current NetApp storage controller options.

Table 42) NetApp storage controller options.

Current Component	FAS6290/V6280	FAS6250/V6240	FAS6220/V6210	FAS3250/V3250	FAS3220/V3220	FAS2240-2	FAS2220
Configuration	Dual chassis HA	Dual chassis HA	Single chassis HA	Dual chassis HA	Single chassis HA	Dual chassis HA	Single chassis HA
Rack units	12U	12U	6U	6U	3U	2U	2U
Memory	192GB	144GB	96GB	40GB	24GB	12GB	12GB
Flash Cache (maximum)	16TB	8TB	6TB	2TB	1TB	1TB	512GB
Maximum volume or aggregate size	100TB	100TB	70TB	70TB	60TB	120TB	120 TB

Current Component	FAS6290/ V6280	FAS6250/ V6240	FAS6220/ V6210	FAS3250/ V3250	FAS3220/ V3220	FAS2240-2	FAS2220
Maximum number of LUNs	4,096					1,024	
Storage networking supported	FC, FCoE, IP SAN (iSCSI), NFS, CIFS, HTTP, and FTP					FC, IP SAN (iSCSI), NFS, CIFS	IP SAN (iSCSI), NFS, CIFS
Maximum number of FlexVol® volumes	500 per controller						
Maximum number of supported SAN hosts	Up to 512 hosts per HA pair						
Maximum number of Snapshot™ copies	127,000						

**Note:** Flash Cache is only supported through Data ONTAP operating in 8.0.x for the FAS3210.

**Note:** For the FAS2200 series product line, FAS2240 is the only product included as part of FlexPod. NetApp recommends the FAS2240-2 if you are using the FAS2200 series.

Table 43 lists the current NetApp storage controller options datasheets.

**Table 43) NetApp storage controller options datasheets.**

Component	Storage Controller Datasheet
FAS6200 series datasheet	<a href="http://www.netapp.com/us/products/storage-systems/fas6200/fas6200-tech-specs.aspx">http://www.netapp.com/us/products/storage-systems/fas6200/fas6200-tech-specs.aspx</a>
FAS3200 series datasheet	<a href="http://www.netapp.com/us/products/storage-systems/fas3200/fas3200-tech-specs.aspx">http://www.netapp.com/us/products/storage-systems/fas3200/fas3200-tech-specs.aspx</a>
FAS2200 series datasheet	<a href="http://www.netapp.com/us/products/storage-systems/fas2200/fas2200-tech-specs.html">www.netapp.com/us/products/storage-systems/fas2200/fas2200-tech-specs.html</a>
V-Series datasheet	<a href="http://www.netapp.com/us/products/storage-systems/v-series/v-series-tech-specs.aspx">http://www.netapp.com/us/products/storage-systems/v-series/v-series-tech-specs.aspx</a>

**Note:** For the FAS2200 series product line, Both FAS2220 and FAS2240 are supported options in FlexPod. However, configuration changes will need to be made with these products because of intentional product limitations. For example, to use a FAS2200 series with clustered Data ONTAP, your cluster network would only be 1GbE. To use a FAS2200 series with Data ONTAP operating in 7-Mode, you will need to use iSCSI boot to take advantage of 10GbE uplink ports. NetApp recommends FAS2240-2 if you are using the FAS2200 series.

Table 44 lists the legacy equipment options.

**Note:** These legacy equipment options are no longer for sale because they have been announced as EOL/EOS by their respective companies. Although these models are no longer sold, if you already own them, they are still supported pieces of equipment in a FlexPod environment.

Table 44) Legacy equipment options.

Legacy Equipment	
Cisco UCS B200 M1	Cisco UCS 6120XP
Cisco UCS B250 M1 Extended Memory	Cisco UCS 6140XP
Cisco UCS B230 M1	Cisco Nexus 5010
Cisco UCS B440 M1 High-Performance	Cisco Nexus 5020
Cisco UCS C200 M1	NetApp FAS6280/V6280
Cisco UCS C210 M1	NetApp FAS6240/V6240
Cisco UCS C250 M1	NetApp FAS6220/V6220
Cisco UCS B200 M2	NetApp FAS6080/V6080
Cisco UCS C200 M2	NetApp FAS6040/V6040
Cisco UCS C210 M2	NetApp FAS3170/V3170
Cisco UCS 2104XP FEX	NetApp FAS3160/V3160
Cisco UCS C250 M2 Extended Memory	NetApp FAS3140/V3140

For more information about legacy equipment, refer to the following sources:

- [www.cisco.com/en/US/products/ps10493/prod\\_eol\\_notices\\_list.html](http://www.cisco.com/en/US/products/ps10493/prod_eol_notices_list.html)
- [www.cisco.com/en/US/products/ps10280/prod\\_eol\\_notices\\_list.html](http://www.cisco.com/en/US/products/ps10280/prod_eol_notices_list.html)
- <https://support.netapp.com/info/web/ECMP1110975.html>
- <http://support.netapp.com/info/web/ECMP1110982.html#130507>
- <http://www.netapp.com/us/products/storage-systems/v-series/v-series-tech-specs-more.aspx>

## NetApp Ethernet Adapters

Table 45 lists the NetApp 10GbE adapters.

Table 45) NetApp 10GbE adapters.

Component	X1160A-R6*	X1117A-R6	X1139A-R6	x1140A-R6
Port count	2	2	2	2
Adapter type	SFP+ with fiber	SFP+ or copper	UTA with fiber	UTA with copper

\*X1160A-R6 SFP+ is only supported with FAS2200 series controllers.

For more information, refer to the [NetApp 10GbE adapters datasheet](#).

## NetApp Disk Shelves

Table 46 lists the NetApp disk shelf options.

Table 46) NetApp disk shelf options.

Component	DS2246	DS4243	DS4246	DS4486
Form factor	2U	4U	4U	4U

Component	DS2246	DS4243	DS4246	DS4486
Drives per enclosure	24	24	24	48
Drive form factor	2.5" small form factor	3.5" large form factor	3.5" large form factor	3.5" large form factor
Shelf I/O modules	Dual IOM6 modules	Dual IOM3 modules	Dual IOM6 modules	Dual IOM6 modules

For more information, refer to the [NetApp disk shelves datasheet](#).

## NetApp Disk Drives

Table 47 lists the NetApp disk shelf options.

Table 47) NetApp disk shelf options.

Component	2.5" SAS	3.5" SAS	SSD	SATA
Form factor	2.5"	3.5"	3.5"	3.5"
Disk capacities	450GB, 600GB, 900GB	450GB, 600GB	200GB, 800GB	1TB, 2TB, 3TB
Disk RPM	10k	15k	N/A	7.2k
Supporting controllers	FAS/V3070, FAS/V3100 series, FAS/V3200 series, FAS/V6000 series, FAS/V6200 series	FAS/V3070, FAS/V3100 series, FAS/V3200 series, FAS/V6000 series, FAS/V6200 series	FAS/V3160, FAS/V3170, FAS/V3240, FAS/V3270, FAS/V6040, FAS/V6080, FAS/V6200 series	FAS/V3000 series, FAS/V3100 series, FAS/V3200 series, FAS/V6000 series, FAS/V6200 series
Data ONTAP version required	7.3.3P2 or later, 8.0P1 or later	7.3.3P2 or later, 8.0P1 or later	8.0.1 or later	7.2.2P2 or later, 8.0P1 or later; 3TB SATA requires 8.0.2 or later

For more information, refer to the [NetApp disk drive specifications](#).

## Additional Validated Connectivity Options

For additional validated connectivity options, refer to Figure 2 and Figure 3. Figure 2 shows an Ethernet-only configuration that is booted using iSCSI. Figure 3 shows an FC connectivity configuration.

Figure 2) iSCSI boot scenario.

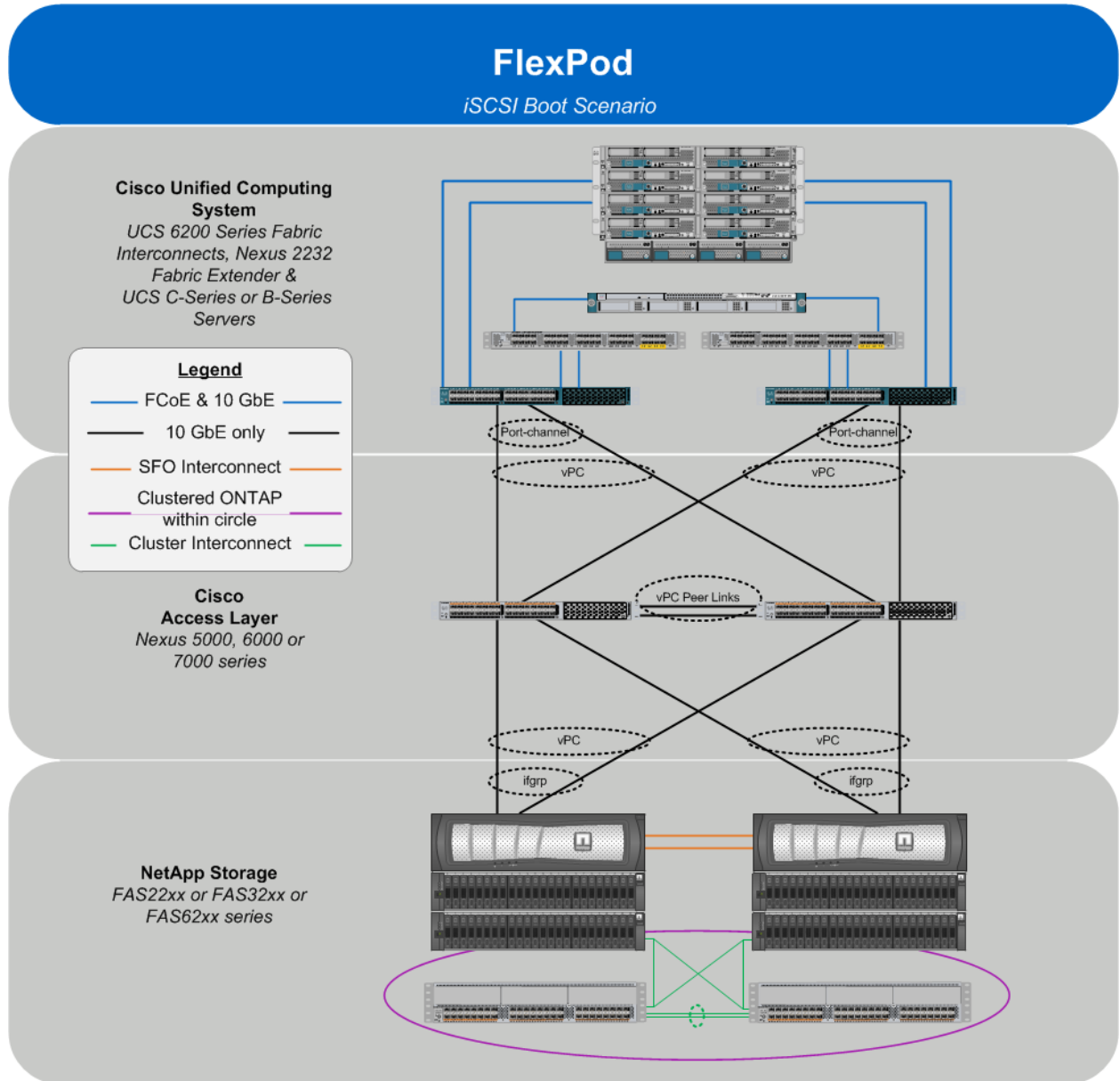
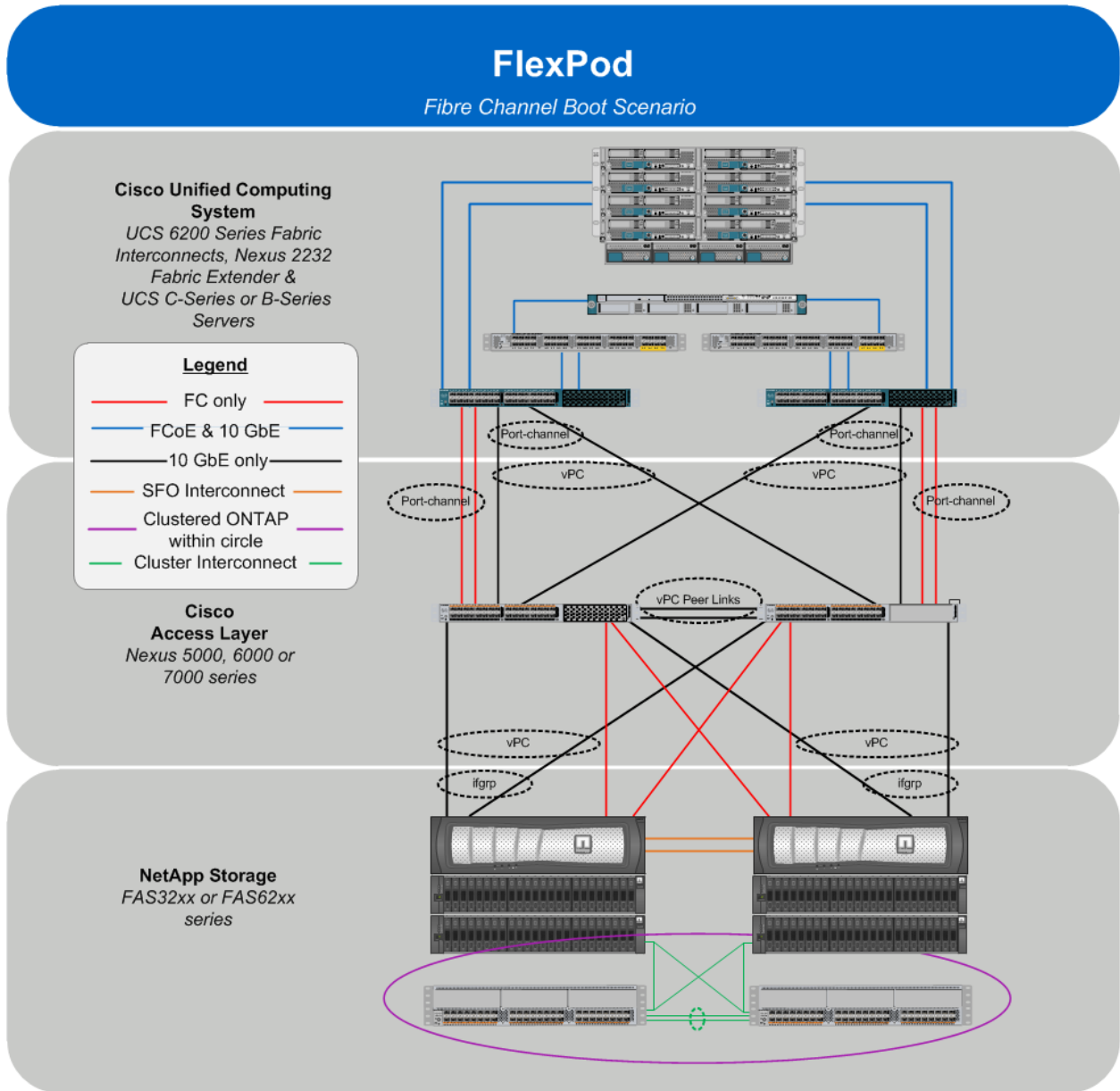


Figure 3) FC boot scenario.



## Version History

Version	Date	Document Version History
Version 1.0	February 2012	Initial release
Version 1.0.1	May 2012	Updated to include FAS2240 and Cisco UCS C-Series.
Version 1.0.2	July 2012	Minor updates.
Version 1.0.3	October 2012	Updated to include clustered Data ONTAP, Cisco UCS M3 servers, and EOL notices for Cisco UCS 6100 and 2100.
Version 1.0.4	April 2013	Updated to include FAS3250. Moved 6100 series FI and 50x0

Version	Date	Document Version History
		series to legacy.
Version 1.0.5	January 2014	Includes the new FAS6200 and 3200 series, Cisco Nexus 6000, and the updated UCS gear.

Refer to the [Interoperability Matrix Tool](#) (IMT) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

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