



Technical Report

FlexPod Express Technical Specifications

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Important

Before ordering a complete FlexPod[®] configuration, check the NetApp[®] [FlexPod Solutions](#) website for the latest version of these technical specifications.

TABLE OF CONTENTS

1	Overview	5
2	Definition of FlexPod Rules	5
3	Data ONTAP Modes of Operation	5
4	Minimum Hardware Requirements	5
5	Minimum Software Requirements	6
6	Connectivity Requirements	6
7	Other Requirements	6
8	Optional Features	6
8.1	Requirements for iSCSI Boot Option	6
8.2	Configuration Options	7
9	Cisco Components	9
9.1	Cisco UCS B-Series Blade Server Options	9
9.2	Cisco UCS C-Series Rack Server Options	10
9.3	Cisco Nexus Switches	10
9.4	Cisco Support Licensing Options	11
10	NetApp Components	11
10.1	NetApp Storage Controller Options	11
10.2	NetApp Ethernet Expansion Modules	12
10.3	NetApp Disk Shelves and Disks	12
10.4	NetApp Software Licensing Options	13
10.5	NetApp Support Licensing Options	14
11	Power and Cabling Requirements	14
11.1	Power Requirements	14
11.2	Minimum Cable Requirements	15
	Appendix: Technical Specifications and Reference	16
	Cisco UCS B-Series Blade Servers	16
	Cisco UCS C-Series Rack Servers	16
	Cisco Nexus 3000 Series Switches	18
	NetApp Storage Controllers	19
	NetApp Ethernet Adapters	20
	NetApp Disk Shelves	21

NetApp Disk Drives	21
Version History	22

LIST OF TABLES

Table 1) Cisco UCS B-Series servers.	9
Table 2) Cisco UCS C-Series rack options.....	10
Table 3) Cisco Nexus switches.	11
Table 4) Cisco support licensing options.	11
Table 5) NetApp storage controller options.	11
Table 6) NetApp 10GbE adapter options.....	12
Table 7) NetApp disk shelf options.	12
Table 8) NetApp disk drive options.....	13
Table 9) NetApp software licensing options.	14
Table 10) NetApp support licensing options.	14
Table 11) Power ports required per device.....	14
Table 12) Minimum number of cables required for each device.	15
Table 13) Cisco UCS B-Series blade server options.	16
Table 14) Cisco UCS M4 servers.	16
Table 15) Cisco UCS C-Series rack server options (part 1 of 2).	17
Table 16) Cisco UCS C-Series rack server options (part 2 of 2).	17
Table 17) Cisco UCS C-Series rack server options datasheets.	17
Table 18) Cisco Nexus 3000 series switch options.	18
Table 19) Cisco Nexus 3000 series switch options datasheets.....	18
Table 20) Cisco Nexus 9000 series switch options.	18
Table 21) Cisco Nexus 9000 series switch options datasheets.....	19
Table 22) NetApp storage controller options.....	19
Table 23) FAS8020 controller characteristics.....	19
Table 24) NetApp storage controller datasheets.	20
Table 25) NetApp 10GbE adapters.	20
Table 26) NetApp disk shelf options.....	21
Table 27) NetApp disk drive options.....	21

LIST OF FIGURES

Figure 1) FlexPod Express small configuration.	7
Figure 2) FlexPod Express medium configuration.....	8
Figure 3) FlexPod Express large configuration.....	8
Figure 4) FlexPod Express Cisco UCS-managed configuration.	9

1 Overview

FlexPod Express is a predesigned, best practice architecture that is built on the Cisco Unified Computing System™ (Cisco UCS®), the Cisco Nexus® family of switches, and NetApp fabric-attached storage (FAS). FlexPod Express is a suitable platform for running a variety of virtualization hypervisors as well as bare metal operating systems and enterprise workloads. FlexPod Express delivers not only a baseline configuration, but also the flexibility to be sized and optimized to accommodate many different use cases and requirements. Three separate FlexPod Express configurations with different rules are presented in this document. The three configurations are small/medium, large, and Cisco UCS-managed.

2 Definition of FlexPod Rules

The FlexPod Express 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 Express configuration. The numbers and rules listed are only the minimum requirements for FlexPod Express.

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 7-Mode. FlexPod Express is validated with both modes of operation, including clustered Data ONTAP operating as switchless cluster. Clustered Data ONTAP provides a highly scalable storage architecture that enables nondisruptive operations, nondisruptive upgrades, and an agile data infrastructure. For more information about NetApp clustering with Data ONTAP 8, refer to [NetApp Data ONTAP 8: Clustering to Achieve Nondisruptive Operations](#).

4 Minimum Hardware Requirements

This section lists the hardware requirements for FlexPod Express:

Small/Medium Configuration

- Two Cisco Nexus 3048 switches in a redundant configuration
- At least two Cisco UCS C-Series rack mount servers
- Two NetApp FAS2200 or FAS2500 series controllers in a high-availability (HA) pair configuration.

Large Configuration

- Two Cisco Nexus 3500 series or Cisco Nexus 9300 series switches in a redundant configuration
- At least two Cisco UCS C-Series rack mount servers
- Two NetApp FAS2552, FAS2554, or FAS8020 controllers in an HA pair configuration; requires two 10 Gigabit Ethernet (10GbE) ports per controller
- One NetApp disk shelf with any supported disk type (when the FAS8020 is used)

Cisco UCS-Managed Configuration

- Two 10 Gigabit/s standard Ethernet switches in a redundant configuration (Cisco Nexus 3524 recommended)
- One Cisco UCS 5108 AC blade server chassis
- Two Cisco UCS 6324 fabric interconnects
- Cisco UCS B-Series servers; at least four Cisco UCS B200 M3 blade servers
- Two NetApp FAS2552, FAS2554, or FAS8020 controllers in an HA pair configuration; requires two available unified target adapter 2 (UTA2) ports per controller

- One NetApp disk shelf with any supported disk type (when the FAS8020 is used)

5 Minimum Software Requirements

This section lists the software requirements for FlexPod Express:

- NetApp Data ONTAP:
 - 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® NX-OS version 5.0(3)N1(1c) 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 previously.
- In the Cisco UCS-Managed configuration, Cisco UCS Manager 3.0(1c)

6 Connectivity Requirements

This section lists the connectivity requirements for FlexPod Express:

- NetApp storage controllers must be directly connected to the Cisco Nexus switches, except in the Cisco UCS-Managed configuration, where storage controllers are connected to the fabric interconnects.
- No additional equipment can be placed inline between the core FlexPod components.
- Virtual port channels (vPCs) are required when the Cisco Nexus 3000/9000 series switches connect to the NetApp storage controllers.
- Jumbo frame support must be enabled throughout the environment.

7 Other Requirements

This section lists other requirements:

- All hardware components and software must be listed and supported on the [NetApp IMT](#).
- Valid support contracts are required for all equipment, including:
 - SMARTnet® support for Cisco equipment
 - SupportEdge Premium support for NetApp equipment

8 Optional Features

The FlexPod Express architecture uses iSCSI boot. The following subsections describe the minimum requirements for iSCSI boot.

8.1 Requirements for iSCSI Boot Option

This subsection describes the requirements for the iSCSI boot option:

- Requires iSCSI license on the NetApp storage controller
- Requires a two-port 10Gb/s Ethernet adapter on the NetApp storage controller

8.2 Configuration Options

For information about the configuration required and validated in the FlexPod Express architecture, refer to the following FlexPod Express implementation guides:

- [FlexPod Express with VMware vSphere 5.5 Update 1: Small and Medium Configurations](#)
- [FlexPod Express with VMware vSphere 5.5 Update 1: Large Configuration](#)

Figure 1 through Figure 4 illustrate the FlexPod Express configurations described in this document.

Figure 1) FlexPod Express small configuration.

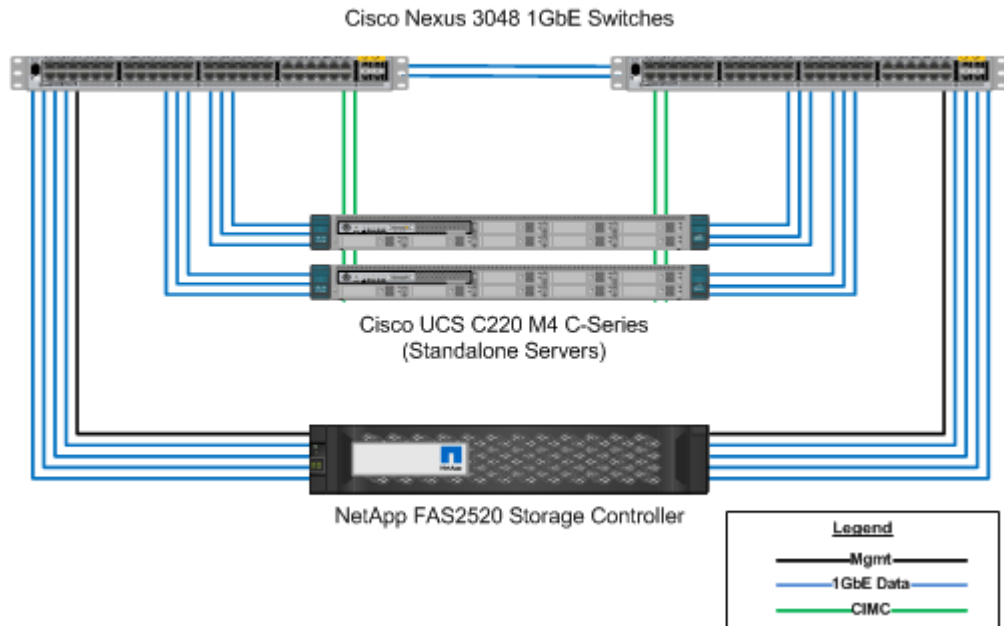


Figure 2) FlexPod Express medium configuration.

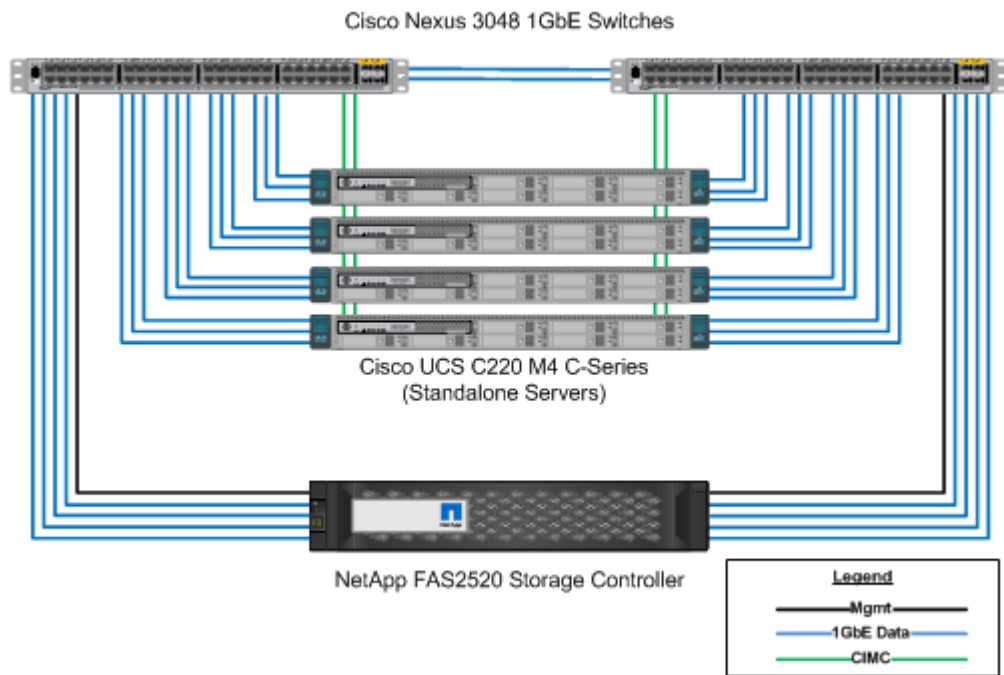


Figure 3) FlexPod Express large configuration.

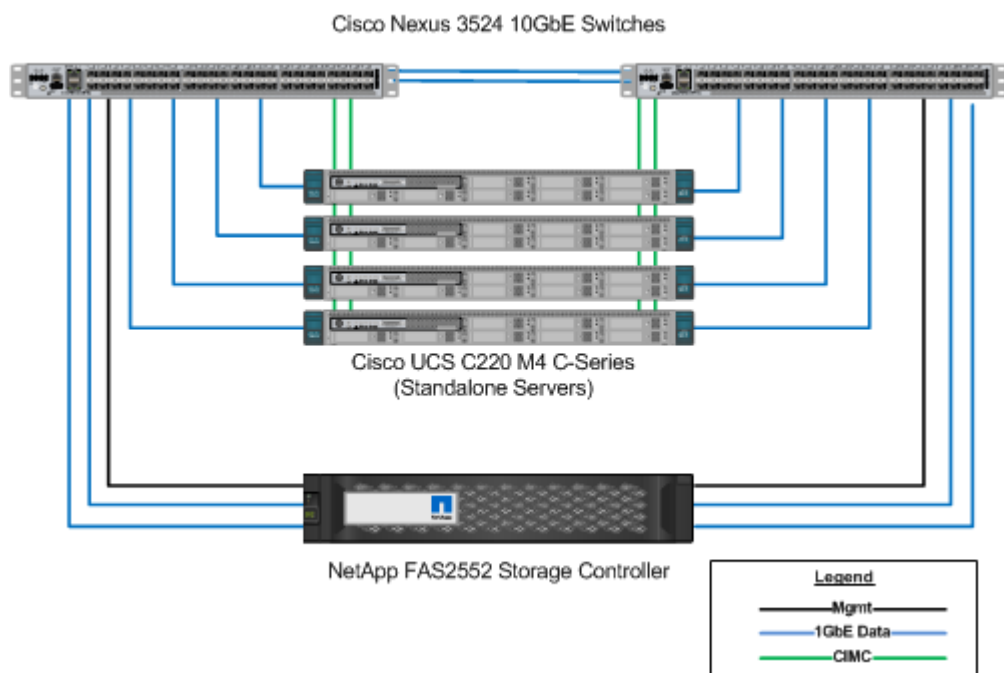
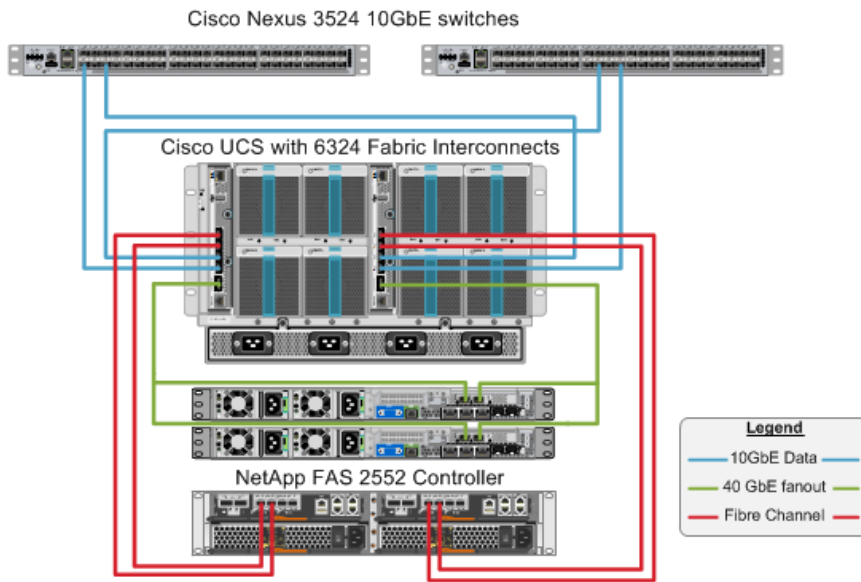


Figure 4) FlexPod Express Cisco UCS-managed configuration.



9 Cisco Components

Cisco has contributed substantially to the FlexPod Express design and architecture, covering both the compute and networking layers of the solution. This section describes the Cisco UCS and Cisco Nexus components that are available for FlexPod Express.

9.1 Cisco UCS B-Series Blade Server Options

Cisco UCS B-Series blade currently supported in the Cisco UCS Mini platform is B200 M3. Other blades will be listed in Table 1 as they become supported in the Cisco UCS Mini platform.

Table 1) Cisco UCS B-Series servers.

Cisco UCS B-Series Server	Part Number	Technical Specifications
Cisco UCS B200 M4	UCSB-B200-M4	http://www.cisco.com/c/dam/en/us/products/collateral/servers-unified-computing/ucs-b-series-blade-servers/b200m4-specsheet.pdf
Cisco UCS B200 M3	UCSC-B200-M3S	www.cisco.com/c/en/us/products/collateral/servers-unified-computing/ucs-b200-m3-blade-server/data_sheet_c78-700625.html
Cisco UCS B420 M3	UCSB-B420-M3	http://www.cisco.com/c/en/us/products/collateral/servers-unified-computing/ucs-b-series-blade-servers/data_sheet_c78-706603.html
Cisco UCS B22 M3	UCSB-B22-M3	http://www.cisco.com/c/dam/en/us/products/collateral/servers-unified-computing/ucs-b-series-blade-servers/b22m3-specsheet.pdf

9.2 Cisco UCS C-Series Rack Server Options

Cisco UCS C-Series blades are available in one- and two-rack unit (RU) varieties, with various CPU, memory, and I/O options. The part numbers listed in Table 2 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 2) Cisco UCS C-Series rack options.

Cisco UCS C-Series Rack Server	Part Number	Technical Specifications
Cisco UCS C220 M4	UCSC-C220-M4S	http://www.cisco.com/c/dam/en/us/products/collateral/servers-unified-computing/ucs-c-series-rack-servers/c220m4-sff-spec-sheet.pdf
Cisco UCS C240 M4	UCSC-C240-M4S	http://www.cisco.com/c/dam/en/us/products/collateral/servers-unified-computing/ucs-c-series-rack-servers/c240m4-sff-spec-sheet.pdf
Cisco UCS C460 M4	UCSC-C460-M4	http://www.cisco.com/c/dam/en/us/products/collateral/servers-unified-computing/ucs-c-series-rack-servers/c460m4_specsheet.pdf
Cisco UCS C22 M3	UCSC-C22-M3S	www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706101.html
Cisco UCS C220 M3	UCSC-C220-M3S	http://www.cisco.com/c/en/us/products/collateral/servers-unified-computing/ucs-c220-m3-rack-server/data_sheet_c78-700626.html
Cisco UCS C24 M3	UCSC-C24-M3S	www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706103.html
Cisco UCS C240 M3	UCSC-C240-M3S	http://www.cisco.com/c/en/us/products/collateral/servers-unified-computing/ucs-c240-m3-rack-server/data_sheet_c78-700629.html
Cisco UCS C260 M2	C260-BASE-2646	www.cisco.com/en/US/prod/collateral/ps10265/ps10493/c260m2_specsheet.pdf
Cisco UCS C420 M3	UCSC-BASE-M3-C420	www.cisco.com/en/US/products/ps12770/index.html
Cisco UCS C460 M2	UCSC-BASE-M2-C460	www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps11587/spec_sheet_c17-662220.pdf

9.3 Cisco Nexus Switches

Redundant switches are required for all FlexPod Express architectures.

The FlexPod Express small and medium architectures are built using the Cisco Nexus 3048 GbE switches. FlexPod Express large architectures are built using the Cisco Nexus 3524 10GbE switches or the Cisco Nexus 9396 10GbE switches. FlexPod Express with the Cisco UCS Mini (Cisco UCS-managed) architecture is validated using the Cisco Nexus 3524. This configuration can also be deployed with a standard switch.

The part numbers listed in Table 3 are for the Cisco Nexus series chassis; they do not include additional SFP or add-on modules.

Table 3) Cisco Nexus switches.

Cisco Nexus Series Switch	Part Number	Technical Specifications
Cisco Nexus 3048	N3K-C3048TP-1GE	www.cisco.com/c/en/us/products/collateral/switches/nexus-3000-series-switches/data_sheet_c78-685363.html
Cisco Nexus 3524	N3K-C3524P-10G	www.cisco.com/c/en/us/products/collateral/switches/nexus-3548-switch/data_sheet_c78-707001.html
Cisco Nexus 9396	N9K-C9396PX	www.cisco.com/c/en/us/products/collateral/switches/nexus-9000-series-switches/datasheet-c78-729405.html

9.4 Cisco Support Licensing Options

Valid SMARTnet support contracts are required on all Cisco equipment in the FlexPod Express 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 4 lists the Cisco support licensing options.

Table 4) Cisco support licensing options.

Cisco Support Licensing	License Guide
SMARTnet 24x7x4	www.cisco.com/web/services/portfolio/product-technical-support/smartnet/index.html

10 NetApp Components

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

10.1 NetApp Storage Controller Options

Redundant NetApp FAS2200 or FAS2500 series controllers are required in the FlexPod Express architecture. The controllers run 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, the cluster can be deployed either with a pair of cluster interconnect switches or in a switchless cluster configuration.

Note: The part numbers listed in Table 5 are for an empty controller. Different options and configurations are available based on the storage platform selected. Consult your sales representative for details on these additional components.

Table 5) NetApp storage controller options.

Storage Controller	FAS Part Number	Technical Specifications
FAS2240	Based on individual options chosen	www.netapp.com/us/products/storage-systems/fas2000/fas2000-tech-specs.html
FAS2220	Based on individual options chosen	www.netapp.com/us/products/storage-systems/fas2200/fas2200-tech-specs.aspx

Storage Controller	FAS Part Number	Technical Specifications
FAS2520	Based on individual options chosen	www.netapp.com/us/products/storage-systems/fas2500/fas2500-tech-specs.aspx
FAS2552	Based on individual options chosen	www.netapp.com/us/products/storage-systems/fas2500/fas2500-tech-specs.aspx
FAS2554	Based on individual options chosen	www.netapp.com/us/products/storage-systems/fas2500/fas2500-tech-specs.aspx
FAS8020	Based on individual options chosen	www.netapp.com/us/products/storage-systems/fas8000/fas8000-tech-specs.aspx

10.2 NetApp Ethernet Expansion Modules

Table 6 lists the NetApp 10GbE adapter options.

Table 6) NetApp 10GbE adapter options.

Component	Part Number	Technical Specifications
NetApp X1160A	X1160A-R6	https://library.netapp.com/ecm/ecm_download_file/ECMP1368525
NetApp X1117A	X1117A-R6	https://library.netapp.com/ecm/ecm_download_file/ECM11280307

Note: The FAS2500 series storage systems have onboard 10GbE ports.

Note: The NetApp X1160A adapter is for FAS2200 series storage systems.

Note: The NetApp X1117A adapter is for FAS8020 storage systems.

10.3 NetApp Disk Shelves and Disks

A minimum of one NetApp disk shelf is required for storage controllers. The NetApp shelf type selected determines which drive types are available within that shelf.

Note: The FAS2200 and FAS2500 series of controllers are 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 alternating current (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 7 lists the NetApp disk shelf options.

Table 7) NetApp disk shelf options.

Disk Shelf	Part Number	Technical Specifications
DS2246	X559A-R6	www.netapp.com/us/products/storage-systems/disk-shelves-and-storage-media/disk-shelves-tech-specs.html
DS4246	X24M-R6	www.netapp.com/us/products/storage-systems/disk-shelves-and-storage-media/disk-shelves-tech-specs.html

Disk Shelf	Part Number	Technical Specifications
		specs.html

Table 8 lists the NetApp disk drive options.

Table 8) NetApp disk drive options.

Component	Part Number	Technical Specifications
1200GB SAS	X425A-R6	http://hwu.netapp.com/Drives/Index
1200GB SAS	X489A-R6	
900GB SAS (encrypted)	X417A-R6	
900GB SAS (encrypted)	X495A-R6	
900GB SAS	X423A-R5	
900GB SAS	X488A-R5	
600GB SAS (encrypted)	X416A-R5	
600GB SAS (encrypted)	X494A-R5	
600GB SAS	X422A-R5	
600GB SAS	X487A-R5	
450GB SAS	X421A-R5	
450GB SAS	X486A-R5	
1.6TB SSD	X439A-R6	
1.6TB SSD	X576A-R6	
800GB SSD (encrypted)	X440A-R6	
800GB SSD	X447A-R6	
800GB SSD	X449A-R6	
400GB SSD	X438A-R6	
400GB SSD	X575A-R6	
200GB SSD	X446B-R6	
.2TB SSD	X446A-R6	
3TB SATA	X308A-R5	
2TB SATA	X306A-R5	
1TB SATA	X302A-R5	

10.4 NetApp Software Licensing Options

Table 9 lists the NetApp software licensing options.

Table 9) NetApp software licensing options.

NetApp Software Licensing	Part Number	Technical Specifications
Base cluster license	Consult your NetApp sales team for more licensing information.	

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 Express design.

Table 10 lists the NetApp support licensing options.

Table 10) NetApp support licensing options.

NetApp Support Licensing	Part Number	Technical Specifications
SupportEdge Premium 4 hours onsite; months: 36	CS-O2-4HR	www.netapp.com/us/support/supportedge.html

11 Power and Cabling Requirements

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

11.1 Power Requirements

The power requirements described are based on U.S. specifications and assume the use of AC power. Other countries might 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 11 lists the power ports required per device.

Table 11) Power ports required per device.

Cisco Nexus Switches	Power Ports Required
Cisco Nexus 3048	2 C13/C14 power cables for each Cisco Nexus 3000 series switch
Cisco Nexus 3524	2 C13/C14 power cables for each Cisco Nexus 3000 series switch
Cisco Nexus 9396	2 C13/C14 power cables for each Cisco Nexus 9000 series switch
Cisco UCS B-Series Servers	Power Ports Required
Cisco UCS B200 M3	2 C13/C14 power cables for each Cisco UCS server
Cisco UCS C-Series Servers	Power Ports Required
Cisco UCS C220 M4	2 C13/C14 power cables for each Cisco UCS server
Cisco UCS C240 M4	

Cisco UCS C460 M4	
Cisco UCS C22 M3	
Cisco UCS C220 M3	
Cisco UCS C24 M3	
Cisco UCS C240 M3	
Cisco UCS C260 M2	
Cisco UCS C420 M3	
Cisco UCS C460 M2	
NetApp FAS Controllers	Power Ports Required (per HA Pair)
FAS2554	2 C13/C14
FAS2552	2 C13/C14
FAS2520	2 C13/C14
FAS2240	4 C13/C14 or 2 C13/C14 depending on the controller/chassis configuration
FAS2220	2 C13/C14
FAS8020	2 C13/C14
NetApp Disk Shelves	Power Ports Required
DS2246	2 C13/C14
DS4246	4 C13/C14

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 12 lists the minimum number of cables required for each device.

Table 12) Minimum number of cables required for each device.

Cisco Nexus 3000 Series Switches	Cables Required
Cisco Nexus 3048	<ul style="list-style-type: none"> At least two 10GbE fiber or twinax cables per switch
Cisco Nexus 3524	
Cisco Nexus 9396	
NetApp FAS Controllers	Cables Required
FAS2554	<ul style="list-style-type: none"> A pair of SAS or SATA cables per storage controller At least two 10GbE cables per controller
FAS2552	

FAS2520	<ul style="list-style-type: none"> At least one GbE cable for management per controller If deploying clustered Data ONTAP (not as a switchless cluster), eight short twinax cables are required per pair of cluster interconnect switches For clustered Data ONTAP switchless cluster deployments, at least two 10GbE or GbE cables (throughput depends on controller model) for one controller HA pair
FAS2240	
FAS2220	
FAS8020	
NetApp Disk Shelves	Cables Required
DS2246	<ul style="list-style-type: none"> Two SAS, SATA, or FC cables per disk shelf
DS4243	
DS4246	

Appendix: Technical Specifications and Reference

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

Cisco UCS B-Series Blade Servers

Table 13 lists the Cisco UCS B-Series blade server options.

Table 13) Cisco UCS B-Series blade server options.

Component	UCS B200 M4	Cisco UCS B200 M3	UCS B420 M3	UCS B22 M3
Processor support	Intel® Xeon® E5-2600	Intel® Xeon® E5-2600	Intel® Xeon® E5-4600	Intel® Xeon® E5-2400
Maximum memory capacity	24 DIMMs for a maximum of 768GB	24 DIMMs for a maximum of 768GB	48 DIMMs for a maximum of 1.5TB	12 DIMMs for a maximum of 384GB
Memory size and speed	32GB DDR4; 2133MHz	16GB DDR3; 1600MHz	32GB	32GB DDR3; 1600Mhz
SAN boot support	Yes	Yes	Yes	Yes
Mezzanine I/O adapter slots	2	1	3	2
I/O maximum throughput	80Gbps	80Gbps	160Gbps	80Gbps

Cisco UCS C-Series Rack Servers

Table 14 lists Cisco UCS M4 server options, and Table 15 and Table 16 list the Cisco UCS C-Series rack server options.

Table 14) Cisco UCS M4 servers.

Component	Cisco UCS C220 M4	Cisco UCS C240 M4	Cisco UCS C460 M4
Processor support	1 or 2 Intel E5-	1 or 2 Intel Xeon	2 or 4 Intel Xeon

Component	Cisco UCS C220 M4	Cisco UCS C240 M4	Cisco UCS C460 M4
	2600 series	E5-2600 series	E7-4800/8800 series
Maximum memory capacity	1.5GB	1.5TB	6TB
PCIe slots	2	6	10
Form factor	1RU	2RU	4RU

Table 15) 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
Form factor	1RU	1RU	2RU

Table 16) 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	2RU	2RU	2RU	4RU

Table 17 lists Cisco UCS C-Series rack server options datasheets.

Table 17) Cisco UCS C-Series rack server options datasheets.

Component	Cisco UCS Datasheet
Cisco UCS C220 M4	http://www.cisco.com/c/dam/en/us/products/collateral/servers-unified-computing/ucs-c-series-rack-servers/c220m4-sff-spec-sheet.pdf
Cisco UCS C240 M4	http://www.cisco.com/c/en/us/products/collateral/servers-unified-computing/ucs-c240-m4-rack-server/datasheet-c78-732455.html
Cisco UCS C460 M4	http://www.cisco.com/c/en/us/products/collateral/servers-unified-computing/ucs-c460-m4-rack-server/datasheet-c78-730907.html
Cisco UCS C22 M3	www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706101.html
Cisco UCS C220 M3	www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps12369/data_sheet_c78-700626.html

Component	Cisco UCS Datasheet
Cisco UCS C24 M3	www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-706103.html
Cisco UCS C240 M3	www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps12370/data_sheet_c78-700629.html
Cisco UCS C260 M2	www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps11588/data_sheet_c78-648148.html
Cisco UCS C420 M3	www.cisco.com/en/US/prod/collateral/ps10265/ps10493/data_sheet_c78-717325.html
Cisco UCS C460 M2	www.cisco.com/en/US/prod/collateral/ps10265/ps10493/ps11587/data_sheet_c78-648154.html

Cisco Nexus 3000 Series Switches

Table 18 lists the Cisco Nexus 3000 series switch options.

Table 18) Cisco Nexus 3000 series switch options.

Component	Cisco Nexus 3048	Cisco Nexus 3524
Form factor	1RU	1RU
Maximum 1Gb/s ports	48	24
Forwarding rate	132 mbps	360 mbps
Jumbo frame support	Yes	Yes

Table 19 lists Cisco Nexus 3000 series switch options datasheets.

Table 19) Cisco Nexus 3000 series switch options datasheets.

Component	Cisco Nexus Datasheet
Cisco Nexus 3048	www.cisco.com/c/en/us/products/collateral/switches/nexus-3000-series-switches/data_sheet_c78-685363.html
Cisco Nexus 3524	www.cisco.com/c/en/us/products/collateral/switches/nexus-3548-switch/data_sheet_c78-707001.html

Table 20 lists the Cisco Nexus 9000 series switch options.

Table 20) Cisco Nexus 9000 series switch options.

Component	Cisco Nexus 9396
Form factor	2RU
Maximum ports	60
10Gbps SFP+ uplink ports	48

Table 21 lists the Cisco Nexus 9000 series switch options datasheets.

Table 21) Cisco Nexus 9000 series switch options datasheets.

Component	Cisco Nexus Datasheet
Cisco Nexus 9396	www.cisco.com/c/en/us/products/collateral/switches/nexus-9000-series-switches/datasheet-c78-729405.html

NetApp Storage Controllers

Table 22 lists the current NetApp storage controller options.

Table 22) NetApp storage controller options.

Current Component	FAS 2240-2	FAS 2240-4	FAS2554	FAS2552	FAS2520
Configuration	2 controllers in a 2U chassis	2 controllers in a 4U chassis	2 controllers in a 4U chassis	2 controllers in a 2U chassis	2 controllers in a 2U chassis
Maximum raw capacity	518TB	576TB	576TB	509TB	336TB
Internal drives	24	24	24	24	12
Maximum number of drives (internal + external)	144	144	144	144	84
Maximum volume size	60TB				
Maximum aggregate size	120TB				
Maximum number of LUNs	1,024 per controller		2,048 per controller		
Storage networking supported	iSCSI, FC, NFS, and CIFS		iSCSI, FCoE, FC, NFS, and CIFS		iSCSI, NFS, and CIFS
Maximum number of NetApp FlexVol [®] volumes	500 per controller				
Maximum number of NetApp Snapshot [®] copies	127,000 per controller		255,000 per controller		
Maximum NetApp FlashPool [™] intelligent data caching	N/A		64TB		32TB

Table 23 lists the characteristics of a FAS8020 controller system.

Table 23) FAS8020 controller characteristics.

Current Component	FAS8020
Configuration	2 controllers in a 3U chassis
Maximum raw	2880TB

Current Component	FAS8020
capacity	
Maximum number of drives	480
Maximum volume size	70TB
Maximum aggregate size	324TB
Maximum number of LUNs	8,192 per controller
Storage networking supported	iSCSI, FC, NFS, and CIFS
Maximum number of FlexVol volumes	1,000 per controller
Maximum number of Snapshot copies	255,000 per controller
Maximum NetApp FlashCache™ intelligent data caching	3TB
Maximum FlashPool data caching	24TB

Table 24 lists the current NetApp storage controller datasheets.

Table 24) NetApp storage controller datasheets.

Component	Storage Controller Datasheet
FAS2200 series	www.netapp.com/us/products/storage-systems/fas2200/fas2200-tech-specs.html
FAS2500 series	www.netapp.com/us/products/storage-systems/fas2500/fas2500-tech-specs.aspx
FAS8000 series	http://www.netapp.com/us/products/storage-systems/fas8000/fas8000-tech-specs.aspx

NetApp Ethernet Adapters

Table 25 lists NetApp 10GbE adapters.

Table 25) NetApp 10GbE adapters.

Component	X1160A-R6	X1117A-R6
Port count	2	2
Adapter type	SFP+ with Fibre	SFP+ with Fibre

Note: The X1160A-R6 SFP+ adapter is only supported with FAS2200 series controllers.

Note: The X1117A-R6 SFP+ adapter is supported on FAS8000 series controllers.

Note: The FAS2500 series storage systems have onboard 10GbE ports.

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

NetApp Disk Shelves

Table 26 lists the NetApp disk shelf options.

Table 26) NetApp disk shelf options.

Component	DS2246	DS4246
Form factor	2RU	4RU
Drives per enclosure	24	24
Drive form factor	2.5 inch small form factor	3.5 inch large form factor
Shelf I/O modules	Dual IOM6 modules	Dual IOM6 modules

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

NetApp Disk Drives

Table 27 lists NetApp disk drive options.

Table 27) NetApp disk drive options.

Component	2.5 Inch SAS	SSD	SATA
Form factor	2.5 inch	3.5 inch	3.5 inch
Disk capacities	600GB, 900GB, and 1.2TB	200GB, 400GB, 800GB, and 1.6TB	2TB, 3TB, 4TB, and 6TB
Disk RPM	10k	N/A	7.2k
Supporting controllers	<ul style="list-style-type: none"> FAS/V3070 FAS/V3100 series FAS/V3200 series FAS/V6000 series FAS/V6200 series FAS2200 series FAS2500 series FAS8000 series 	<ul style="list-style-type: none"> FAS/V3160 FAS/V3170 FAS/V3240 FAS/V3270 FAS/V6040 FAS/V6080 FAS/V6200 series FAS2200 series FAS2500 series FAS8000 series AFF8000 series 	<ul style="list-style-type: none"> FAS/V3000 series FAS/V3100 series FAS/V3200 series FAS/V6000 series FAS/V6200 series FAS2200 series FAS2500 series FAS8000 series
Data ONTAP version required	<ul style="list-style-type: none"> 7.3.3P2 or later 8.0P1 or later 	8.0.1 or later	<ul style="list-style-type: none"> 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](#).

Version History

Version	Date	Document Version History
Version 1.3	September 2015	Added Cisco M4 servers and NetApp FAS8000 series controllers
Version 1.2	April 2015	Added Cisco UCS-managed architecture
Version 1.1	December 2014	Added FAS2500
Version 1.0	April 2014	Initial release

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