



Technical Specification

## FlexPod Select with Hadoop

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# 1 Product Overview

FlexPod Select with Hadoop is a reference architecture developed in collaboration between Cisco and NetApp. This solution is pre-validated for enterprise Hadoop deployments built using Cisco 6296 Fabric Interconnects (connectivity and management), C220 M3 Servers (compute), NetApp FAS2220 and NetApp E5400 series storage arrays. Following the highly successful FlexPod model of pre-sized rack level configurations, this solution will be made available through the well-established FlexPod sales engagement and channel. The architecture consists of a master rack and optionally up to nine expansion racks in a single management domain, creating a complete, self-contained Hadoop cluster. The master rack provides all of the components required to run a 12-node Hadoop cluster. Each additional expansion rack provides an additional 16 Hadoop cluster nodes. The solution has been tested and validated with major Hadoop Distributions including Cloudera and Hortonworks.

## 2 System Specifications

### 2.1 Hardware Requirements

The FlexPod Select with Hadoop reference architecture is comprised of the following hardware and software components.

#### Servers

##### Cisco UCS C220 M3 Servers

- Up to two Intel Xeon E5-2600 processor product family
- Up to 512 GB of RAM with 16 DIMM slots for memory-intensive applications
- Four or eight SAS/SATA/SSD drives
- 2 PCI Express Gen 3 slots and two 1GE LAN interfaces on the motherboard
- Trusted Platform Module (TPM) for authentication and tool-less access

#### Storage

- NetApp E5460 Data Storage Subsystem
- NetApp FAS2220 NAS Storage System

#### Network

- Cisco UCS 6296UP Fabric Interconnect
- Cisco Nexus 2232 Fabric Extenders
- Cisco® Catalyst® 2960S

### 3 System Specifications

Table 1 lists the components of the master rack.

Table 1) System specifications for the Hadoop master rack configuration.

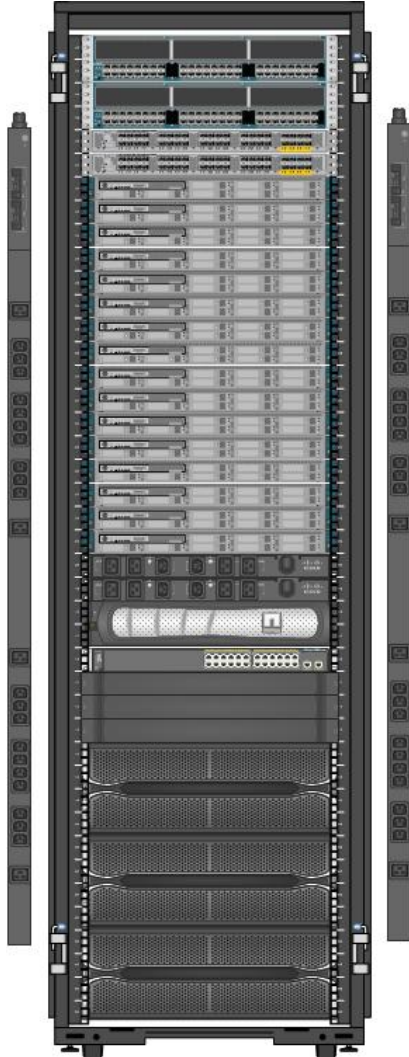
Component	Details	Master Rack
Cisco® R42610 Rack	Industry standard 42U rack	
Cisco RP208-30-U-1	Single phase PDU with 2 C13 connectors and 4 C19 connectors (2 per rack)	
Cisco RP208-30-U-2	Single phase PDU 20 C13 connectors and 4 C19 connectors (2 per rack)	
Networking Components		
Cisco UCS 6296UP Fabric Interconnect	96-port 10 Gigabit Fabric Interconnect switch (2 per cluster of up to 160 servers)	
Cisco Nexus® 2232 Fabric Extenders	32-port 10 Gigabit Fabric Extenders (2 per rack)	
Cisco Catalyst® 2960S	Layer 2 Ethernet switch (1 per cluster)	
Hadoop Management Components		
FAS2220-6X1TB-R6	Entry-level NAS with 6 x 1TB drives for NameNode metadata protection	
Cisco UCS C220 M3 Server 1	DNS server	
Cisco UCS C220 M3 Server 2	NameNode server	
Cisco UCS C220 M3 Server 3	Secondary NameNode server	
Cisco UCS C220 M3 Server 4	JobTracker	
Configuration of Cisco UCS C220 M3 Server 1-4	2 x Intel® Xeon® E5-2680 @ 2.70GHz, 256GB Memory, Cisco UCS VIC 1225, 2 x 600GB 6Gb SAS 10K RPM SFF HDD	
Data Nodes		
Cisco UCS C220 M3 5 -16	Data nodes	
Configuration of Cisco UCS C220 M3 Server 5-16	2 x Intel Xeon E5-2680 @ 2.70GHz, 256GB Memory, Cisco UCS VIC 1225, 2 x 600GB, 6Gb SAS 10K RPM SFF HDD, LSI SAS 9200-8e HBA	
Storage Arrays		
E5460	6 x E5400A, 6GB controllers 3 x DE6600 4U-60-drive enclosures 180 x 3TB 7.2K disk drives	

Table 2 lists the components of the expansion rack.

Table 2) System specifications for the Hadoop expansion rack configuration.

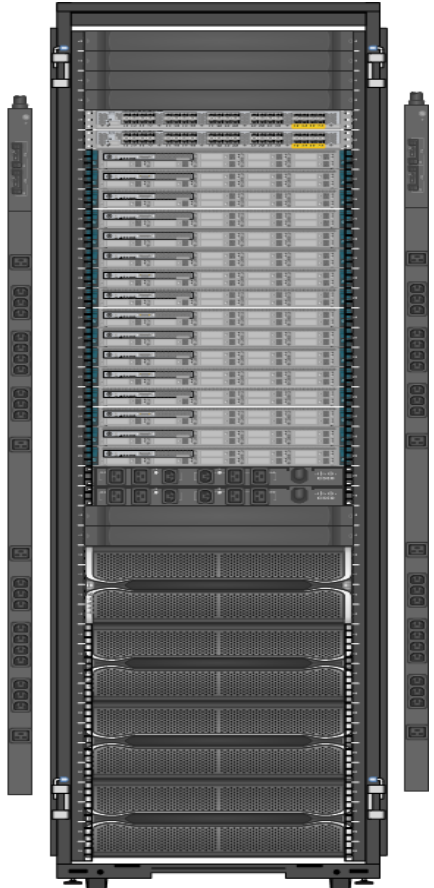
Component	Details	Expansion Rack
Cisco R42610 Rack	Industry standard 42U rack	
Cisco RP208-30-U-1	Single phase PDU with 2 C13 connectors and 4 C19 connectors (2 per rack)	
Cisco RP208-30-U-2	Single phase PDU 20 C13 connectors and 4 C19 connectors (2 per rack)	
Networking Components		
Cisco Nexus 2232 Fabric Extenders	32-port 10 Gigabit Fabric Extenders (2 per rack)	
DataNode Servers		
Cisco UCS C220 M3 Servers	Data Nodes (16 per expansion rack)	
Configuration of Cisco UCS C220 M3 Servers	2 x Intel Xeon E5-2680 @ 2.70GHz, 256GB Memory, Cisco UCS VIC 1225, 2 x 600GB 6Gb SAS 10K RPM SFF HDD, LSI SAS 9200-8e HBA	
Storage Arrays		
E5460	8 x E5400A, 6GB controllers 4 x DE6600 4U-60-drive enclosures 240 x 3TB 7.2K disk drives	

Table 3 lists estimated environmental data for the master and expansion rack configurations.

Table 3) Estimated environmental data for the master and expansion rack configurations.

Equipment	Master Rack					Expansion Rack				
	Rack Units (RUs)	Max/ Typical Watts	Max/ Typical BTUs	Weight	Qty	RUs	Max/ Typical Watts	Max/ Typical BTUs	Weight	Qty
R42610 Rack	42	N/A	N/A	354 lb 161kg	1	42	N/A	N/A	N/A	0
Cisco UCS 6296UP	2	950/750 W	3163 Btu/h	50 lb 22.67 kg	2	N/A	N/A	N/A	N/A	0
Cisco Nexus 2232PP	1	270/165 W	1330/806 Btu/h	18.3 lb 8.3 kg	2	1	270/165 W	1330/806 Btu/h	18.3 lb 8.3 kg	2
Cisco Catalyst 2960S	1	131/84 W	740/447 Btu/h	9.5 lb 4.30 kg	1	N/A	N/A	N/A	N/A	0
Cisco UCS C220 M3 Server	1	506/321 W	1682/1095 Btu/h	37 lb 16.78 kg	16	1	506/321 W	1682/1095 Btu/h	37 lb 16.78 kg	16
RP208-30-U-1	0				2	0				2
RP208-30-U-2	1				2	1				2
NetApp FAS2220	2	423/257 W	1444/878 Btu/h	62.9 lb 28.5 kg	1	N/A	N/A	N/A	N/A	0
NetApp E5460	4	1222/835 W	4180/2850 Btu/h	232 lb 105.2 kg	3	4	1222/835 W	4180/2850 Btu/h	232 lb 105.2 kg	4
Total	37	14756/9812 W	50622/35333 Btu/h	1497 lb 678.8 kg		34	13524/8806 W	46292/30532 Btu/h	1557 lb 705.9 kg	

## 4 Hadoop Master Rack and Expansion Rack Details

Table 4 through Table 12 provide detailed part number information for a master rack and one expansion rack.

Table 4) NetApp hardware.

Part Number	Part Description	Master Qty.	Qty. per Expansion
NetApp FAS Components			
FAS2220-6X1TB-R6	FAS2220, 6x1TB, base	1	0
X800E-R6	Power cable North America, R6	2	0
X5518A-R6	Rackmount Kit, 4-Post, Universal, R6	1	0
NetApp E-Series Components			
E5400-SYS-R6	E5400, SYS, -R6	3	4
E5400A-6GB-R6-C	E5400A, 6GB Controller	6	8
DE6600-SYS-ENCL-R6	DE6600 system enclosure	3	4
E-X5680A-R6-C	Enclosure, 4U-60, DE6600, empty, 2PS	3	4
X-54736-00- R6-C	HIC, E5400, E5500, SAS, 4-Port, 6Gb	6	8
E-X4021A-10-R6-C	Disk Drives, 10x3TB, 7.2k, DE6600	18	24
X-48619-00-R6-C	Battery, 5400	6	8

Table 5 lists NetApp software licensing.

Table 5) NetApp software licensing.

Part Number	Service Description	Master Qty.	Qty. per Expansion
SW-2220-ONTAP8-P	SW, Data ONTAP® Essentials, 2220-P	1	0
SW-NFS-C	SW, NFS, -C	1	0
SW-CIFS-C	SW, CIFS, -C	1	0
SW-FCP-C	SW, FCP, -C	1	0
SW-ISCSI-C	SW, iSCSI, -C	1	0

Table 6 provides information about Hadoop software licensing and support.

Table 6) Hadoop software licensing and support.

Part Number	Service Description	Master Qty.	Qty. per Expansion
Select either Cloudera Enterprise management software and support or Hortonworks Support			
SW-HORTONWKS-SERVICE-12	Hortonworks 24/7 support for 12 months	14	16

Part Number	Service Description	Master Qty.	Qty. per Expansion
SW-CLOUDERA-HADOOP-24x7	Cloudera Enterprise management software with 12 months of 24/7 support and product guarantee	14	16

Table 7 provides information about NetApp support services.

**Table 7) NetApp support services.**

Part Number	Service Description	Master Qty.	Qty. per Expansion
CS-O2-4HR	SupportEdge Premium 4hr onsite: FAS2220 36 months	1	
CS-O2-4HR VA	SupportEdge Premium 4hr onsite, VA; E5460: 36 months	3	4

Table 8 provides information about NetApp Professional Services.

**Table 8) NetApp Professional Services.**

Part Number	Service Description
PS-SOW-E-HADOOP-POD	Storage configuration and Hadoop installation and configuration, custom

Table 9 provides information about Cisco DataNode hardware<sup>1</sup> and cables.

**Table 9) Cisco DataNode hardware and cables.**

Manufacturer Part Number	Part Description	Master Qty.	Qty. per Expansion
RACK-UCS2	Cisco R42610 standard rack w/side panels	1	1
RACK-BLANK-001	Filler panels (qty 12) 1U plastic toolless	1	1
RP208-30-1P-U-1	Cisco RP208-30-U-1 Single Phase PDU 2x C13 4x C19	2	2
RP208-30-1P-U-2	Cisco RP208-30-U-2 Single Phase PDU 20x C13 4x C19	2	2
UCSC-C220-M3S	Cisco UCS C220 M3 SFF w/o CPU mem HDD PCIe PSU w/ rail kit	16	16
UCS-CPU-E5-2680	2.70 GHz E5-2680 130W 8C/20MB Cache/DDR3 1600MHz	32	32

<sup>1</sup> Cisco Base Rack components are available in single SKU bundle UCS-EZ-DB-NOSH.



Manufacturer Part Number	Part Description	Master Qty.	Qty. per Expansion
UCS-MR-1X162RY-A	16GB DDR3-1600-MHz RDIMM/PC3-12800/dual rank/1.35v	256	256
A03-D600GA2	600GB 6Gb SAS 10K RPM SFF HDD/hot plug/drive sled mounted	32	32
CAB-N5K6A-NA	CAB-C13-C14-2M Power Cord Jumper, C13-C14 Connectors, 2 Meter Length	32	32
UCSC-PSU-650W	650W power supply for C-series rack servers	32	32
UCSC-RAID-ROM55	Embedded SW RAID 0/1/10/5 8 ports SAS/SATA	16	16
UCSC-PCIE-CSC-02	Cisco VIC 1225 Dual Port 10Gb SFP+ CAN	16	16
N20-BBLKD	Cisco UCS 2.5 inch HDD blanking panel	96	96
UCSC-HS-C220M3	Heat Sink for Cisco UCS C220 M3 Rack Server	32	32
UCSC-PCIF-01F	Full height PCIe filler for C-Series	16	16
UCSC-PCIF-01H	Half height PCIe filler for Cisco UCS	16	16
UCSC-RAIL1	Rail Kit for C220 C22 C24 rack servers	16	16
LSI00188	LSI 9200-8e SGL SAS PCIe HBA FW version 12.00.00.00, BIOS version 7.23.01.00	12	16
LSI CBL-SFF8088 SAS-20M	2M External Mini SAS SFF-8088(26-pin 4x) to Mini-SAS SFF-8088 (26-pin 4x) Cables	12	16
C3050-05BLU	CCX CAT5e patch cable, 5Ft, blue	8	8

Table 10 provides information about Cisco networking hardware and cables.

Table 10) Cisco networking hardware and cables.

Manufacturer Part Number	Part Description	Master Qty.	Qty. per Expansion
UCS-FI-6296UP	Cisco UCS 6296UP 2RU Fabric Int/No PSU/48 UP/ 18p LIC	2	0
UCS-PSU-6296UP-AC	Cisco UCS 6296UP Power Supply/100-240VAC	4	0
N2K-UCS2232PP-10GE	N2K 10GE, 2 AC PS, 1 Fan (Std Air), 32x1/10GE+8x10GE	2	2
WS-C2960S-48FPS-L	Cisco Catalyst 2960S 48 GigE PoE 740W, 4 x SFP LAN Base	1	0
SFP-H10GB-CU3M	10GBASE-CU SFP+ Cable 3 Meter	16	24
SFP-H10GB-CU2M	10GBASE-CU SFP+ Cable 2 Meter	20	24

Manufacturer Part Number	Part Description	Master Qty.	Qty. per Expansion
SFP-H10GB-CU1M	10GBASE-CU SFP+ Cable 1 Meter	18	0

Table 11 provides information about Cisco DataNode software requirements.

**Table 11) Cisco DataNode software requirements.**

Part Number	Part Description	Total Needed
N/A	Cloudera's Distribution including Apache Hadoop (CDH) 4.x	Installed on all servers, except for DNS
N/A	Hortonworks Distribution of Apache Hadoop (HDP) 1.x	Installed on all servers, except for DNS
RHEL-2S-1G-3A	Rhel/2 Socket/1 Guest/3Yr Svcs required; version 6.2 for x86_64	Installed on all servers

Table 12 provides information about Cisco DataNode and switching support services.

**Table 12) Cisco DataNode and switching support services.**

Part Number	Service Description	Master Qty.	Qty. per Expansion
CON-UCW3-C220M3SF	UC PLUS 24X7X4 Cisco UCS C220 M3 SFF	48	48
CON-UCW3-RPDUX	UC PLUS 24X7X4 Cisco RP208-30-U-X Single Phase PDU 2x	12	12
CON-UCW7-FI6296UP	36X24X7 Support Cisco UCS 6296UP 2RU Fabric Int/2 PSU/4 Fans	2	0
CON-SNTP-N2232F	Smart Net Services 24X7X4	6	6
CON-SNT3-2960S4FS	SMARTNET 3YR 8X5XNBD Cat2960S Stk48 GigE PoE 740W, 4xSFP Base	1	0
CON-ISV1-RH2S1G3A	ISV 24X7 Rhel/2 Socket/1 Guest List Price 3Y	16	16

Table 13 provides information about partner professional services.

**Note:** Each rack in the configuration requires an [LSI SAS 9200-8e](#) host bus adapter (HBA). The HBA can be sourced from any vendor or purchased directly from LSI, but it must match the part number listed in Table 9.

**Table 13) Partner professional services.**

Professional Service Description
Master rack integration: On-site installation and configuration services (including travel expenses)
Expansion rack integration: On-site installation and configuration services (including travel expenses)

## 5 Software Versions

Table 14 lists the software versions validated in the FlexPod Select solutions:

Table 14) Software versions.

Software	Version
NetApp Data ONTAP 7-Mode	Data ONTAP 8.1.2 7-Mode
NetApp E-Series Controller Firmware	07.84.44.00
NetApp SANtricity®	10.84
Red Hat Enterprise Linux®	RHEL 6.2
Cloudera CDH 4.x	4.1.3
Hortonworks HDP 1.x	1.2.x

## 6 Support

The solution components should be covered by a validated support contract with each vendor, as listed in Table 15 as required. The solution provides Unified Support across all vendors leveraging existing best practices for case escalation and transfer to support customer needs.

Table 15 lists the support contracts.

Table 15) Support contracts.

Company	Support Contract	Contact
NetApp	SupportEdge Premium for NetApp Systems	<a href="http://support.netapp.com/">http://support.netapp.com/</a>
Cisco	Networking: SMARTnet® 24x7x4	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>
Red Hat	Red Hat Enterprise Linux Server Premium	<a href="http://www.redhat.com/support/">http://www.redhat.com/support/</a>
LSI	LSI hardware support	<a href="http://www.lsi.com/support/Pages/download-search.aspx">http://www.lsi.com/support/Pages/download-search.aspx</a>
Cloudera	Cloudera 24/7 support for 12 months	<a href="http://www.cloudera.com/content/support/en/home.html">http://www.cloudera.com/content/support/en/home.html</a>
Hortonworks	Hortonworks 24/7 support for 12 months	<a href="http://hortonworks.com/hadoop-support/#portal">http://hortonworks.com/hadoop-support/#portal</a>

## Version History

Version	Date	Document Version History
Version 1.0	August 2013	Initial release
Version 1.1	August 2013	LSI SAS HBA Firmware/BIOS update

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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