FUJITSU

Windows Server 2022
Addendum: Storage Spaces Direct

A supplement to the [Windows Server 2022 Datasheet](), this document provides information on hardware requirements for and availability of Storage Spaces Direct on PRIMERGY servers.

Storage Spaces Direct (S2D)

Storage Spaces Direct (S2D) is a powerful Windows Server 2016/2019/2022 Datacenter feature that consolidates, through software manipulation, on-premises servers' physical drives into a virtual storage space that can be easily expanded or reduced as needed. For more information about S2D, please access [here]().
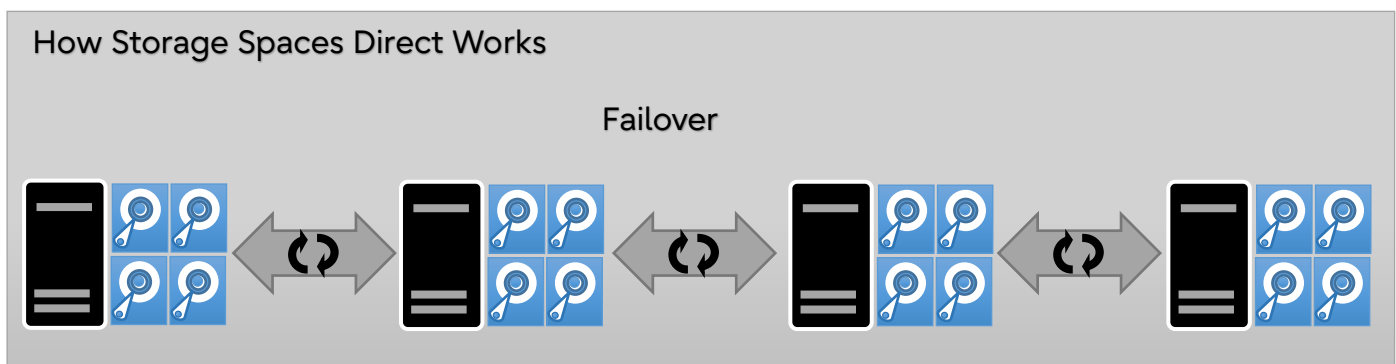
S2D on PRIMERGY Servers: Overview

Storage Spaces Direct can be implemented on the following PRIMERGY models:

PRIMERGY models	Abbreviated name in this Datasheet
PRIMERGY RX2530 M7, PRIMERGY RX2540 M7	2M7
PRIMERGY RX2530 M6, PRIMERGY RX2540 M6	2M6
PRIMERGY RX2530 M5, PRIMERGY RX2540 M5	2M5
PRIMERGY TX1330 M5	1M5

✓ Please note that Storage Spaces Direct is available for Hyper-V or SQL Server workloads only.
Please apply the latest BIOS and firmware, available for download at [https://support.ts.fujitsu.com/IndexDownload.asp](), to PRIMERGY servers.

Please also apply the latest drivers and firmware, available for download at [https://support.ts.fujitsu.com/IndexDownload.asp](), to component parts.

✓ Hot swap/hot add of NVMe is restricted.
If you insert an NVMe disk when the server is powered-on, the NVMe disk will not be recognized automatically on 2M6,2M7.

Please powered off the server, and add or swap the NVMe disk.

✓ The Clusters with mixed nodes with different CPUs (4th and 5th generation Intel Xeon-SPs) in 2M7 are not supported.

S2D on PRIMERGY RX2530 M7 and RX2540 M7

For RX2530 M7's and RX2540 M7's configuration data, access
https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgRX2530M7.pdf (RX2530 M7)

https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgRX2540M7.pdf (RX2540 M7)

Use the following base units and upgrade kits, when S2D is to be implemented on Windows Server 2022.

Order Number	Base Unit / Upgrade Kit	Note
PYR2537R2N	PY RX2530 M7 8x 2.5'	-
PYR2537RAN	PY RX2530 M7 10x 2.5'	-
PYR2537RBN	PY RX2530 M7 10x 2.5' w/ Expander	-
PYR2537RDN	PY RX2530 M7 8x 2.5'	Short Depth
PYR2537REN	PY RX2530 M7 10x 2.5'	Short Depth
PYR2537RCN	PY RX2530 M7 10x 2.5'	-
PYR2537RFN	PY RX2530 M7 10x 2.5'	Short Depth
PYR2547R2N	PY RX2540 M7 16x 2.5'	-
PY2547RBN	PY RX2540 M7 16x 2.5' w/ Expander	-
PY2547REN	PY RX2540 M7 24x 2.5'	-
PY2547RGN	PY RX2540 M7 24x 2.5' w/ Expander	-
PY2547RJN	PY RX2540 M7 24x 2.5' w/ Expander	Used GPU install
PY2547R3N	PY RX2540 M7 10x 3.5'	-
PYR2547RAN	PY RX2540 M7 12x 3.5' w/ Expander	-
PYR2547RLN	PY RX2540 M7 6x 3.5'	Used GPU install
PYR2547RCN	PY RX2540 M7 8x 2.5' mixed	-
PYR2547RHN	PY RX2540 M7 24x 2.5' NVMe	-
PYR2547RKN	PY RX2540 M7 8x 2.5' mixed	Used GPU install

S2D on PRIMERGY RX2530 M6 and RX2540 M6

For RX2530 M6's and RX2540 M6's configuration data, access
[https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgRX2530M6.pdf (RX2530 M6)](https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgRX2530M6.pdf)

[https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgRX2540M6.pdf (RX2540 M6)](https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgRX2540M6.pdf)

Use the following base units and upgrade kits, when S2D is to be implemented on Windows Server 2022.

Order Number	Base Unit / Upgrade Kit	Note
PYR2536RBN	PY RX2530 M6 10x 2.5' w/ Expander	-
PYR2546RBN	PY RX2540 M6 12x 3.5' w/ Expander	
PYR2546RDN	PY RX2540 M6 16x 2.5' w/ Expander	
PYR2546RGN	PY RX2540 M6 24x 2.5' w/ Expander	
PYR2546RFN	PY RX2540 M6 24x 2.5'	
PYR2546RHN	PY RX2540 M6 24x 2.5" NVMe	-

S2D on PRIMERGY RX2530 M5 and RX2540 M5

For RX2530 M5's and RX2540 M5's configuration data, access
[https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgRX2530M5.pdf (RX2530 M5)](https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgRX2530M5.pdf)

[https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgRX2540M5.pdf (RX2540 M5)](https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgRX2540M5.pdf)

Use the following base units and upgrade kits, when S2D is to be implemented on Windows Server 2022.

Order Number	Base Unit / Upgrade Kit	Note
S26361-K1659-V501	PY RX2530 M5 10x 2.5' HDD bays	Under the options, Storage Spaces Direct(S2D) is not supported.
S26361-K1655-V112	PY RX2540 M5 12x 3.5' HDD bays	- Bays are expandable installed PCIe SSD - Rear bays are expandable installed PCIe SSD
S26361-K1655-V408 S26361-F2495-L445	PY RX2540 M5 8x 2.5' HDD bays Upgrade Kit 16x 2.5' HDD	
S26361-K1655-V424	PY RX2540 M5 24x 2.5' HDD bays	

S2D on PRIMERGY TX1330 M5

For TX1330 M5's configuration data, access
[https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgTX1330M5.pdf (TX1330 M5)](https://sp.ts.fujitsu.com/dmsp/Publications/public/cnfgTX1330M5.pdf)

Use the following base units and upgrade kits, when S2D is to be implemented on Windows Server 2022.

Order Number	Base Unit / Upgrade Kit	Note
PYT1335TNM	PY T1330M5/f/Red. PSU	You cannot configure S2D using PCIe SSD.

S2D-Ready Network Cards

"Role-based certification" is the "Additional Qualification certifications" to network cards by Microsoft.
The type depends on the intended use of the network (Management LAN, Compute LAN, Storage LAN).
Recommend using the cards that had "Role-based certification ", when using Storage Spaces Direct feature.

Purpose of using the network	Role-based certification
Management LAN	Management
Compute LAN	Compute (Standard)
	Compute (Premium)
Storage LAN	Storage (Standard)
	Storage (Premium)

For details of each "Role-based certification", access below.

- Management:
  https://www.windowsservercatalog.com/content.aspx?ctf=AQinfo-network-adapters-management.htm
- Compute (Premium):
  https://www.windowsservercatalog.com/content.aspx?ctf=AQinfo-network-adapters-compute-premium.htm
- Compute (Standard):
  https://www.windowsservercatalog.com/content.aspx?ctf=AQinfo-network-adapters-compute-standard.htm
- Storage (Premium):
  https://www.windowsservercatalog.com/content.aspx?ctf=AQinfo-network-adapters-storage-premium.htm
- Storage (Standard):
  https://www.windowsservercatalog.com/content.aspx?ctf=AQinfo-network-adapters-Storage-standard.htm

Recommend using the cards that had "Role-based certification ", when using Storage Spaces Direct feature.

M: Management
C(P): Compute(Premium)　　　　C(S): Compute(Standard)　　　　S(P): Storage(Premium)　　　　S(S): Storage(Standard)

Order Number	Product Name	Supported Server for S2D	Driver / Package *	Firmware / Package *	Role-based certification				
					M	C		S	
					-	(P)	(S)	(P)	(S)
S26361-F4610-L522 S26361-F4610-L502 S26361-F4610-E802 S26361-F4610-E702 S26361-F4610-E202 S26361-F4610-E2	PLAN CP 2x1Gbit Cu Intel I350-T2	1M5 2M5	>=27.2.1 Intel® Ethernet Adapters Connections CD	>=1.63 This version or later is applied at the time of shipment.	x				
S26361-F4610-L504 S26361-F4610-E804 S26361-F4610-E704 S26361-F4610-E4 S26361-F4610-E204	PLAN CP 4x1Gbit Cu Intel I350-T4	1M5 2M5 2M6 2M7	Same as above	Same as above	x				

S26361-F3948-L522 S26361-F3948-L502 S26361-F3948-E202 S26361-F3948-E2	PLAN EP X550-T2 2x10GBASE-T	2M5	Same as above	>=3.60 NVM Update Package for Intel® X550 Series	x				
S26361-F3640-L522 S26361-F3640-L502 S26361-F3640-E202 S26361-F3640-E2	PLAN EP X710-DA2 2x10Gb SFP+	1M5 2M5 2M6 2M7	Same as above	>=8.15 NVM Update Package for Intel® X710 Series	x		x		
S26361-F3640-L504 S26361-F3640-E4 S26361-F3640-E204	PLAN EP X710-DA4 4x10Gb SFP+	1M5 2M5 2M6 2M7	Same as above	Same as above	x		x		
S26361-F4055-L502 S26361-F4055-E202 S26361-F4055-E2	PLAN EP XXV710-DA2 25Gb 2p SFP28	2M5	Same as above	Same as above	x		x		
S26361-F4055-L302 S26361-F4055-E302	PLAN EP XXV710-DA2 25Gb 2p SFP28 OCP	RX2530 M5	Same as above	Same as above	x		x		
PYBLA432U PYBLA432U2	PLAN EP E810-CQDA2 2X 100G QSFP28 OCPv3	2M6 2M7	Same as above	>=3.20 NVM Update Package for Intel® E810 Series	x	x		x	
PY-LA432 PYBLA432L PYBLA432	PLAN EP E810-CQDA2 2X 100G QSFP28 PCIe	2M6 2M7	Same as above	Same as above	x	x		x	
PYBLA402U PYBLA402U2	PLAN EP E810-XXVDA2 2X 25G SFP28 OCPv3	2M6 2M7	Same as above	Same as above	x	x		x	
PY-LA402 PYBLA402L PYBLA402	PLAN EP E810-XXVDA2 2X 25G SFP28 PCIe	1M5 2M6 2M7	Same as above	Same as above	x	x		x	

Order code	Product name	System	Driver	Firmware					
PY-LA404U2 PY-LA404U PYBLA404U2 PYBLA404U	PLAN EP E810-XXVDA4 4X 25G SFP28 OCPv3	1M5 2M5 2M6 2M7	Same as above	Same as above	x	x		x	
PY-LA404 PYBLA404L PYBLA404	PLAN EP E810-XXVDA4 4X 25G SFP28 PCIe	1M5 2M5 2M6 2M7	Same as above	Same as above	x	x		x	
S26361-F4054-L502 S26361-F4054-E202 S26361-F4054-E2	PLAN EP MCX4-LX 25Gb 2p SFP28	1M5 2M6 2M5	>=2.70 Mellanox driver package (WinOF-2) for Windows	>=5.4.2 Mellanox mlxup Firmware Bundle for Linux/Windows/ESX	x	x		x	
S26361-F4054-L302 S26361-F4054-E302	PLAN EP MCX4-LX 25Gb 2p SFP28 OCP	RX2530 M5	>=2.80 Mellanox driver package (WinOF-2) for Windows	>=5.5.1 Mellanox mlxup Firmware Bundle for Linux/Windows/ESX	x	x		x	
PYBLA3F2U PYBLA3F2U2	PLAN EP MCX4-LX DA2 2X 25G SFP28 OCPv3	2M5 2M6	>=2.70 Mellanox driver package (WinOF-2) for Windows	>=5.4.2 Mellanox mlxup Firmware Bundle for Linux/Windows/ESX	x	x		x	
S26361-F4056-L502 S26361-F4056-E202 S26361-F4056-E2	PLAN EP QL41212 25Gb 2p SFP28	2M5	>=20.87.1.1 QL41xxx, QL45611, Windows Driver Installer and Driver files	>=8.59.01 QL41xxxH Firmware Upgrade utility(Multi Boot Image)	x	x		x	
S26361-F4057-L501 S26361-F4057-E201 S26361-F4057-E1	PLAN EP QL45611 100Gb 1p QSFP28	2M5	Same as above	Same as above	x	x		x	
S26361-F4068-L502 S26361-F4068-E202 S26361-F4068-E2	PLAN EP QL41112 2X 10GBASE-T	2M5	Same as above	Same as above	x	x		x	
S26361-F4069-L502 S26361-F4069-E202 S26361-F4069-E2	PLAN EP QL41132 2X 10G SFP+	2M5	Same as above	Same as above	x	x		x	
S26361-F4069-L504 S26361-F4069-E4 S26361-F4069-E204	PLAN EP QL41134 4X 10G SFP+	2M5	Same as above	Same as above	x	x		x	

Product ID	Name		Firmware	Driver					
S26361-F4068-L504 S26361-F4068-E4 S26361-F4068-E204	PLAN EP QL41134 4X 10GBASE-T	2M5	Same as above	Same as above	x	x		x	
S26361-F5651-L540 S26361-F5651-E540 S26361-F3953-L210 S26361-F3953-E210	PLAN EM 10Gb T OCP	2M5	>=27.2.1 Intel® Ethernet Adapters Connections CD	>=1.5.1 Intel® NVM Update Package (NUP) for X722 devices	x		x		x
S26361-F5651-L510 S26361-F5651-E510 S26361-F3953-L211 S26361-F3953-E211	PLAN EM 2x 10GB SFP+ OCP interface	2M5	Same as above	Same as above	x		x		x
S26361-F5651-L550 S26361-F5651-E550 S26361-F3953-L411 S26361-F3953-E411	PLAN EM 4x 10GB SFP+ OCP interface	2M5	Same as above	Same as above	x		x		x
S26361-F5960-L502 S26361-F5960-E202 S26361-F5960-E2	PLAN EP X710-T2L 2X 10GBASE-T PCIe (Retail)	1M5 2M5 2M6	Same as above	>=8.15 NVM Update Package for Intel® X710 Series	x		x		
S26361-F3948-L504 S26361-F3948-E4 S26361-F3948-E204	PLAN EP X710-T4 4x10GBASE-T	1M5 2M5 2M6	Same as above	Same as above	x		x		
PYBLA274U PYBLA274U2	PLAN CP I350-T4 4X 1000BASE-T OCPv3	1M5 2M5 2M6 2M7	Same as above	>=1.63 This version or later is applied at the time of shipment.	x				
PYBLA352U PYBLA352U2	PLAN EP X710-DA2 2X 10G SFP+ OCPv3	1M5 2M5 2M6 2M7	Same as above	>=8.15 NVM Update Package for Intel® X710 Series	x				
PYBLA354U PYBLA354U2	PLAN EP X710-DA4 4X 10G SFP+ OCPv3	1M5 2M5 2M6 2M7	Same as above	Same as above	x				
PYBLA342U PYBLA342U2	PLAN EP X710-T2L 2X 10GBASE-T OCPv3	1M5 2M5 2M6 2M7	Same as above	Same as above	x				

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Product codes	Description	Model	Driver	Firmware					
PY-LA342 PYBLA342L PYBLA342	PLAN EP X710-T2L 2X 10GBASE-T PCIe	1M5 2M5 2M6 2M7	Same as above	Same as above	x				
PY-LA344 PYBLA344L PYBLA344	PLAN EP X710-T4L 4X 10GBASE-T PCIe	1M5 2M5 2M6 2M7	Same as above	Same as above	x				
PY-LA284 PYBLA284L PYBLA284	PLAN CP BCM5719-4P 4X 1000BASE-T PCI	1M5 2M6 2M7	>= 221.0.4.0 Broadcom 1G driver package (b57nd60x) for Windows	>= 221.1.4.1 Broadcom 1G lnxfwupg Firmware Bundle for Linux/Windows/ESXi	x				
PY-LA284U2 PY-LA284U PYBLA284U2 PYBLA284U	PLAN CP N41T 4X 1000BASE-T OCPV3	2M6 2M7	Same as above	Same as above	x				
PY-LA3J2U2 PY-LA3J2U PYBLA3J2U2 PYBLA3J2U	PLAN EP N210P 2X 10G SFP+ OCPV3	2M6 2M7	>= 222.0.126.0 Broadcom 10G driver package (bnxtnd) for Windows	>= 222.1.68.0 Broadcom 10G bnxtnvm Firmware Bundle for Linux/Windows/ESXi	x		x	x	
PY-LA3K2U2 PY-LA3K2U PYBLA3K2U2 PYBLA3K2U	PLAN EP N210TP 2X 10GBASE-T OCPV3	2M6 2M7	Same as above	Same as above	x		x	x	
PY-LA3J2 PYBLA3J2L PYBLA3J2	PLAN EP P210P 10Gb	1M5 2M6 2M7	Same as above	Same as above	x		x	x	
PY-LA3K2 PYBLA3K2L PYBLA3K2	PLAN EP P210P 2x10Gb	1M5 2M6 2M7	Same as above	Same as above	x		x	x	
PY-LA402U5 PYBLA402U5	PLAN EP MCX6-LX 25Gb 2p SFP28 OCPV3	RX2530 M7	>= 3.20.25915	>= 26.36.1010 Firmware Bundle for Linux/Windows/ESXi	x	x		x	
PY-LA402U4 PYBLA402U4	PLAN EP MCX6-LX 25Gb 2p SFP28 OCPV3	RX2540 M7	Same as above	Same as above	x	x		x	

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					x	x		x	
PY-LA4024 PYBLA402L4	PLAN EP MCX6-LX 25Gb 2p SFP28 PCIe	RX2530 M7	Same as above	Same as above					
PY-LA4024 PYBLA402L4 PYBLA4024		RX2540 M7	Same as above	Same as above	x	x		x	

* Please apply the latest network card driver/firmware available for download at:

https://support.ts.fujitsu.com/IndexDownload.asp?lng=COM

S2D-Ready SAS Controller Cards

Use the SAS controller cards, when S2D is to be implemented on Windows Server 2022.

Order Number	Product Name	Supported Server for S2D	Driver / Package	Firmware / Package
PYBSC3FBL	PSAS CP503i LP	2M6 2M5	Apply the driver provided by Microsoft.	≥14.00.02.06 FW of this version or higher is already applied to it at the same time of shipment. Not need to update by yourself.
PY-SC3FB	PSAS CP503i FH/LP			
PY-SC3MA2 PYBSC3MA2	PSAS CP2100-8i FH/LP	2M7 2M6* 2M5 1M5	≥1010.24.0.1005	≥5.00
PY-SC4FA PYBSC4FAVL PYBSC4FAL	PSAS CP600i	2M7 2M6	Apply the driver provided by Microsoft.	≥22.00.00.00 FW of this version or higher is already applied to it at the same time of shipment. Not need to update by yourself.
PY-SC4MA1 PYBSC4MA1L	PSAS CP 2200-16i	2M7	≥1010.84.0.1012	≥3.01.26.036

* BIOS version : ≥R1.16.1

Less than R1.16.1 BOIS version, PSAS CP2100-8i FH/LP is not used on 2M6

S2D-Ready HDDs/SSDs

Available HDDs and SSDs

The drives are listed in the "System configurator and order information guide" of server can be used as S2D drives except for Self Encrypting Drives.

The drives that you want to use as cache must meet one of the following conditions.

 - DWPD value 3 or more

 - DWPD value multiplied by Drive Capacity is over 4TB

There are no conditions to use as capacity.

Windows Server 2022's online firmware update function is not supported.

Appropriate drivers for PCIe SSDs

Fsas Technologies PCIe SSD drivers (IaNVMe.sys) do not support S2D. Therefore, in order to use PCIe SSD with S2D, you need to apply the driver provided by Microsoft (stornvme.sys), not the one provided by Fsas Technologies (IaNVMe.sys).

Technical Notes on Storage Spaces Direct (S2D)

Storage Spaces Direct makes it possible to combine multiple physical drives of different kinds into what is called a "storage pool" - a scalable, virtual storage space. S2D automatically detects what kind of drive is available and determines whether a given drive is to be used as a cache or a capacity drive; drives of the highest performance will be used as cache drives, and the remaining drives are to be used as capacity drives. To be included in a storage pool, a server must contain at least 2 cache drives and at least 4 capacity drives.

PCIe SSDs, SSDs, and HDDs can be combined in many different ways to form storage pools. Table 1 shows six such patterns and refers to the storage pools thus-formed as Storage Pool A to F.

Table 1.   How PCIe SSDs, SSDs, and HDDs Can Be Combined to Form Storage Pools

Storage Pool	PCIe SSD	SSD	HDD
A	—	≥2 cache drives	≥4 capacity drives
B	≥2 cache drives	—	≥4 capacity drives
C	≥2 cache drives	≥4 capacity drives	—
D	≥2 cache drives	≥4 capacity drives (can be combined with HDDs)	≥4 capacity drives (can be combined with SSDs)
E	—	≥4 capacity drives	—
F	≥4 capacity drives	—	—

Some SSDs are meant to be used as cache drives, while other SSDs as capacity drives. HDDs can be used only as capacity drives. The lists of 2.5-inch and 3.5-inch drives in the previous section classify PCIe SSDs, SSDs, and HDDs according to the purpose for which they are to be used in a storage pool (i.e., whether to be used as cache or capacity drives). Those drives can be grouped into five categories. Table 2 summarizes them and refers to them as Drive Category 1 to 5. The numbers in the aforementioned drive lists refer to the Drive Categories.

Table 2.   Drive Category and Purpose

Drive Category	Purpose
1	PCIe SSDs (for cache and capacity)
2	PCIe SSDs (for capacity only)
3	SSDs (for cache and capacity)
4	SSDs (for capacity only)
5	HDDs (for capacity only)

Table 3 shows which Drive Category's drives (see Table 2) are to be used for Storage Pool A to F (see Table 1). For example, Storage Pool A can consist of cache drives from Drive Category 3 and capacity drives from Drive Category 5. Please refer to your PRIMERGY server's technical specifications to determine which drives can be used with your system.

Table 3.   Storage Pool by Drive Category

Storage Pool	Drive Category	
	For Cache	For Capacity
A	3	5
B	1	5
C	1	3 or 4
D	1	3 and 5, 4 and 5
E	—	3 or 4 (3 and 4 can be combined)
F	—	1 or 2

Version history

Version	Date	Document changes
1.0	April 5, 2022	Initial Release
1.1	April 22, 2022	Base Unit information updated to support PCIe SSDs
1.2	August 30, 2022	Add Base Unit (PY RX2540 M6 24x 2.5" NVMe bays) Add CP2100-8i (S2D-Ready SAS Controller Cards)
1.3	September 15, 2022	Add PRIMERGY RX2530 M5, PRIMERGY RX2540 M5
1.4	October 11, 2022	Add RIMERGY TX1330 M5
1.5	January 10, 2023	Add "Role-based certification "of S2D-Ready Network Cards
1.6	March 9, 2023	Add "1M5 support info" to S2D-Ready Network Cards
1.7	April 18, 2023	Add some "Role-based certification" of S2D-Ready Network Cards
1.8	June 20, 2023	Add some "Role-based certification" of S2D-Ready Network Cards
1.9	July 18, 2023	Add PRIMERGY RX2530 M7, PRIMERGY RX2540 M7
2.0	October 24, 2023	Add base unit of RX2530 M7& RX2540 M7 Add "Hot swap/hot add of NVMe is restricted."
2.1	November 7, 2023	Add CP 600i(S2D-Ready SAS Controller Cards)
2.2	April 23, 2024	Add S2D-Ready Network Cards Add CP 2200i(S2D-Ready SAS Controller Cards)