Hewlett Packard Enterprise

Technical White Paper

HPE Superdome Flex 280 for SAP HANA - Predefined Configuration and TDI Implementation Guide

Intel® Xeon® Scalable 3rd Generation (Cooper Lake) Processors

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EXECUTIVE SUMMARY

Hewlett Packard Enterprise is #1 in SAP HANA server deployments with approximately 40% of the market share for SAP® systems. Ranked #1 in Scale-up and Scale-out capacity, Hewlett Packard Enterprise commands a wide margin, and leadership, in total SAP systems deployed, SAP HANA® appliances, Tailored Data center Integration (TDI), SAP BW/4HANA, and SAP S/4HANA.

With nearly 34,000+ servers deployed at thousands of SAP HANA customers worldwide, complemented by an unmatched services portfolio, Hewlett Packard Enterprise brings a unique understanding of SAP and SAP HANA environments that helps customers de-risk their SAP HANA adoption journey.

Hewlett Packard Enterprise offers a differentiated infrastructure portfolio for SAP HANA designed to address a broad range of customer needs beginning with production systems for small and medium businesses to highly scalable solutions for mission-critical environments, including the application tier. For more information, see Hewlett Packard Enterprise Solutions for SAP HANA page.

HPE Pointnext Services provide truly comprehensive SAP solutions for the Hybrid Cloud leveraging experience from over 1500 SAP HANA consulting projects and supporting over 25,000 SAP customers.

SAP HANA is a modern technology that offers an in-memory database, enables a radically different application architecture, and provides a new philosophy about data model simplicity. SAP HANA offers a new way to solve current and future challenges with enterprise applications, such as real-time data analysis of large amounts of data. More customers are transitioning to SAP HANA and are accelerating its use as a mission-critical platform.

SAP HANA requires memory for processing data in real-time, as well as persistent storage to hold the data on media. In the context of an SAP HANA integration, either shared storage or local disks can be leveraged. Shared or external storage based on Fibre Channel or Network File System (NFS) is required to get certified as SAP HANA Enterprise Storage. NFS is not required for certifying local disk connectivity with SAP, instead, a vendor verification for implementing the SAP HANA persistence layer on local disks must be completed.

This vendor verification is required as proof that the SAP HANA KPIs have been met. Vendor verification is a process to validate the solutions created by SAP Partners for SAP HANA Solutions are meeting the desired design implementation rules and minimal KPIs defined by SAP for HANA Appliances and TDI implementation.

An SAP HANA appliance deployment utilizes specific, preconfigured hardware (compute, network, and storage) and software (OS, SAP HANA) certified by SAP as appliance and implemented by Hewlett Packard Enterprise as a plug-and-play solution.

Hewlett Packard Enterprise and SAP work together to improve the enterprise capabilities of IT organizations, meet their business needs, safeguarding their current investments in data center infrastructure, tools, and operational processes.

This document describes the implementation of the HPE Superdome Flex 280 Scale-up server with Internal Storage configurations based on Intel® Xeon® Scalable 3rd Generation processor (Cooper Lake). The Superdome Flex 280 Scale-up with Internal Storage supports a wide variety of memory and disk configurations that SAP supports.

Target audience: This document is for Enterprise Solution Architects, Deployment/Implementation Engineers, and others to learn about the implementation of HPE Solution for SAP HANA using Superdome Flex 280 Scale-up.

Document Purpose: This document describes the architectural and technical overview required while using HPE Superdome Flex 280 Scale-up Server to deploy in-memory SAP HANA Database with Intel Xeon Scalable 3rd Generation processors.

OBJECTIVE

HPE Superdome Flex 280 is designed for mission-critical use cases, ranging from small 2-socket systems with 384 GB of DDR4 to 8-socket systems up to 24 TB of all DDR4 RAM or a mix of Persistent Memory. Featuring 3rd Generation Intel Xeon Scalable processors, HPE Superdome Flex 280 is designed based on the unique, modular HPE Superdome Flex 280 server that utilizes a modular 5U building block. It scales cost-efficiently from 2-socket to 8-socket to meet future growth.

HPE solutions for SAP HANA based on HPE Superdome Flex 280 is SAP HANA Appliance Certified from 2-socket systems with 768 GB to 8-socket systems with up to 12 TB of all DDR4 RAM. The customer has a choice to opt for TDI implementation and can scale up to 24 TB memory using pure DDR4 or combination with Intel Optane Persistent Memory.

HPE Solutions for SAP HANA based on HPE Superdome Flex 280 are SAP certified up to 12 TB of memory in Scale-up configurations. Scale-out configurations of up to 16 nodes can be deployed under the SAP Tailored Data center Integration model. For more information, see https://www.sap.com/dmc/exp/2014-09-02-hana-hardware/enEN/#/solutions?filters=v:deCertified;v:3a584c7d-ca9b-458a-bf13-b7de11e413b6&sort=Latest%20Certification&sortDesc=true&id=s:2682.

SOLUTION OVERVIEW

HPE Superdome Flex 280 Server

The HPE Superdome Flex 280 is a new introduction in the HPE Superdome Flex family of servers built using 2 to 8 Intel Xeon Scalable 3rd Generation processors. With 6 Ultra Path Interconnect (Intel UPI) links per processor, it provides comparatively higher bandwidth and faster data rates than prior generations of servers. It is designed to support 384GB to 24TB of shared memory for SAP HANA solutions. HPE Superdome Flex 280 Server comes with a choice between high-performance all DDR4 RAM or a combination of DDR4 RAM and Persistent Memory with Intel Optane Persistent Memory 200 Series.

HPE Superdome Flex 280 solutions for SAP HANA supports up to 8-socket Intel Xeon Scalable 3rd Generation processors in a single system with up to 28 cores per socket for a maximum of 224 cores per system. For more information, see HPE Superdome Flex 280 Solutions for SAP HANA QuickSpecs.

Design and implementation recommendations made in this document are only for SAP HANA implementations.

Figure 1 shows the 2-socket and 4-socket HPE Superdome Flex 280 server with the following two options:

- 12 slots with eight full-height slots (4 x16 slots and 4 x8 slots) + 4 half-height slots (1 x16 slot and 3 x8 slots)
- 16 half-height PCIe slots (7 x16 slots and 9 x8 slots)
- For a 2-socket server, the first 8 PCIe slots are available

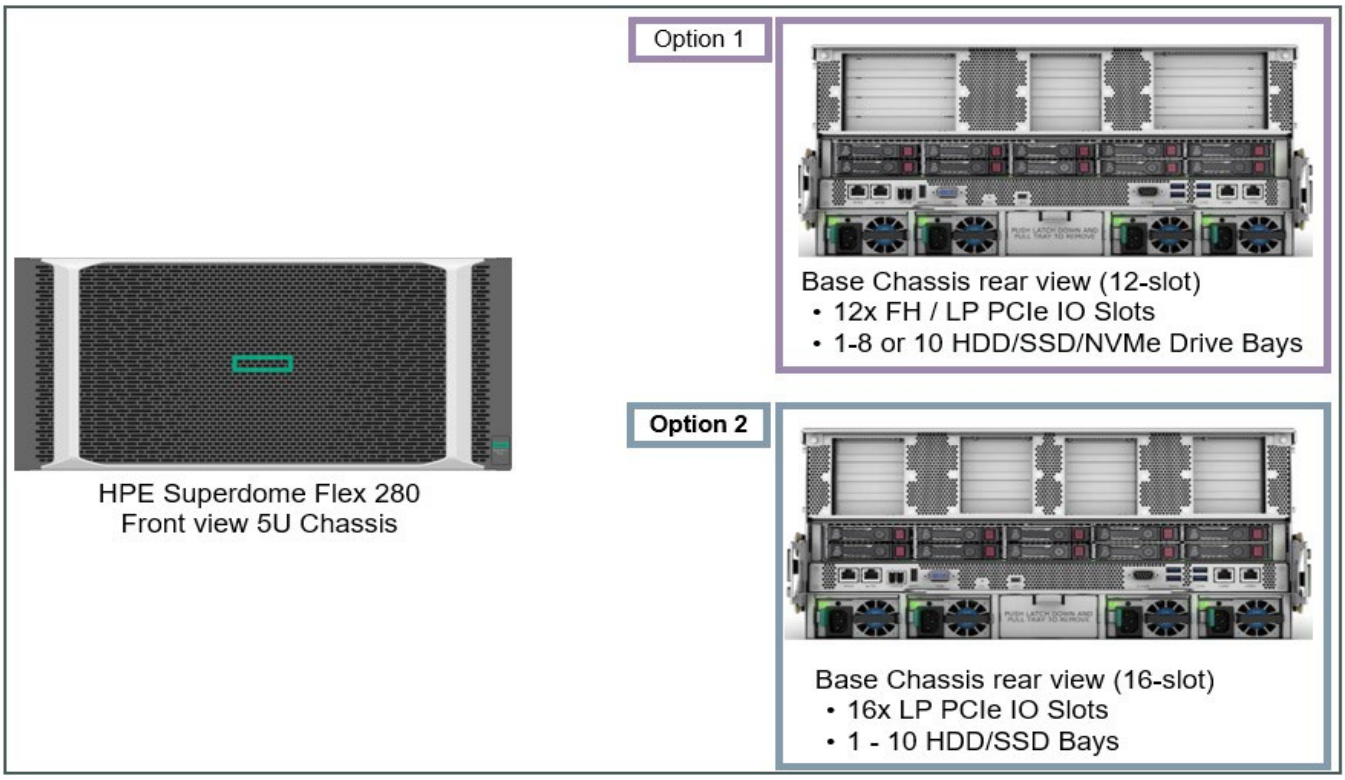

FIGURE 1.HPE Superdome Flex 280 Base chassis front and rear view (12 and 16 PCI Slot Options)

Figure 2 shows 6-socket and 8-socket HPE Superdome Flex 280 server with the following options:

- 16 half-height PCIe slots (7 x16 slots and 9 x8 slots)
- 12 slots with eight-full height slots (4 x16 slots and 4 x8 slots) + 4 half-height slots (1 x16 slot and 3 x8 slots)

PCI slots are optional on the Expansion chassis for an 8-socket server.

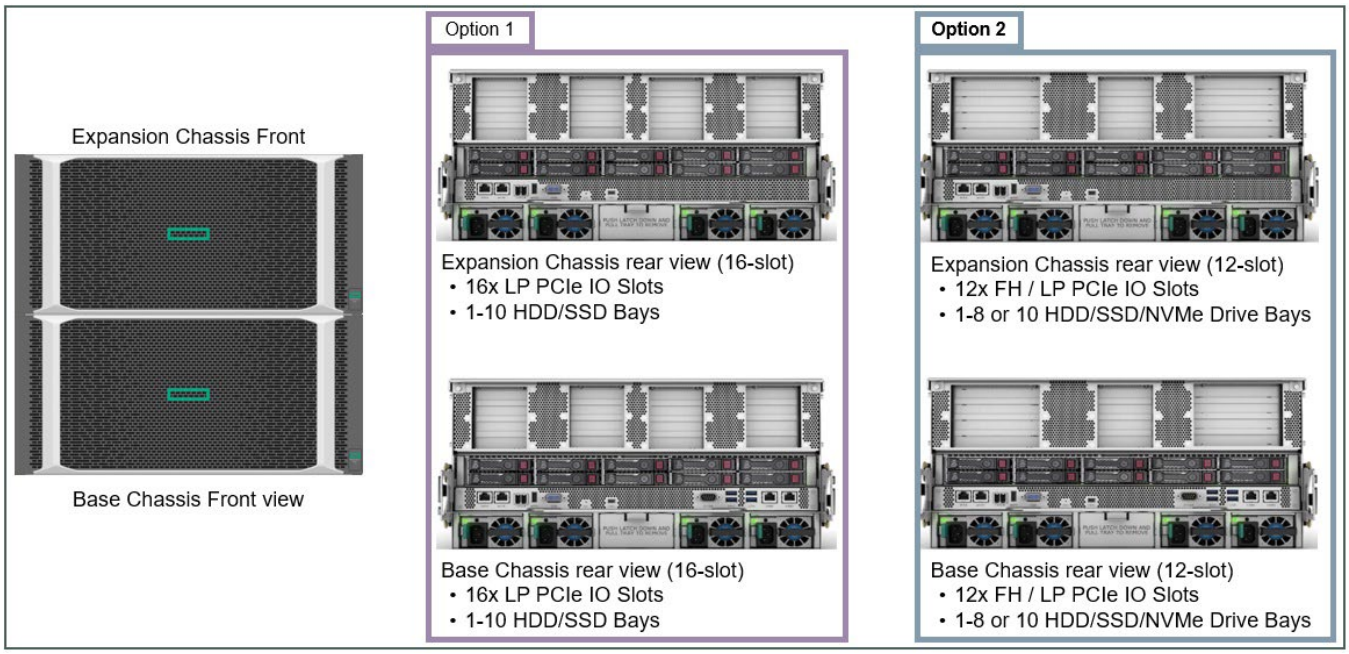

FIGURE 2. HPE Superdome Flex 280 chassis front and rear view (16 and 12 PCI Slot Options)

Table 1 shows the technical specifications of the HPE Superdome Flex 280 server.

TABLE 1.HPE Superdome Flex 280 technical specifications overview

Server Hardware Component	Description
Processor name	Intel Xeon Scalable 3rd Generation Processors (Platinum or Gold)
Number of processors	Two or four Intel Xeon Scalable Processors (Platinum or Gold) per chassis
Processor core available	8, 16, 18, 20, 24 (HANA TDI category) 28 (SAP HANA Appliance Certified CPU)
Processor cache	16.5MB or 22MB or 24.75MB or 27.5MB or 33MB or 35.75MB or 38.5MB
Form factor	Chassis is a 5U enclosure
Memory type	DDR4 Memory Intel Optane Persistent Memory 200 Series for HPE
Memory slots	Max. 48 DIMM slots per Chassis
Drive description	Max. 10 per chassis
Power supply type	HPE 1600W hot-swappable. Optional 2130W hot-swappable. up to 4 per chassis
Drive Supported	2.5-inch SFF SAS/SATA SSDs or SAS/SATA HDDs. Max. 10 per chassis
Infrastructure management	Web-based GUI, command-line, and Redfish

Server Hardware Component	Description
Minimum dimensions (H x W x D)	21.95 x 44.45 x 82.55 cm (chassis)
Weight (metric)	Average 50 kg / 110 lbs.

For detailed HPE Superdome Flex 280 specification and update, see HPE Superdome Flex 280 Server QuickSpecs.

Reliability, Availability, Serviceability (RAS) features

HPE Superdome Flex 280 servers offer RAS features in key hardware subsystems—processor, memory, and I/O—and provide the ideal foundation for mission-critical Linux® and VMware® Operating System environments. The Hewlett Packard Enterprise mission-critical Superdome Flex server addresses the growing emphasis on availability and provides it through a layered approach that offers application, file system, and operating system protection. The Hewlett Packard Enterprise mission-critical Superdome Flex infrastructure and the x86 operating environments provide a comprehensive RAS strategy that covers all layers—from application to hardware.

Fault management strategy

HPE Superdome Flex servers fully realize Hewlett Packard Enterprise's design strategy for systems handling mission-critical workloads, which is to implement, when applicable, a four-stage RAS strategy of the detect, log, analyze, and repair.

Figure 3 shows the RAS functions of the HPE Superdome Flex 280 server.

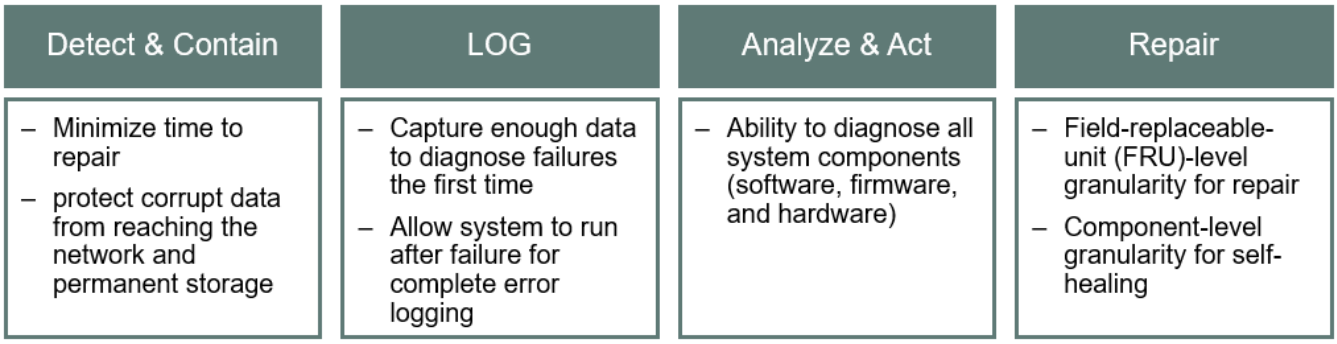

FIGURE 3. HPE Superdome Flex 280 RAS functions

This strategy keeps workloads up and their data available even in the incident of faults. Some of the design keys for diagnostic abilities that are built into every HPE Superdome Flex server are mentioned here.

Firmware First

Part of HPE Superdome Flex's comprehensive strategy for fault management includes Firmware First problem diagnosis. Intel Xeon Scalable processor's Enhanced Machine Check Architecture Gen 2 (EMCA2) allows firmware a first look at error logs so that firmware can diagnose problems and take appropriate actions for the platform before OS and higher-level software involvement. This feature provides software recovery for uncorrectable errors, which improves system availability.

RAS differentiators

While features such as hot-swap N+1 power supply and single and multi-bit memory error correction have become common in the industry, several RAS differentiators set HPE Superdome Flex servers apart from other industry-standard servers. HPE Superdome Flex servers offer the following RAS differentiators:

- Self-healing capabilities
- Processor RAS
- Memory RAS
- Platform RAS

- Application RAS
- OS RAS

For more information on RAS Feature, see Technical Paper HPE Superdome Flex 280 Server Architecture and RAS.

Overview and offerings

SAP HANA system infrastructure should address a core set of requirements spanning data growth, application, and infrastructure uptime and by maintaining the best in class application performance, the desired level of infrastructure, implementation, and service integration with the IT environment, while delivering the best value for powering mission-critical landscapes.

Hewlett Packard Enterprise offers a differentiated infrastructure portfolio designed to address a broad range of customer needs for SAP HANA use cases. For mission-critical use cases with scalability needs up to 24TB of DRAM in a single system, Hewlett Packard Enterprise offers the HPE Superdome Flex 280 server based on the 3rd Generation Intel Scalable Processor platform. For environments that require massive scalability with up to 32 sockets and 24TB of memory in a Scale-up system or Scale-out systems with up to 288TB of memory, the HPE Superdome Flex based on the 2nd Generation Intel Scalable Processor platform is the largest SAP certified system in the market, featuring a unique modular architecture that delivers an unmatched combination of performance, flexibility, availability, and scalability.

Customer and IT requirements will vary, driven by application requirements, integration and usages, infrastructure sizing, environment consumption, and deployment, and accordingly require a different infrastructure and service framework. Hewlett Packard Enterprise has come up with a variety of solutions offering for SAP HANA keeping all the factors in place.

HPE Superdome Flex 280 solution is available in SAP HANA Certified Appliance and SAP HANA Tailored Data Center Integration (TDI) as a building block offering. Customers can avail themselves of best-in-class and expert HPE Pointnext services.

HPE Superdome Flex 280 for SAP HANA – SAP use cases and workloads

HPE Superdome Flex 280 for SAP HANA is a certified Appliance and TDI compute block that is available to run the SAP Business Warehouse on HANA and SAP Business Suite on HANA (SoH) or S4HANA. The described core to memory ratio and scaling with workload-based sizing for BW, SoH/S4HANA are described in the following section.

- 2-socket configuration can scale-up to 1.5TB for BWoH and 3.0TB for SoH/S4H
- 4-socket configuration can scale-up to 3.0TB for BWoH and 6.0TB for SoH/S4H
- 6-socket configuration can scale-up to 4.5TB for BWoH and 9.0TB for SoH/S4H
- 8-socket configuration can scale-up to 6.0TB for BWoH and 12.0TB for SoH/S4H

SAP HANA Tailored Datacenter Integration offers customers additional flexibility to integrate HANA into their datacenters. Under SAP HANA TDI, SAP Partners and customers are allowed to custom assemble hardware, OS, and hypervisor from SAP-certified components.

Under SAP HANA TDI Phase V and VI, SAP has opened up flexible deployment options. Workload-driven HANA system sizing and implementations for SAP HANA TDI Phase V and VI flexibility options are described below.

- Tailored customer sizing is allowed hence the system processor and memory sizing can be fine-tuned according to specific customer workloads.
- SAP HANA hardware partner translates the sizing results (SAPS, RAM, CPU, and disk I/O**) into customer-tailored system configurations using a wide range of CPUs (including lower-end CPUs, not the only top–bin CPUs).
- Allow efficient implementation of Intel Optane DC persistent memory in customer data centers and manage large data sizes in memory effectively.

For more information on TDI and workload-driven sizing, refer to the SAP Document - “SAP HANA Tailored Data Center Integration – Overview”.

HPE predefined solutions for SAP HANA based on HPE Superdome Flex 280

Customers require a predictable and dependable procurement and deployment experience for their SAP HANA solutions to meet their project timelines and schedules. The HPE solutions for SAP HANA pre-defined configuration are turnkey experience to the customer and are purpose-built, optimized, and pre-integrated systems, designed with mission-critical reliability. These solutions come with HPE SAP HANA CoE life cycle services that ensure SAP HANA infrastructure performs to customer's organization-specific needs and objectives.

At present, Hewlett Packard Enterprise offers the HPE Superdome Flex 280 as the solution for SAP HANA with the following predefined configurations as options. HPE predefined solutions for SAP HANA are built with precisely chosen server components to achieve the optimal performance and workload.

Figure 4 and Figure 5 show the solution offerings.

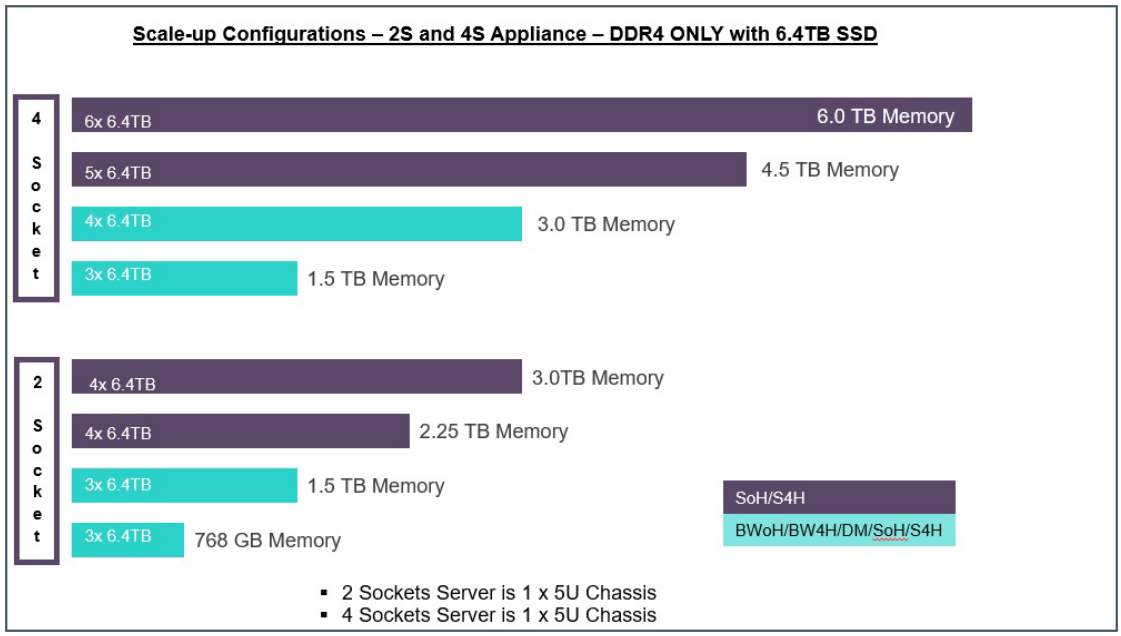

FIGURE 4. HPE Superdome Flex 280 predefined menu offerings for 2-socket and 4-socket

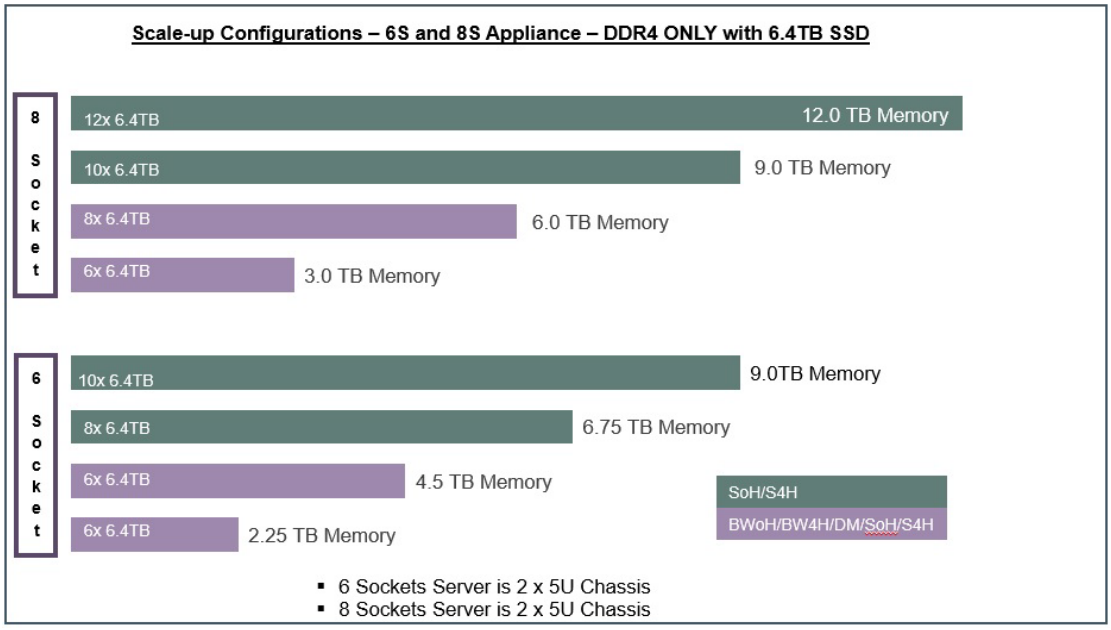

FIGURE 5. HPE Superdome Flex 280 predefined menu offerings for 6-socket and 8-socket

SOLUTION COMPONENTS

Components to build SAP HANA Appliance

Table 2 lists the major server components offered to build SAP HANA Appliance using HPE Superdome Flex 280, 2-socket, 4-socket, 6–socket, and 8–socket. The 6-socket and 8-socket implementations are available only with Platinum processors.

TABLE 2. Components of HPE Superdome Flex 280 Scale-up 2s/4s/6s/8s SAP-certified HANA Appliance

Components	Component description
HPE Superdome Flex 280 Chassis	HPE Superdome Flex 280 with 16 x Low Profile I/O Slots
Processor name	Intel Xeon Scalable 3rd Generation processors (Platinum) 8380H, 8380HL, 8376H, 8380HL (SAP HANA Appliance Certified CPU)
Number of processors	Two Intel Xeon Platinum Scalable processors Four Intel Xeon Platinum Scalable processors Six Intel Xeon Platinum Scalable processors Eight Intel Xeon Platinum Scalable processors
Memory options	64GB Dual Rank x4 DDR4-3200 R-DIMM 64GB Quad Rank x4 DDR4-2933 LR-DIMM 128GB Quad Rank x4 DDR4-3200 L R-DIMM
Number of DIMMs	24 or 48 per Chassis
Drive Backplanes (10 Drives Max/Chassis)	8SFF Premium Stg BP Kit 2SFF Premium Stg BP Kit
Storage controller	HPE SD Flex 280 SR 3154-24i Controller
Number of the storage controller	1 per Chassis
Storage drive	HPE SD Flex 280 6.4TB SAS 12G MU SFF BC SSD
Number of storage drive	3 to 6 per Chassis
Network cards (Base chassis)	HPE Ethernet 10Gb 2P 562T Adapter

Components	Component description
	HPE Ethernet 10/25Gb 2P 640SFP28 Adapter
Number of network card	Depends on the configuration and choice
Fibre Channel HBA (Optional) (Base chassis)	16Gb/32Gb FC HBA
Dual-purpose (Non-production storage)	HPE Solutions D3710 Storage Block
Dual-purpose storage controller (Base chassis)	HPE 3154-8e 8-port External RAID Controller
Dual-purpose storage drive option	HPE 2.4TB SAS 12G 10K SFF SC 512e DS HDD HPE 3.2TB SAS MU SFF SC SSD HPE 6.4TB SAS MU SFF SC SSD

HPE Predefined Solutions for SAP HANA based on HPE Superdome Flex 280 using Persistent Memory

Intel® Optane™ Persistent Memory 200 Series for HPE, delivers a unique combination of affordable larger capacity and support data persistence. Intel Optane Persistent Memory 200 Series for HPE in the combination of Intel Xeon 3rd Generation Scalable processor on HPE Superdome Flex 2-socket and the 4-socket server can turn more data into actionable insights.

According to SAP HANA TDI Phase V and VI, Hewlett Packard Enterprise offers the Persistent memory options for HANA on HPE Superdome Flex 280 Server as Pre-Defined configurations on 2-socket and 4-socket servers.

HPE Predefined Configuration using Intel Optane Persistent Memory 200 Series for HPE Superdome Flex 280, 2-socket, and 4-socket are shown in Figure 6. These are the configuration recommended by the HPE SAP solutions team wherein more combinations can be achieved by following the HPE SAP HANA building block options for HPE Superdome Flex 280 Server.

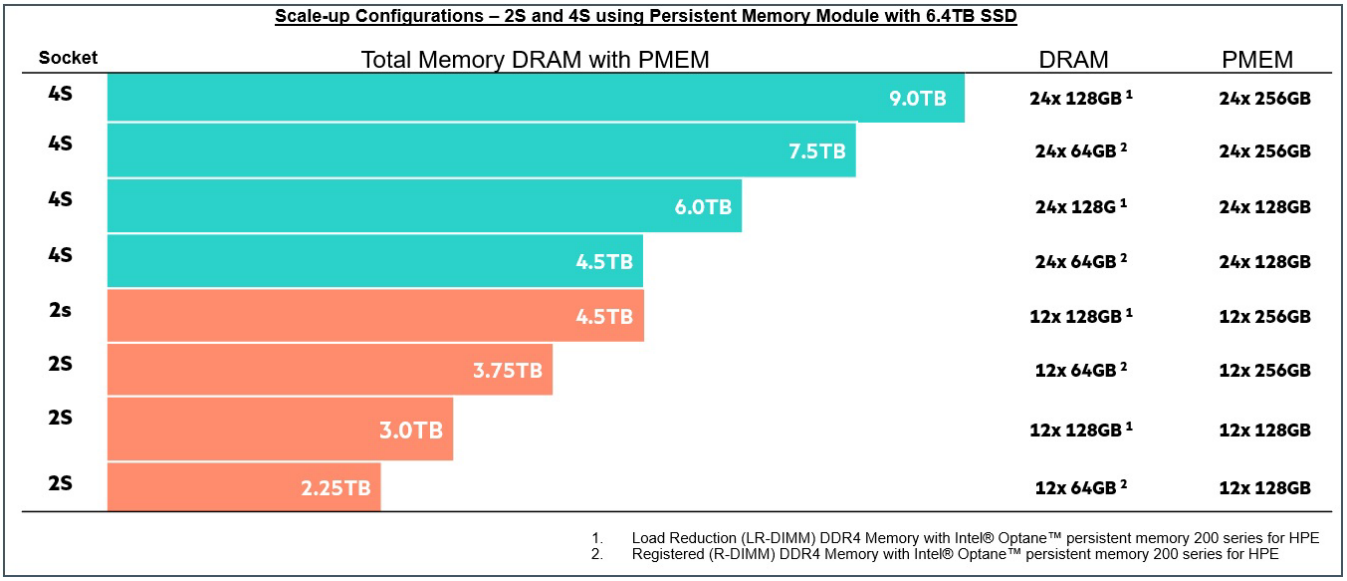

FIGURE 6. Memory (DRAM + PMEM) offerings for 2-socket and 4-socket configurations

NOTE

All Predefined configurations using Persistent Memory configurations are required “HL” processors.

Hardware components with Persistent Memory implementation

HPE Predefined Configuration for SAP HANA shown in Figure 6, using Intel Optane Persistent Memory 200 Series on HPE Superdome Flex 280 2-socket and 4-socket server. Table 3.shows the major components of HPE Superdome Flex 280 Scale-up 2S/4S with Persistent Memory implementation.

TABLE 3. Components of HPE Superdome Flex 280 Scale-up 2S/4S with Persistent Memory implementation

Components	Component description
HPE Superdome Flex 280 Chassis	HPE Superdome Flex 280 with 16 x Low Profile I/O Slots
Processor name	Intel Xeon Scalable 3rd Generation processors (Platinum or Gold) 8380HL, 8376HL, 8360HL, 6328HL 8380H, 8376H, 8360H, 8354H, 8353H, 6348H, 6330H, 6328H, 5320H, 5318H
Number of processors	Two Intel Xeon Scalable processors Four Intel Xeon Scalable processors
Memory options	64GB Dual Rank x4 DDR4-3200 R-DIMM 128GB Quad Rank x4 DDR4-3200 L R-DIMM
Persistent Memory	Intel Optane 128GB persistent memory 200 Series for HPE Intel Optane 256GB persistent memory 200 Series for HPE
Number of DIMMs	24 or 48 per Chassis
Drive Backplanes (10 Drives Max/Chassis)	8SFF Prem Stg BP Kit 2SFF Prem Stg BP Kit
Storage controller	HPE SD Flex 280 SR 3154-24i Controller
Number of the storage controller	1 per Chassis
Storage drive	HPE SD Flex 280 6.4TB SAS 12G MU SFF BC SSD
Number of storage drive	3 to 10 per Chassis
Network cards (Base chassis)	HPE Ethernet 10Gb 2P 562T Adapter HPE Ethernet 10/25Gb 2P 640SFP28 Adapter
Number of network card	Depends on the configuration and choice
Fibre Channel HBA (Optional) (Base chassis)	16Gb / 32Gb FC HBA
Dual-purpose (Non-production storage)	HPE Solutions D3710 Storage Block
Dual-purpose storage controller (Base chassis)	HPE 3154-8e 8-port External RAID Controller
Dual-purpose storage drive option	HPE 2.4TB SAS 12G 10K SFF SC 512e DS HDD HPE 3.2TB SAS MU SFF SC SSD HPE 6.4TB SAS MU SFF SC SSD

HPE TDI compute building block for SAP HANA based on HPE Superdome Flex 280

The HPE TDI compute building block for SAP HANA based on HPE Superdome Flex 280 provides customers a wide range of options to choose hardware components to help them optimally deploy SAP HANA and solve their business needs. These solutions simplify the infrastructure design and deployment phase for customers and provide an agile solution platform for helping customers drive innovation with new business models and outcomes.

The HPE building block for SAP HANA allows customers to invest and align solution outcomes with their business needs while adapting to changing market and technology trends. The modular building block approach gives customers more granular control over building a solution tailored to their specific needs and greater flexibility during the creation process through individual assembly and modeling of building block components.

SAP HANA TDI implementation offers more flexibility when integrating an SAP HANA system into the existing data center. Costs can be lowered with SAP HANA TDI solutions by using CPUs that meet business needs instead of using Platinum CPUs required for SAP appliances. Similarly, an existing SAP Certified Storage Block available in the data center can be used for HANA Persistent Storage.

HPE building block for SAP HANA based on HPE Superdome Flex 280 supports 2-socket, 4-socket, 6-socket, and 8-socket configurations.

The blocks defined in this section can be modified (e.g. processor model, memory, storage, etc.) to address new or changing workloads and environments. Specific workload services and behavior will drive the final configuration requirements including compute, network, and storage definition and quality. The following list will detail the configuration examples for few solution blocks:

- Enables large memory configurations up to 24TB using all-DDR4 RAM using 256GB DDR4 DIMM.
- Enables large memory configurations up to 24TB and significantly faster restart time with Intel Optane persistent memory 200 Series for HPE.
- Sized to meet your business requirements and specific SAP Workloads.

Table 4 shows the HPE Superdome Flex 280 2s/4s/6s/8s single server building block for SAP HANA TDI options.

TABLE 4. HPE Superdome Flex 280 2s/4s/6s/8s single server building block for SAP HANA TDI options

Components	Component description and choice
HPE Superdome Flex 280 Chassis	HPE Superdome Flex 280 with 16 x Low Profile I/O Slots OR HPE Superdome Flex 280 with 12 x Full Height / Low Profile I/O Slots
Processor name	Intel Xeon Scalable 3rd Generation processors (Platinum or Gold) 8380HL, 8376HL, 8360HL, 6328HL 8380H, 8376H, 8360H, 8356H, 8354H, 8353H, 6348H, 6330H, 6328H, 5320H, 5318H
Number of processors	Two Intel Xeon Scalable processors Four Intel Xeon Scalable processors Six Intel Xeon Scalable processors (with Platinum Processor only) Eight Intel Xeon Scalable processors (with Platinum Processor only)
Memory options	32GB Dual Rank x4 DDR4-3200 R-DIMM 64GB Dual Rank x4 DDR4-3200 R-DIMM 64GB Quad Rank x4 DDR4-2933 LR-DIMM 128GB Quad Rank x4 DDR4-3200 LR-DIMM 256GB Octal Rank x4 DDR4-3200 3DS LR-DIMM
Number of DIMMs	12 or 24: 2-socket 24 or 48: 4-socket 36 or 72: 6-socket 48 or 96: 8-socket
Persistent Memory	Intel Optane 128GB persistent memory 200 Series for HPE (2-socket and 4-socket) Intel Optane 256GB persistent memory 200 Series for HPE (2-socket and 4-socket) Intel Optane 512GB persistent memory 200 Series for HPE (2-socket and 4-socket)
Drive backplanes (10 Drives Max/Chassis)	8SFF+2SFF Premium Storage BP Kit OR 8SFF Standard Storage Backplane Kit **Note:** Standard backplane only uses SR 3162-8i /e and MR 9560-8i controller and provides only x1 PCIe bandwidth. Even though it is supported it is not recommended for SAP HANA due to lower performance results.
Storage controller	3154-24i 24-port Internal 4GB Cache SAS 12G PCIe3 x8 – 10 Drives Max 3154-16i 16-port Internal 4GB Cache SAS 12G PCIe3 x8 – 8 Drives Max 3162-8i /e 8-port Internal 2GB Cache SAS 12G Encryption – 4 Drives Max 9560-16i 16-port Internal 8GB Cache Tri-Mode 12G PCIe4 x8 – 8 Drives Max (NVMe SSD Support) 9560-8i 8-port Internal 4GB Cache Tri-Mode 12G PCIe4 x8 – 2 or 4 Drives Max (NVMe SSD Support)
Number of the storage controller	1 or 2 or 3 per Chassis allowed based on the controller and drive choice
Storage drive	SATA Hard Drive Option: 1.0TB / 2.0TB of Sizes SAS Hard Drive Options: 300GB / 600GB / 1.2TB / 2.4TB of sizes SAS Solid State Drive: 400GB to 6.4TB Mixed Use or Write Intensive Drives NVMe SSD: 800GB to 6.4TB Mixed Use
Number of storage drive	Maximum 10 Drives per chassis
Network cards	HPE Ethernet 10Gb Adapter HPE Ethernet 10/25Gb Adapter HPE Ethernet 100Gb Adapter
Fibre Channel HBA (Options)	16Gb/32Gb FC HBA
GPU controllers	NVIDIA Tesla/Quadro options

NOTE
Dual-purpose can be added separately by using HPE D3710 Storage for SAP HANA building block.

HPE Superdome Flex 280 4-socket/12TB Solution

HPE Superdome Flex 280 4-socket system is capable of scale-up memory configuration up to 12TB using HPE building block options for SAP HANA solutions. The TDI hardware components are briefly described in this section.

NOTE
The use of 4-socket 12TB is TDI only implementation. Please check customer sizing requirements to make sure the larger memory configurations will support the compute.

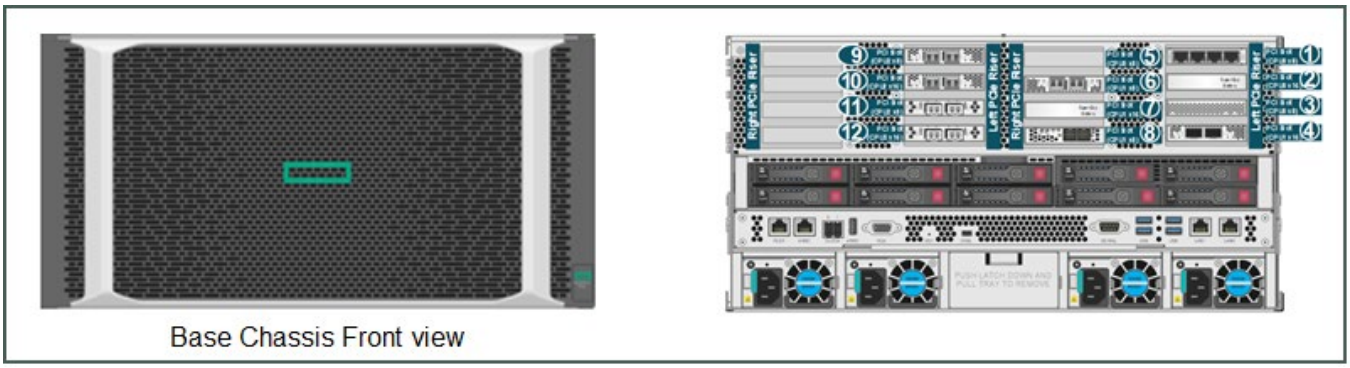

FIGURE 7. 4-socket 12TB using 48x 256GB DDR4 memory building block solution

Figure 8 shows the memory layout for populating 48 numbers of 256GB DIMM on 4-socket Base Chassis.

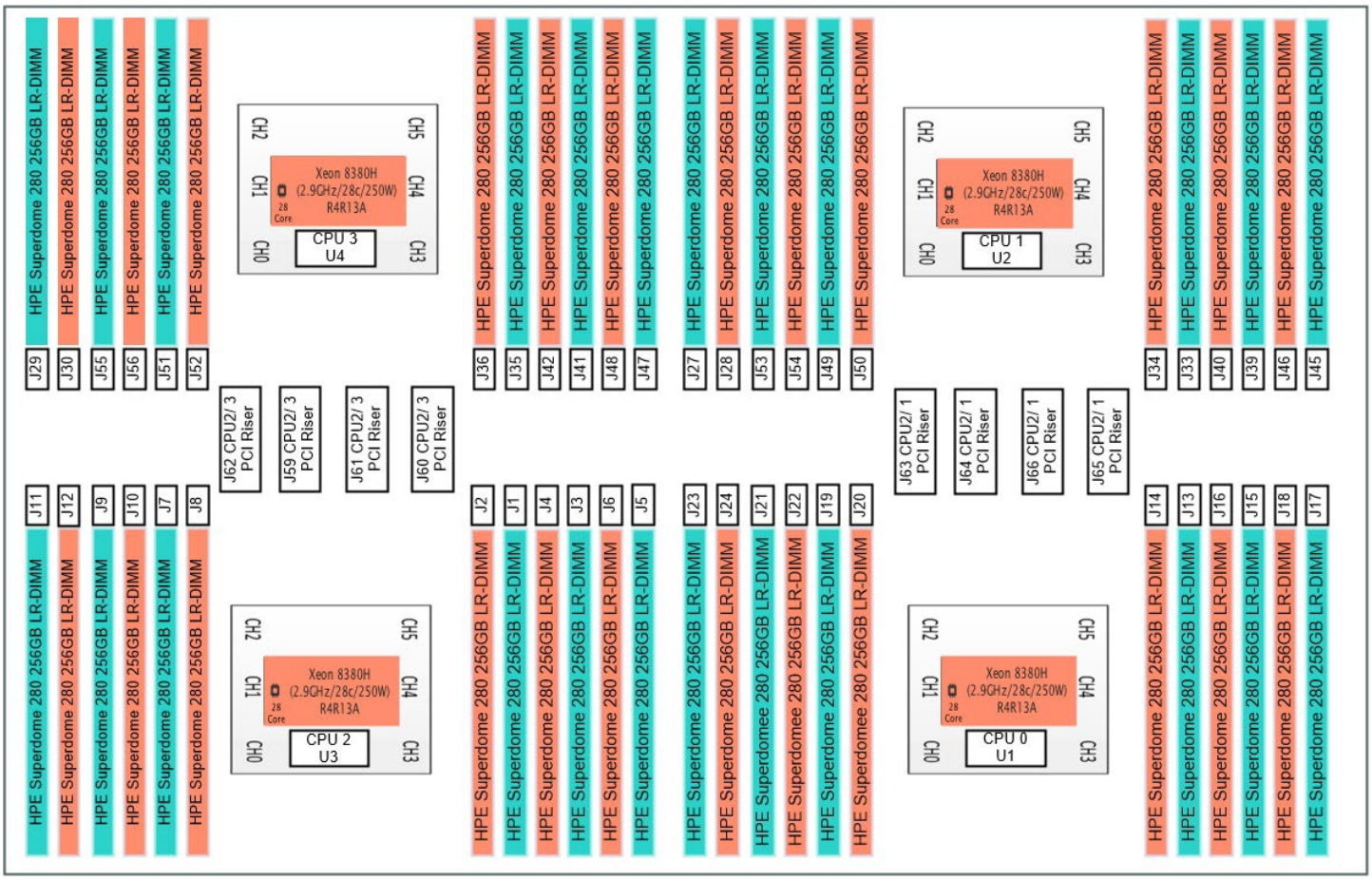

FIGURE 8.4-socket 12TB using 48x 256GB DDR4 memory – memory population

Table 5 shows the major hardware components required to build the 4-socket 12TB pure DDR4 memory configurations.

TABLE 5. HPE Superdome Flex 280 4-socket 12TB single server building block for SAP HANA TDI options

Components	Component description
HPE Superdome Flex 280 Chassis	HPE Superdome Flex 280 with 16 x Low Profile I/O Slots OR HPE Superdome Flex 280 with 12 x Full Height / Low Profile I/O Slots
Processor name	Intel Xeon Scalable 3rd Generation processors (Platinum) 8380HL, 8376HL, 8360HL, 6328HL
Number of processors	Four Intel Xeon Scalable processors (using HL processor only)
Memory options	256GB Octal Rank x4 DDR4-3200 3DS LR-DIMM
Number of DIMMs	48: 4-socket
Drive backplanes (10 Drives Max/Chassis)	8SFF+2SFF Premium Storage BP Kit
Storage controller	1x 3154-24i 24-port Internal 4GB Cache SAS 12G PCIe3 x8 – 10 Drives Max
Storage drive	HPE SD Flex 280 6.4TB SAS 12G MU SFF BC SSD

Components	Component description
Number of storage drive	10 Drives per chassis
Network cards	HPE Ethernet 10Gb Adapter HPE Ethernet 10/25Gb Adapter HPE Ethernet 100Gb Adapter

Superdome Flex 280 8-socket/24TB Solution

HPE Superdome Flex 280 8-socket system is capable of scale-up memory configuration up to 24TB using HPE building block for SAP HANA solutions. The TDI hardware components are briefly described in this section.

Hewlett Packard Enterprise is the only SAP Partner in the market that can offer an 8-socket 24TB all-DDR4 memory configuration. Figure 9 shows an 8-socket server built using 2x 5U HPE Superdome Flex 280 Chassis filled will 20x disks to provision the required persistent storage for HANA. The majority of hardware components are listed out in Table 6.

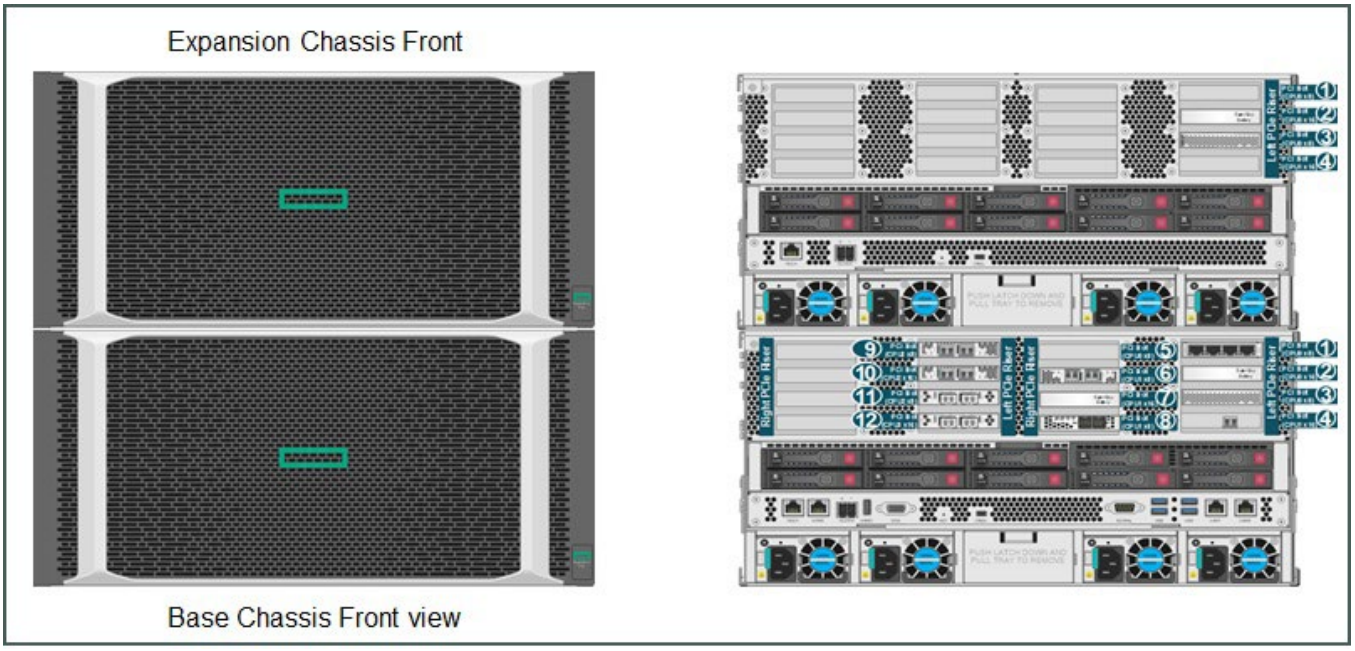

FIGURE 9. 8-socket 24TB using 96x 256GB DDR4 memory building block solution

TABLE 6. HPE Superdome Flex 280 8-socket 24TB single server building block for SAP HANA TDI options

Components	Component description
HPE Superdome Flex 280 Chassis	HPE Superdome Flex 280 with 16 x Low Profile I/O Slots OR HPE Superdome Flex 280 with 12 x Full Height / Low Profile I/O Slots
Processor name	Intel Xeon Scalable 3rd Generation processors (Platinum) 8380HL, 8376HL, 8360HL, 6328HL
No. of Chassis	2
Number of processors	Eight Intel Xeon Scalable processors (using HL processor only)
Memory options	256GB Octal Rank x4 DDR4-3200 3DS LR-DIMM
Number of DIMMs	48 per Chassis

Components	Component description
Drive backplanes (10 Drives Max/Chassis)	8SFF+2SFF Premium Storage BP Kit
Storage controller	1x 3154-24i 24-port Internal 4GB Cache SAS 12G PCIe3 x8 – 10 Drives Max
Number of Storage Controller	1 per Chassis
Storage drive	6.4TB SAS 12G MU SFF BC SSD
Number of storage drive	10 Drives per chassis
Network cards	HPE Ethernet 10Gb Adapter HPE Ethernet 10/25Gb Adapter HPE Ethernet 100Gb Adapter

NOTE
The use of 8-socket 24TB is only for TDI implementation. Please check customer sizing requirements to make sure the larger memory configurations will support the compute requirements for SAP HANA.

CAPACITY AND SIZING

SAP HANA is an in-memory database that stores and processes the bulk of its data in memory. Additionally, it protects against data loss by saving the data in persistent storage locations. For setting up an SAP HANA system, the storage layer must fulfill several requirements. This section discusses the different requirements and common design options for the storage subsystem. Especially when using high availability and disaster tolerance features, care must be taken in planning the persistent space.

Sizing is an activity often performed at the early stage of the project where the business process and application requirements will be translated into hardware infrastructure requirements. Sizing activity includes consolidating the requirement of CPU, Memory, Storage, Power, Network, and I/O throughput.

As SAP HANA is an in-memory database it is important to save a copy of data against data loss by saving it in persistent storage. SAP HANA will be used for various purposes like BW/DM/S4H etc. and the infrastructure required will vary. The persistent storage layer must fulfill various requirements. One major criterion is the SAP HANA Appliance or SAP HANA TDI implementation. The section guides the consumer on how to consider the various sizing aspects.

For more information on SAP HANA Sizing, see SAP HANA Sizing.

Processor

Intel Xeon Scalable 3rd Generation processor is designed for advanced in-memory analytics, artificial intelligence, and high-density server infrastructure, new Intel Xeon Platinum 8300 processors deliver new levels of performance, platform capabilities, and industry-leading workload acceleration.

With the 3rd Generation Scalable processor, Intel has added Processor SKU “H”. The Processor SKU “H” defines the Intel 3rd Generation Intel Processor based on Cedar Island Architecture which is called by the code name “Cooper Lake”.

Figure 10 shows the Intel processor numbering for Cooper Lake/Cedar Island processor.

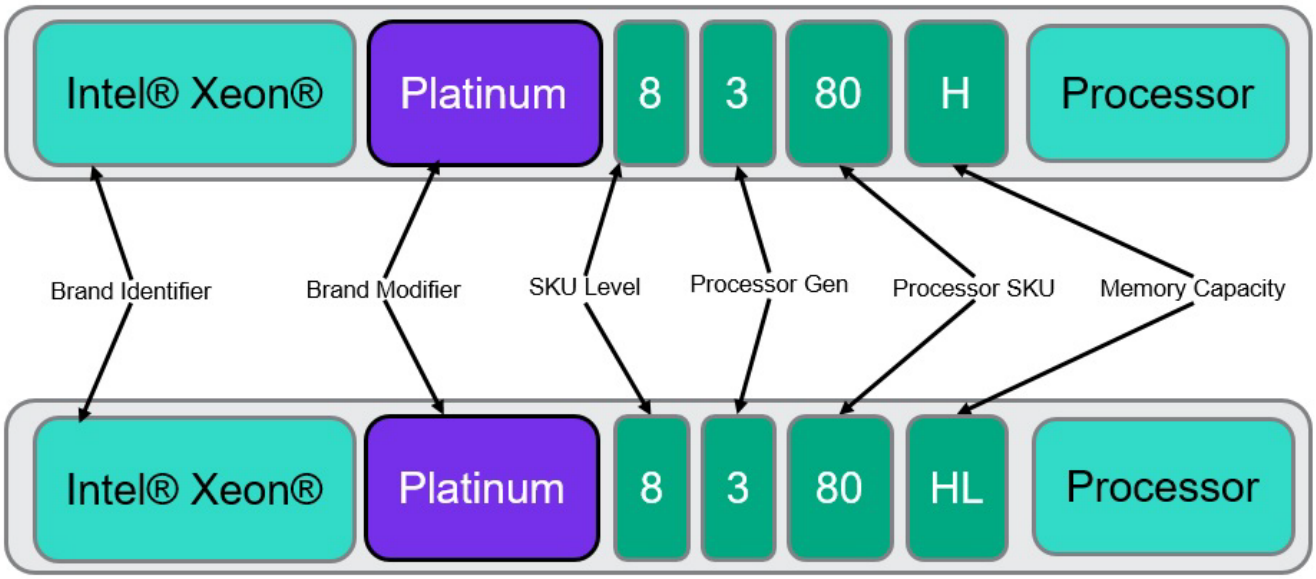

FIGURE 10. Intel processor numbering for Cooper Lake/Cedar Island processor

Table 7 shows the alphanumeric string which describes the characteristics of the Intel Xeon Processor.

TABLE 7. An alphanumeric string that describes the characteristics of the Intel Xeon processor

SKU Level	SKU Descriptions
8	Platinum
6, 5	Gold
Processor Generation	
3	3rd Gen Intel Xeon Scalable Processors (Cooper Lake)
Memory Capacity	Cooper Lake
H	<=1.12TB (1152GB) per socket
HL	<=4.5TB per socket

A few of the major innovations of Intel Xeon Scalable 3rd Generation CPU are as follows:

- Intel Xeon Platinum 8300H processors, Gold 6300H & 5300H processors
- Enhanced DDR performance up to 3200 MT/s
- Intel Deep Learning Boost, now with bfloat16
- 6 Intel Ultra Path Interconnect (Intel UPI)
- Intel Advanced Vector Extensions 512

In-memory applications will benefit from Intel Xeon Scalable 3rd Generation App Direct Mode.

For the implementation of SAP HANA, it is important to understand processor requirements according to their specification and define the memory and storage requirements.

Table 8 shows the Hewlett Packard Enterprise offerings for SAP HANA Appliance and TDI implementation.

TABLE 8. Intel Xeon 3rd Generation processor offerings on HPE Superdome Flex 280 for SAP HANA

SAP HANA implementation Type	Processor Mode	Speed (GHz)	Core/Socket	Per Socket Memory Capacity (TB)	CPU Cache (MB)	Memory Speed Max. (MHz)	TDP in Watt	Maximum Socket Support
Appliance/TDI	8380H	2.9	28	1.12	38.5	3200	250	8
Appliance/TDI	8380HL	2.9	28	4.5	38.5	3200	250	8
Appliance/TDI	8376H	2.6	28	1.12	38.5	3200	205	8
Appliance/TDI	8376HL	2.6	28	4.5	38.5	3200	205	8
TDI	8360H	3.0	24	1.12	33.0	3200	205	8
TDI	8360HL	3.0	24	4.5	33.0	3200	205	8
TDI	8356H	3.90	8	1.12	35.75	2933	190	8
TDI	8354H	3.1	18	1.12	24.75	3200	205	8
TDI	8353H	2.5	18	1.12	24.75	3200	150	8
TDI	6348H	2.3	24	1.12	24.75	2933	150	4
TDI	6330H	2.0	24	1.12	33.0	2933	150	4
TDI	6328H	2.8	16	1.12	22.0	2933	165	4
TDI	6328HL	2.8	16	4.5	22.0	2933	165	4
TDI	5320H	2.4	20	1.12	27.5	2667	150	4
TDI	5318H	2.5	18	1.12	24.75	2667	150	4

Memory

SAP HANA is an in-memory database application and can run the workload upon the large pool of memory. SAP HANA looks for a compute node with homogenous and symmetric assembly of DIMMs across channels and maximizes utilization of all memory channels per processor.

Memory per core ratio is defined by SAP and at regular intervals, SAP releases the T-shirt appliance sizes for SAP HANA defining the memory per core ratio.

In addition to the SAP T-shirt sizes, it is important to understand the hardware and their capabilities to support the SAP T-shirt sizing to run the SAP HANA in-memory database.

Based on the SAP T-Shirt sizing and HPE Hardware capabilities there are a set of offerings available and these offerings are defined in the following sections. Hewlett Packard Enterprise is offering the following DIMM sizes for SAP HANA Solutions based on HPE Superdome Flex 280.

Table 9 shows the memory configurations offered using the HPE building blocks for SAP HANA solutions options. These are the memory offerings available for TDI implementation for 2-socket servers.

TABLE 9. HPE building blocks for SAP HANA TDI solutions: configuration options for HPE Superdome Flex 280 2-socket implementation

Configuration	384GB	768GB	1536GB	2304GB	3072GB
32GB Dual Rank x4 DDR4-3200 R-DIMM	X[1]	X[2]			
64GB Dual Rank x4 DDR4-300 R-DIMM		X[1]	X[2]		
128GB Quad Rank x4 DDR4-3200 LR-DIMM			X[1]		X[2]
256GB Octal Rank x4 DDR4-3200 3DS LR-DIMM					X[1]
Mix DIMM Solutions				X[3]	

Table 10 shows the memory configurations offered using the HPE building blocks for SAP HANA solutions options. These are the memory offerings available for TDI implementation for 4-socket servers.

TABLE 10. HPE building blocks for SAP HANA solutions memory options for HPE Superdome Flex 280 4-socket implementation

Configuration	768GB	1536GB	3072GB	4606GB	6144GB	12288GB
32GB Dual Rank x4 DDR4-3200 R-DIMM	X[1]	X[2]				
64GB Dual Rank x4 DDR4-300 R-DIMM		X[1]	X[2]			
128GB Quad Rank x4 DDR4-3200 LR-DIMM			X[1]		X[2]	
256GB Octal Rank x4 DDR4-3200 3DS LR-DIMM					X[1]	X[2]
Mix DIMM Solutions				X[3]		

Table 11 shows the memory configurations offered using the HPE building blocks for SAP HANA solutions options. These are the memory offerings available for TDI implementation for 6-socket servers.

TABLE 11. HPE building blocks for SAP HANA solutions memory options for HPE Superdome Flex 280 6-socket implementation

Configuration	1152GB	2304GB	4608GB	6912GB	9216GB	18432GB
32GB Dual Rank x4 DDR4-3200 R-DIMM	X[1]	X[2]				
64GB Dual Rank x4 DDR4-300 R-DIMM		X[1]	X[2]			
128GB Quad Rank x4 DDR4-3200 LR-DIMM			X[1]		X[2]	
256GB Octal Rank x4 DDR4-3200 3DS LR-DIMM					X[1]	X[2]
Mix DIMM Solutions				X[3]		

Table 12 shows the memory configurations offered using the HPE building blocks for SAP HANA solutions options. These are the memory offerings available for TDI implementation for 8-socket servers.

TABLE 12. HPE building blocks for SAP HANA solutions memory options for HPE Superdome Flex 280 8-socket implementation

Configuration	1536GB	3072GB	6144GB	9216GB	12288GB	24576GB
32GB Dual Rank x4 DDR4-3200 R-DIMM	X[1]	X[2]				
64GB Dual Rank x4 DDR4-300 R-DIMM		X[1]	X[2]			
128GB Quad Rank x4 DDR4-3200 LR-DIMM			X[1]		X[2]	
256GB Octal Rank x4 DDR4-3200 3DS LR-DIMM					X[1]	X[2]
Mix DIMM Solutions				X[3]		

For more details on sizing, see the SAP Sizing portal.

[1] Memory configuration, half populated and evenly distributed across CPU
[2] Memory configuration, fully populated and evenly distributed across CPU
[3] DDR4 memory mixing of 64GB LRDIMM DDR4 and 128GB LRDIMM DDR4 is allowed. Populated with ½ each type

Persistent Memory

The world is in the midst of an era of digital transformation and most businesses are becoming data-driven and data-centric, thus they will need to capture, organize, analyze, and safeguard the rapid data growth. As the demand for compute is growing the datacenters typically need to scale rapidly to cope with the requirement.

The traditional storage technology is not always able to keep pace with today's demanding workloads. Large pools of DRAM help accelerate computing with low latency, but DRAM is limited in capacity, is volatile, and expensive.

Intel Optane Persistent Memory (PMem) for HPE bridges the gap with an innovative memory technology. This new memory delivers a unique combination of affordable large capacity and support for data persistence. With 3rd Gen Intel Xeon Scalable processors and Intel Optane Persistent Memory 200 series for HPE workloads can optimize performance and cost by creating a 2-tier hierarchy in-memory and storage.

- Reduce the data access time from traditional storage and accelerate in-memory computing by keeping data closer to the CPU.
- Reduce start/restart time as data is persistent in memory and not required to load data from traditional disk storage.
- Reduce power consumption for large memory compute.

HPE Superdome Flex 280 Server supports Intel Optane PMem 200 series for HPE along with processors on 2-socket and 4-socket platforms. Figure 11 shows the DIMM and basic property of Persistent Memory.

TABLE 13. Intel Optane PMem 200 series for HPE Cooper Lake 2-socket and 4-socket platform

Persistent Memory Module
Intel Optane 128GB persistent memory 200 series for HPE
Intel Optane 256GB persistent memory 200 series for HPE
Intel Optane 512GB persistent memory 200 series for HPE

FIGURE 11. Intel Optane Persistent Memory Module and basic support

NOTE

Intel does not support Intel Optane Persistent Memory 200 series on 6-socket and 8-socket server configurations.

Storage RAID Controller

HPE solutions for SAP HANA on HPE Superdome Flex 280 server are based on Direct-attached storage (DAS). It consists of storage disks that are attached directly to the server systems, which run the SAP HANA database workload. The data that resides on the DAS system is private to the server connected to it. Hewlett Packard Enterprise maintains a wide range of PCIe 3.0 and PCI 4.0 based RAID controllers that are supported on the HPE Superdome Flex 280 Server.

The storage RAID controllers offer the connectivity, performance, and protection to support the critical application workloads. Hewlett Packard Enterprise maintains a wide range of SmartRAID (Microsemi) and MegaRAID (Broadcom/LSI) controller cards which are supporting SATA, SAS, and NVMe technologies-based storage devices. There are different types of SATA/SAS/NVMe connectors are available which are capable to provide the speed of 3Gb/s, 6Gb/s, 12Gb/s, 24Gb/s, and 32Gb/s based on the type of drives, backplane, and interconnect cables.

SmartRAID (Microsemi Adaptec) Storage Controller

HPE Superdome Flex 280 Server is available with 3 SmartRAID controller options to fulfill the customer's requirements. Operating System boot device should be configured on SLOT 3, but SLOT 5 and 8 are alternate boot slots available on HPE Superdome Flex 280 Chassis. The 12Gbps SmartRAID 3154-24i and 3154-16i adapters with 4GB onboard cache, coupled with 6/12G SSDs, provide maximum read/write bandwidth and IOPS as well as acceleration and latency optimization through caching for the most performance-demanding in-memory transactional database workload.

SmartRAID 3162-8i/e controller is featuring the 2GB onboard cache that supports encryption with maxCrypto™. SmartRAID 3100 adapters are full-featured RAID adapters with integrated cache backup, providing enormous IOPS, highlighting the feature of Smart Array controllers.

Table 14 shows the HPE Superdome Flex 280 Smart RAID Storage Controller offerings and features.

TABLE 14. HPE Superdome Flex 280 Smart RAID Storage Controller offerings and features

Feature	SR 3154-24i	SR 3154-16i	SR 3162-8i /e
Solution category	Appliance / TDI	TDI	TDI
Controller type	12Gb/s SAS	12Gb/s SAS	12Gb/s SAS
Host interface	PCI Express 3.0 x8	PCI Express 3.0 x8	PCI Express 3.0 x8
Data transfer rate	12Gb/s per port	12Gb/s per port	12Gb/s per port
Encryption support	NO	NO	YES (maxCrypto)
Total number of SAS Ports	24	16	8
Cache memory	4GB FWBC	4GB FWBC	2GB NV Cache
RAID support	0, 1, 5, 6, 50, 60, 1 ADM, 10 ADM	0, 1, 5, 6, 50, 60, 1 ADM, 10 ADM	0, 1, 5, 6, 50, 60, 1 ADM, 10 ADM
Recommended RAID for OS	RAID 1, 5	RAID 1, 5	RAID 1, 5
Recommended RAID for HANA	RAID 5, 50, 6, 60	RAID 5, 50, 6, 60	RAID 5, 50, 6, 60
Max drive support on SD-Flex 280	10 Max	8 Max	4 Max
Supercapacitor	Separate	Separate	Onboard Mounted

Figure 12 shows the Microsemi Adaptec SmartRAID 3100 Series Storage RAID Controller with Supercapacitor for external connectivity.

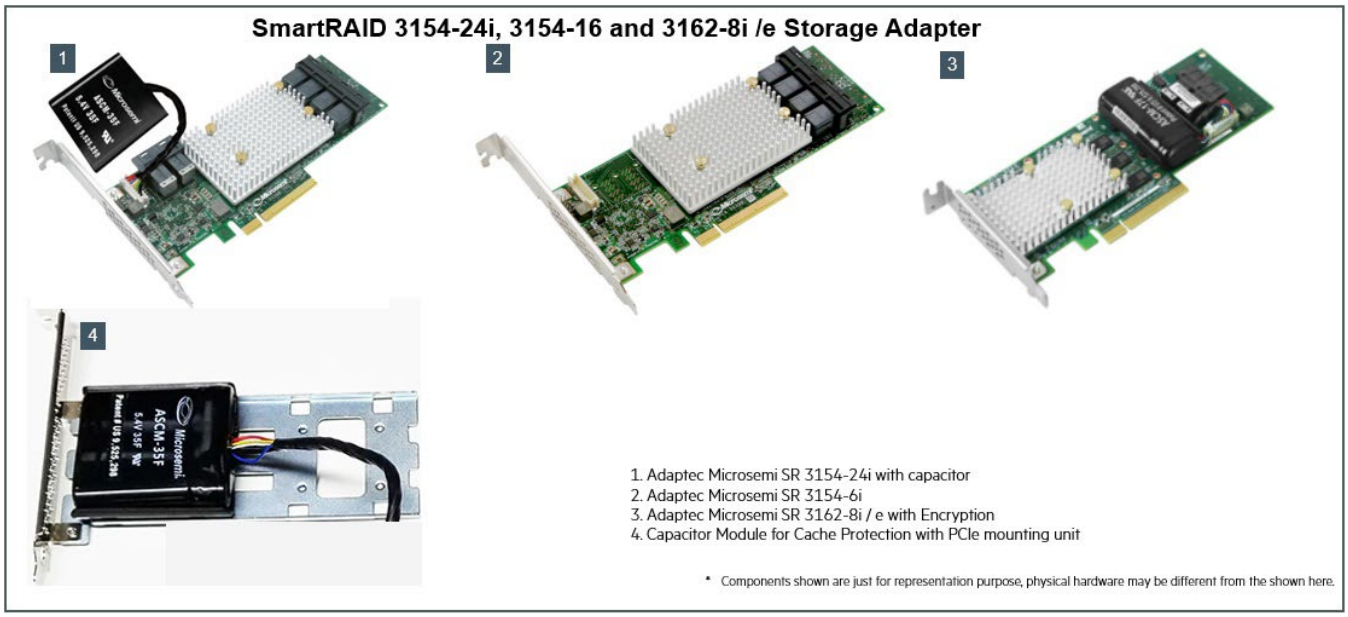

FIGURE 12. Microsemi Adaptec SmartRAID controller supported on HPE Superdome Flex 280 with Supercapacitor PCI mount unit

MegaRAID (Broadcom/LSI) Tri-Mode Storage controller

HPE Superdome Flex 280 MegaRAID 9560-16i and 9560-8i are the first two x8 PCIe Gen 4.0 RAID controllers introduced on HPE Superdome Flex 280 server platform. MegaRAID 9560-16i and 9560-8i are Tri-Mode storage controller which enables the operation of NVMe/SAS/SATA storage drives in a single type of drive bay connected to U.3 backplane. SFF-TA-10001 specification U.3 defines a common bay type for SAS, SATA, and NVMe Universal Backplane Management (UBM), which defines a common backplane drive interconnect and management framework with Tri-Mode technology. For HANA implementation, it is recommended to use U.3 premium backplane to achieve the most performance out of these controllers.

Built with Tri-Mode storage controller technology, the adapter negotiates between speeds and protocols to seamlessly work with any of the three types of storage drives NVMe/SAS/SATA. Tri-Mode enables the use of existing drives in datacenters with NVMe technology on the same server hence it's the best technique for SAP HANA TDI implementation, in the category of Storage RAID Controller.

By using the combination of MegaRAID 9560-16i and 9560-8i controller with U.3 Universal Backplane Management (UBM) Module and the connector for NVMe/SAS/SAS x1, x2, x4 devices speed can be achieved.

Table 15 shows the HPE Superdome Flex 280 Smart RAID Storage Controller offerings and features.

TABLE 15. HPE Superdome Flex 280 Smart RAID Storage Controller offerings and features

Feature	MR 9560-16i	MR 9560-8i
Solution category	TDI	TDI
Controller type	12Gb/s Tri-Mode (NVMe/SAS/SATA)	12Gb/s Tri-Mode (NVMe/SAS/SATA)
Host interface	PCI Express 4.0 x8	PCI Express 4.0 x8
Data transfer rate	12Gb/s SAS, 6Gb/s SATA, Gen 4.0 PCIe (NVMe)	12Gb/s SAS, 6Gb/s SATA, Gen 4.0 PCIe (NVMe)
Encryption support	NO	NO
Cache memory	8GB FWBC	4GB FWBC
RAID support	5, 6, 50, 60	5, 6, 50, 60

Feature	MR 9560-16i	MR 9560-8i
Recommended RAID for OS	RAID 1, 5	RAID 1, 5
Recommended RAID for HANA	RAID 5, 50, 6, 60	RAID 5, 50, 6, 60
Max drive support on HPE Superdome Flex 280	8 Max	4 Max

MegaRAID Cache Protection

RAID Controllers cache the data temporarily and write the data on Disks Arrays, cached data can be lost during power failure and thus jeopardize the integrity of data on the storage array.

Controller cache is non-volatile. CacheVault® flash cache protection modules and battery backup units (BBUs) protect the integrity of data available on the controller. It is cached by providing battery power to the controller and helps the controller to transfer the data from the non-volatile cache to NAND flash during power failure to the server. Once the power restores to the server system the normal operation is resumed.

Figure 13 shows the major components of MegaRAID 9560-16i and 9560-8i storage controller.

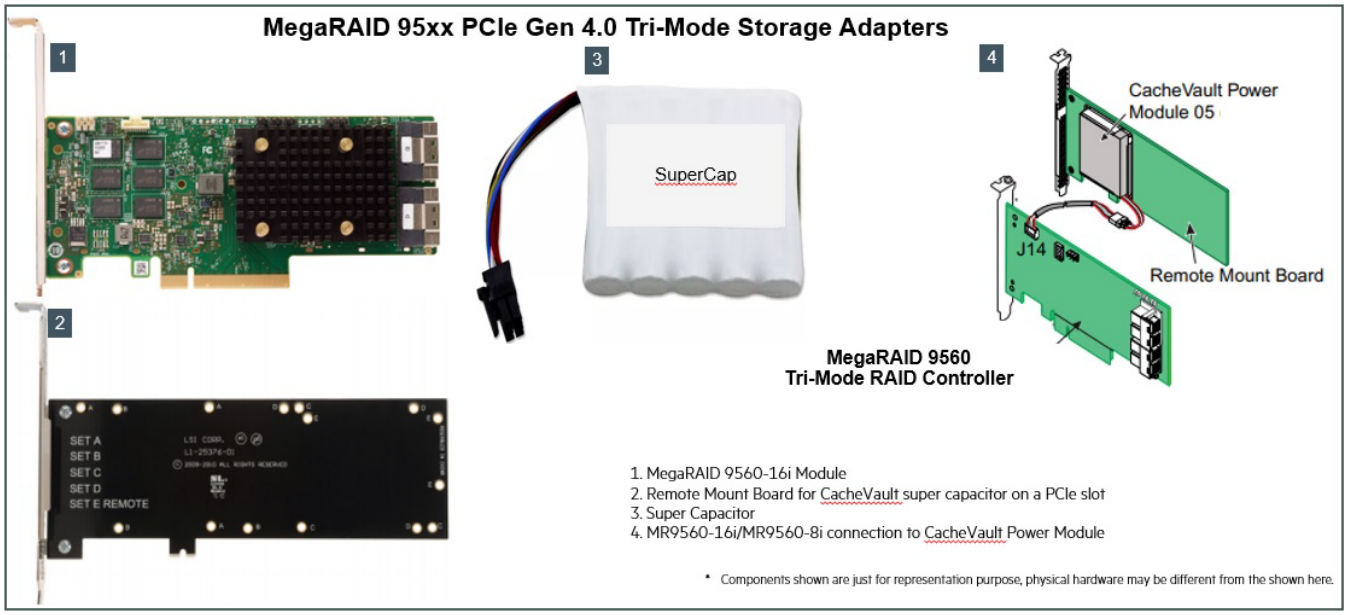

FIGURE 13. HPE Superdome-Flex 280 - MegaRAID 9560-16i and 9560-8i hardware components

SmartRAID Controller implementation for SAP HANA solutions

The following section will describe the best-recommended options for 3154-24i, 3154-16i, and 3162-8i Storage Controller implementation for SAP HANA solutions offering on HPE Superdome Flex 280 server. The described configurations for controller choice and implementation are based on the best practice defined by the HPE SAP HANA solutions team to achieve optimal throughput and IOPS.

NOTE

The standard backplane only uses an SR 3162-8i /e controller and provides only x1 PCIe bandwidth. Even though the standard backplane is supported it is not recommended for SAP HANA due to lower performance results.

HPE SD Flex 280 Smart RAID 3154-24i Controller

HPE SD Flex 280 Smart RAID 3154-24i controller is chosen for SAP HANA Appliance implementation because of its performance, drive scalability, and storage capacity offerings. With the 5U, 2-socket, or 4-socket HPE Superdome Flex 280 server, the SR 3154-24i will be installed

in PCI Slot 3, which is a boot slot. For the 5U, 2 chassis 6-socket or 8-socket server implementation to increase the storage capacity another storage controller card will be installed in Slot 3 of the expansion chassis to support internal storage configured in the expansion chassis.

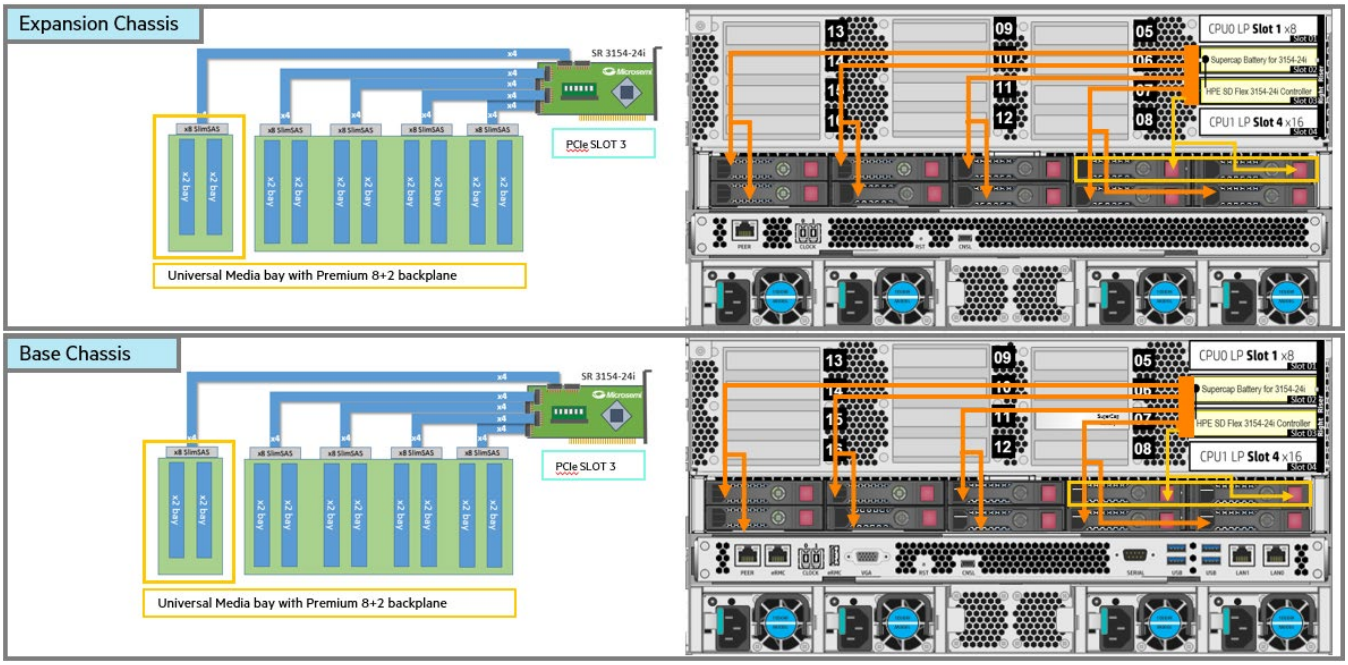

FIGURE 14. 2S/4S (Base) and 6S/8S (Base + Exp. Chassis) with 3154-24i and premium backplane

With a 4-socket server implementation, a maximum of 10 drives can be used, but with HPE Superdome Flex 280, an 8-socket server implementation, 20 drives can be used to double the storage capacity across the two independent arrays using Linux LVM. It is always recommended to divide the number of disks equally across the arrays to achieve the best IO performance for SAP HANA workloads.

Table 16 shows the offerings and features of the HPE Superdome Flex 280 Smart RAID Storage Controller (3154-24i).

TABLE 16. HPE Superdome Flex 280 Smart RAID Storage Controller (3154-24i) offerings and features

Controller Choice	Chassis	Server	PCI Slot	Max. Disks	Backplane
3154-24i	Expansion	6S/8S	3	10	2 + 8 SFF Premium
3154-24i	Base	2S/4S	3	10	2 + 8 SFF Premium

8 SFF Standard backplane can be used for all the options of TDI implementation, but a maximum of 8 disks can only be accommodated. So, if there is a plan to scale the capacity, choose the Premium Backplane.

HPE SD Flex 280 Smart RAID 3154-16i Controller

The only significant difference between the SR 3154-16i controller and the SR 3154-24i controller is the number of disks supported. SR 3154-16i can support a maximum 8 number of disks and SR 3154-24i can support 10 disks. All other features and matrices are similar.

The following section describes options to implement 3154-16i controllers for 1 chassis and 2 chassis. In the following section, all representations of the number of controllers and disks are based on per chassis.

Smart RAID 3154-16i Controller – Option 1

In the configuration shown, the operating system and HANA volumes reside on the same controller on Base Chassis and in the case of 8-socket implementation, only the HANA volume will be configured using Linux LVM.

Figure 15 shows the 2S/4S (Base) and 8S (Base + Exp. Chassis) with 3154-16i with the premium backplane.

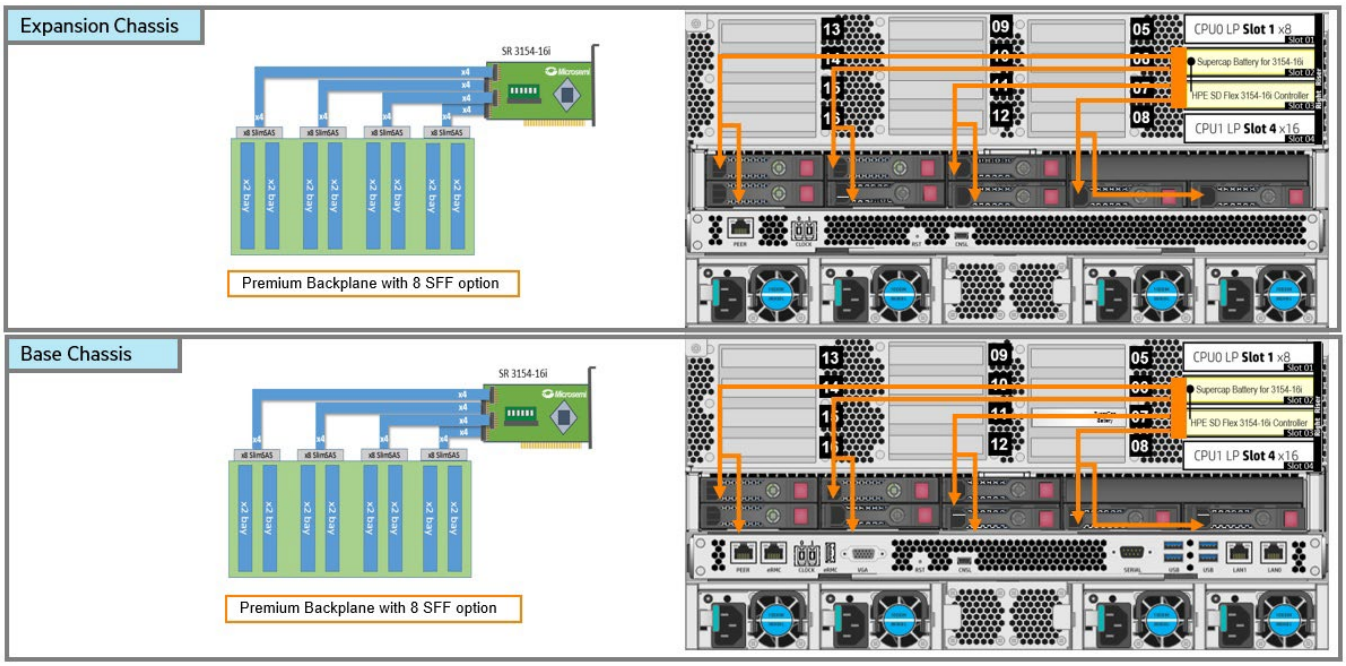

FIGURE 15. 2S/4S (Base) and 6S/8S (Base + Exp. Chassis) with 3154-16i with premium backplane

Table 17 shows the offerings and features of the HPE Superdome Flex 280 Smart RAID Storage Controller (3154-16i).

TABLE 17. HPE Superdome Flex 280 Smart RAID Storage Controller (3154-16i) offerings and features

Controller Choice	Chassis	Server	PCI Slot	Max. Disks	Backplane
3154-16i	Expansion	6S/8S	3	8	Premium Backplane
3154-16i	Base	2S/4S	3	8	Premium Backplane

Smart RAID 3154-16i Controller – Option 2

Smart RAID 3162-8i /e is introduced here and installed on SLOT 3 of Base Chassis to boot the operating system using disks installed on universal media bay and configured in RAID 1. HANA volumes will separately reside on the disks belonging to the 3154-16i controller.

Figure 16 shows the 2S/4S (Base) with premium backplane and 8S (Base + Exp. Chassis) premium backplane/OS boot using 3162-8i /e.

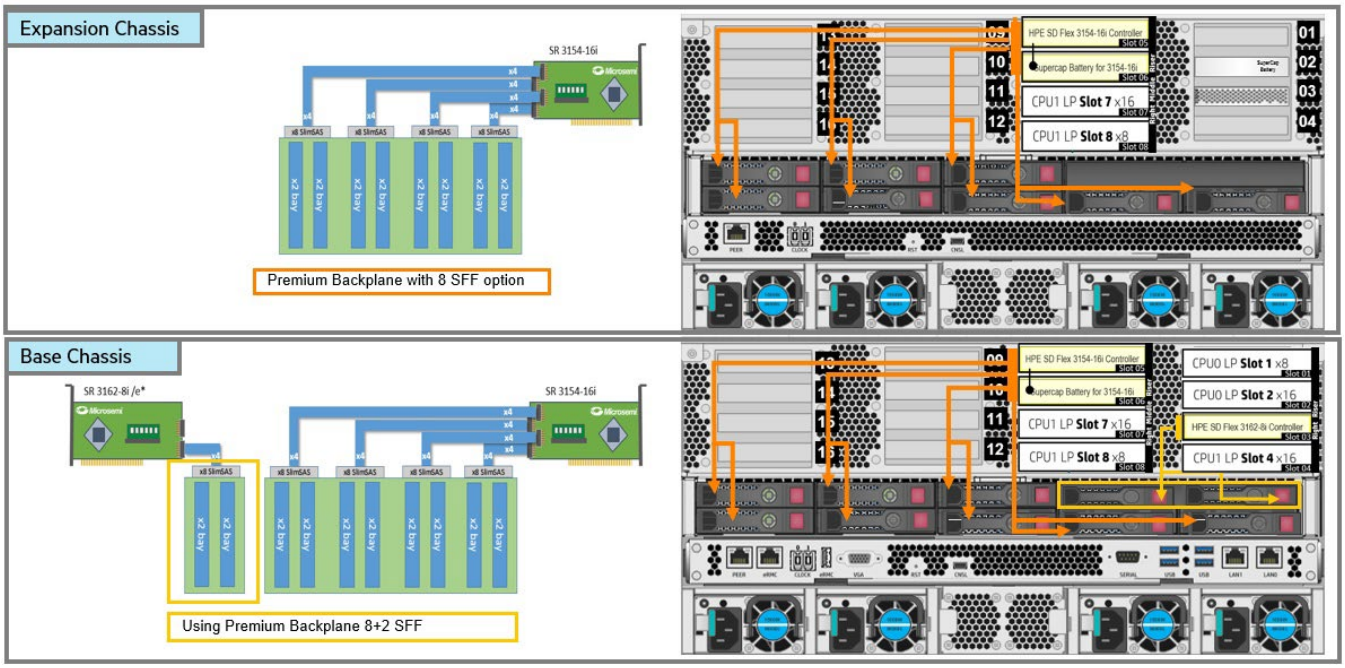

FIGURE 16. 2S/4S (Base) with premium backplane and 6S/8S (Base + Exp. Chassis) premium backplane/OS boot using 3162-8i /e

Table 18 shows the offerings and features of the HPE Superdome Flex 280 Smart RAID Storage Controllers (3154-16i or 3162-8i).

TABLE 18. HPE Superdome Flex 280 Smart RAID Storage Controller (3154-16i or 3162-8i) offerings and features

Controller Choice	Chassis	Server	PCI Slot	Max. Disks	Backplane
3154-16i	Expansion	6S/8S	5	8	Premium Backplane
3154-16i	Base	2S/4S	5	8	Premium Backplane
3162-8i /e	Base (OS)		3	2	Premium Backplane

HPE Smart RAID 3162-8i /e controller

HPE Smart RAID 3162-8i /e RAID adapter is 12Gbps SAS with 8 internal SAS/SATA ports. The controller includes maxCache 4.0, and when coupled with 12Gbps SSDs, provides maximum bandwidth and throughput by acceleration and latency optimization through caching.

HPE Smart RAID 3162-8i /e adapter is also equipped with optional maxCrypto, which offers controller-based encryption for any block storage device.

HPE SAP HANA solutions have the following options to implement the HPE SmartRAID 3162-8i /e with the HPE Superdome Flex 280 Server for SAP HANA.

HPE Smart RAID 3162-8i /e controller – Option 1

This implementation choice shows 2x 3162-8i /e controllers are used in each chassis to get the maximum drive number to 8. Operating System resides on the SLOT 3 controller and respective disks.

Figure 17 shows the 2S/4S (Base) and 8S (Base + Exp. Chassis) with SR 3162-8i /e with premium backplane – Encryption support.

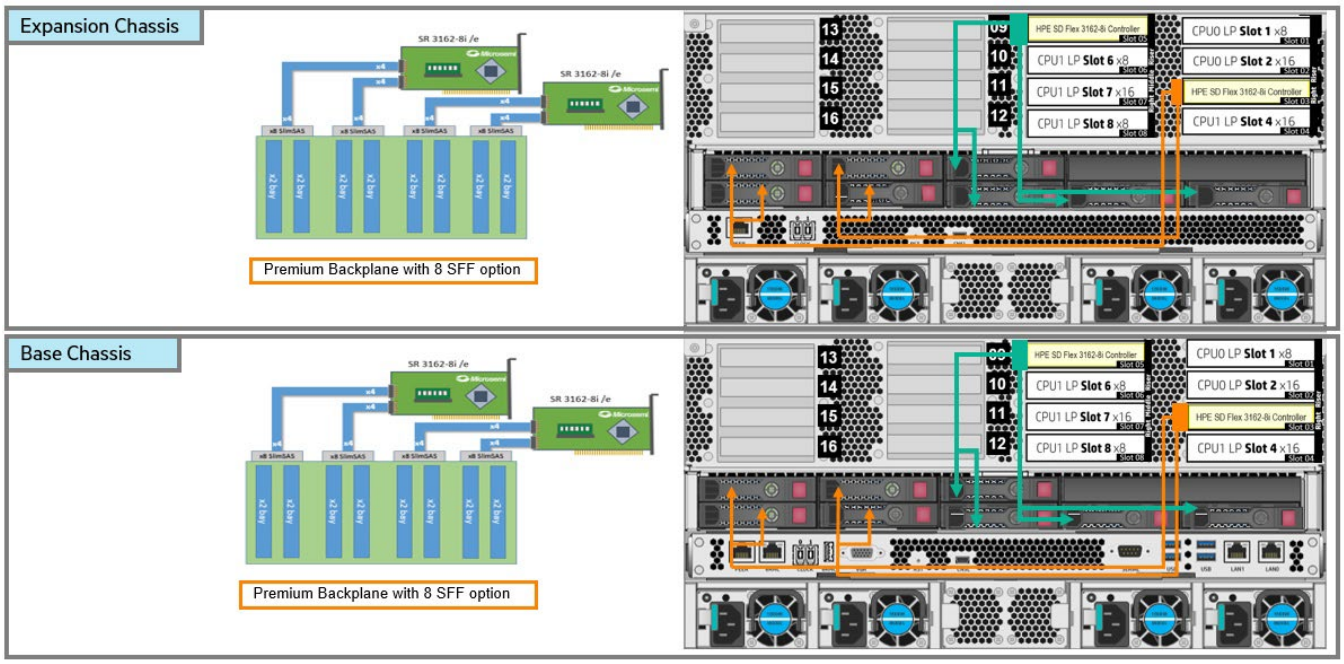

FIGURE 17. 2S/4S (Base) and 6S/8S (Base + Exp. Chassis) with SR 3162-8i /e with premium backplane – Encryption support

Table 19 shows the offerings and features of the HPE Superdome Flex 280 Smart RAID Storage Controller (3162-8i).

TABLE 19. HPE Superdome Flex 280 Smart RAID Storage Controller (3162-8i) offerings and features

Controller Choice	Chassis	Server	PCI Slot	Max. Disks	Backplane
3162-8i /e	Expansion	6S/8S	5	4	8 + 2 SFF Premium Backplane
3162-8i /e	Expansion	6S/8S	3	4	8 + 2 SFF Premium Backplane
3162-8i /e	Base	2S/4S	5	4	8 + 2 SFF Premium Backplane
3162-8i /e	Base	2S/4S	3	4	8 + 2 SFF Premium Backplane

HPE Smart RAID 3162-8i /e Controller – Option 2

This implementation option shows 3x 3162-8i /e controller is used on Base Chassis. The controller on SLOT 3 is used to configure the drives on universal media to install the OS. The remaining 2x 31628i /e controllers are used for HANA Volumes. In the case of an 8-socket server, the same SLOT 5 and SLOT 8 controllers are used for HANA volumes.

Figure 18 shows the 2S/4S (Base) and 8S (Base + Exp. Chassis) with 3162-8i /e (OS Boot) with premium backplane – Encryption support.

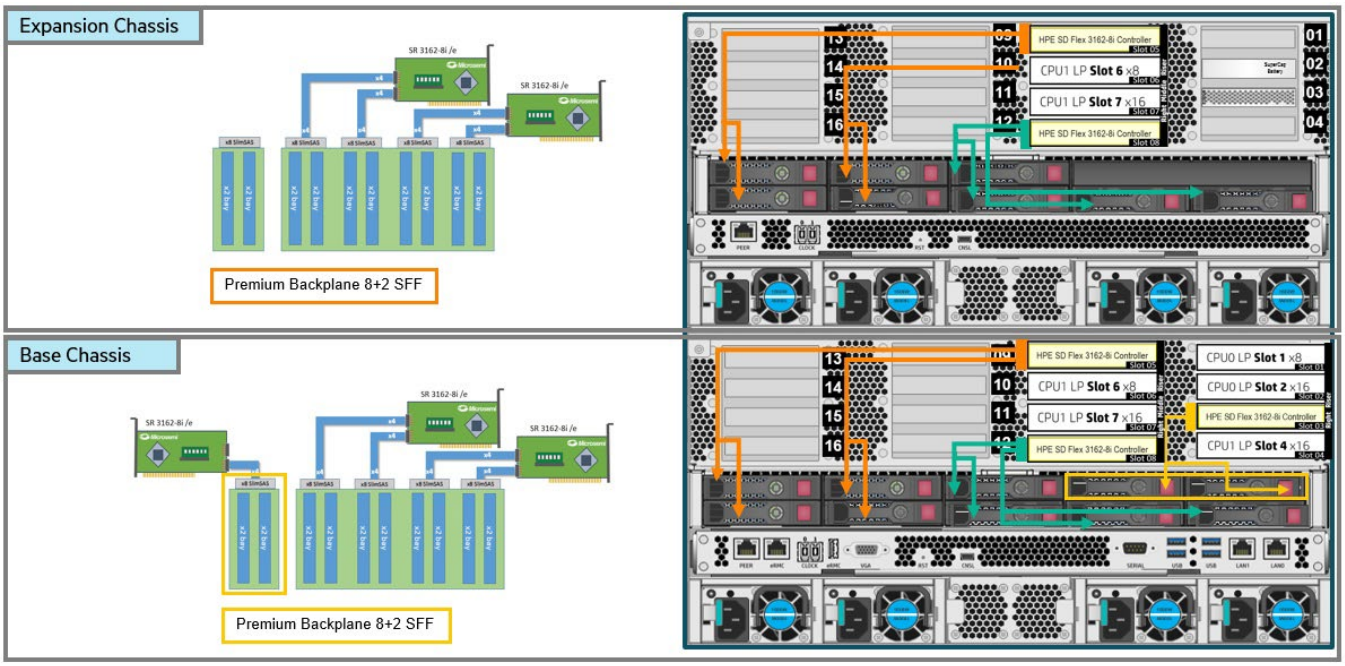

FIGURE 18. 2S/4S (Base) and 6S/8S (Base + Exp. Chassis) with 3162-8i /e (OS Boot) with premium backplane – Encryption support

Table 20 shows the offerings and features of the HPE Superdome Flex 280 Smart RAID Storage Controller (3162-8i /e).

TABLE 20. HPE Superdome Flex 280 Smart RAID Storage Controller (3162-8i /e) offerings and features

Controller Choice	Chassis	Server	PCI Slot	Max. Disks	Backplane
3162-8i /e	Expansion	6S/8S	8	4	8 + 2 SFF Premium Backplane
3162-8i /e	Expansion	6S/8S	5	4	8 + 2 SFF Premium Backplane
3162-8i /e	Base	2S/4S	8	4	8 + 2 SFF Premium Backplane
3162-8i /e	Base	2S/4S	5	4	8 + 2 SFF Premium Backplane
3162-8i /e	Base (OS)		3	2	8 + 2 SFF Premium Backplane

MegaRAID Controller implementation for SAP HANA solutions

This section showcases the best possible and recommended implementation of MegaRAID 9560-16i and 9560-8i Controllers with HPE Superdome Flex 280 server for HANA TDI implementation. The following section described the NVMe SSD implementation with MegaRAID Tri-Mode controller implementations. There are many combinations available to use and implement these controllers, but an elaboration of these options is exponential. Few best combinations have been chosen and shown here in the Solutions Component sections.

MegaRAID 9560-16i Controller – Option 1

Figure 19 shows the MegaRAID 9560-16i is connected to NVMe SSD, where the base chassis can be used with 2-socket, 4-socket, 6-socket, or 8-socket configuration but the controller and NVMe SSD implementation will remain the same. 9560-16i will be able to accommodate a maximum of 8 drives but x2 connectivity which is sufficient to achieve the HANA KPI.

The 6-socket and 8-socket implementation has been shown where the second controller is housed at SLOT 3 of expansion chassis and can accommodate another set of 8 NVMe SSDs.

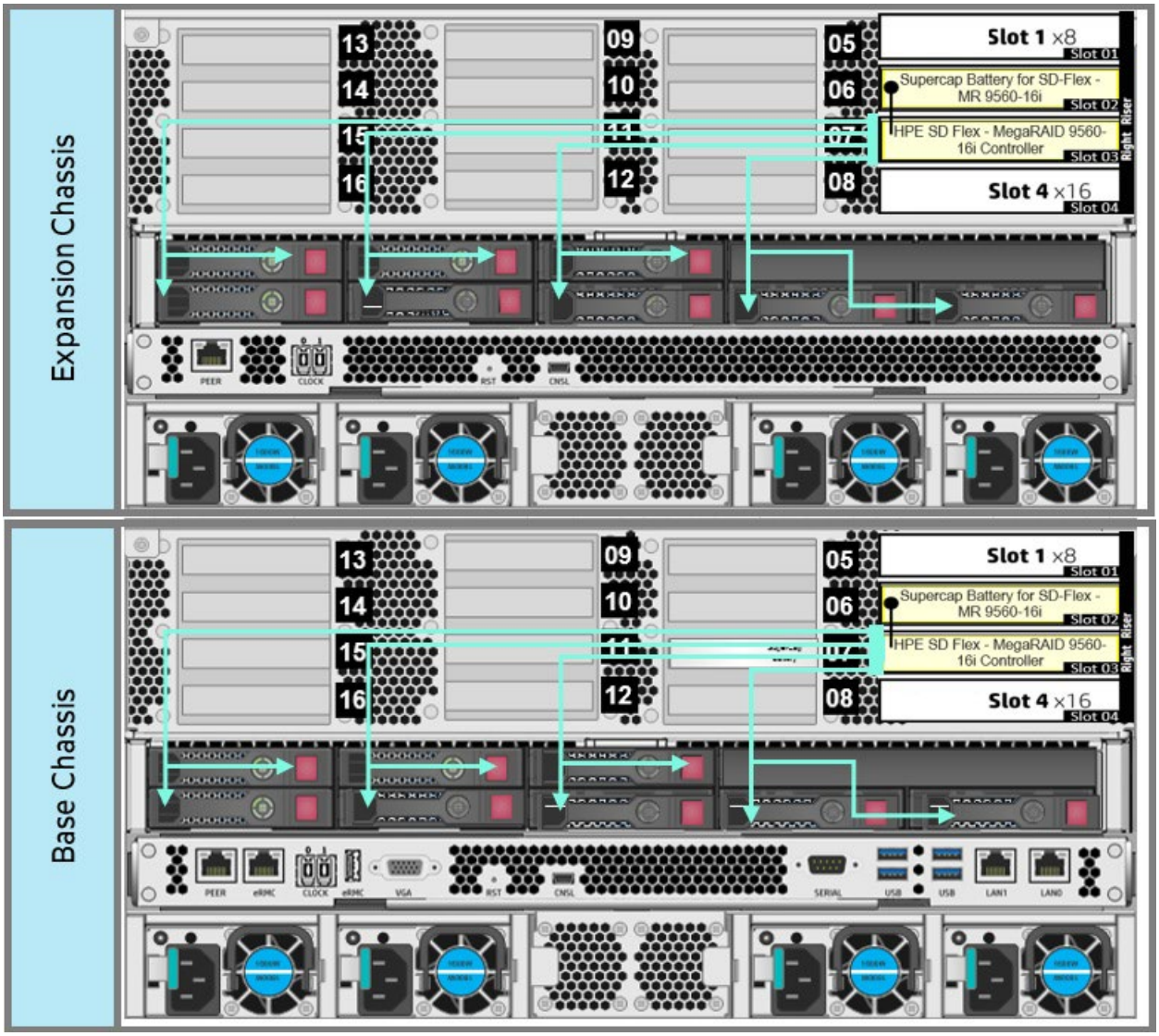

FIGURE 19. 2S/4S (Base) and 6S/8S (Base + Exp. Chassis) with 9560-16i (OS Boot) with premium backplane

Table 21 shows the major hardware components required to implement the solutions described in this section. Do remember to follow the OCA menu to order the complete set of hardware.

TABLE 21. HPE Superdome Flex 280 Smart RAID Storage Controller (9560-16i) offerings and features

Controller Choice	Chassis	Server	PCI Slot	Max. Disks	Drive Type	Backplane
9560-16i	Expansion	6S/8S	3	8	NVMe U.3 SSD	Premium Backplane

Controller Choice	Chassis	Server	PCI Slot	Max. Disks	Drive Type	Backplane
9560-16i	Base	2S/4S	3	8	NVMe U.3 SSD	Premium Backplane

MegaRAID 9560-16i Controller with 9560-8i for OS Boot – Option 2

Figure 20 shows the MegaRAID 9560-16i connected to NVMe SSD, where the base chassis can be used with 2-socket/4-socket/6-socket/8-socket configurations. The controller and NVMe SSD implementation will remain the same. 9560-16i will be able to accommodate a maximum of 8 drives but x2 connectivity which is sufficient to achieve the HANA KPI.

Figure 20 shows the 2-socket/4-socket/6-socket/8-socket server implementation. In this example implementation base chassis has a MegaRAID 9560-8i controller, use to install the OS using RAID 1 to provision persistent storage for HANA 1x 9560-16 controller used on each chassis.

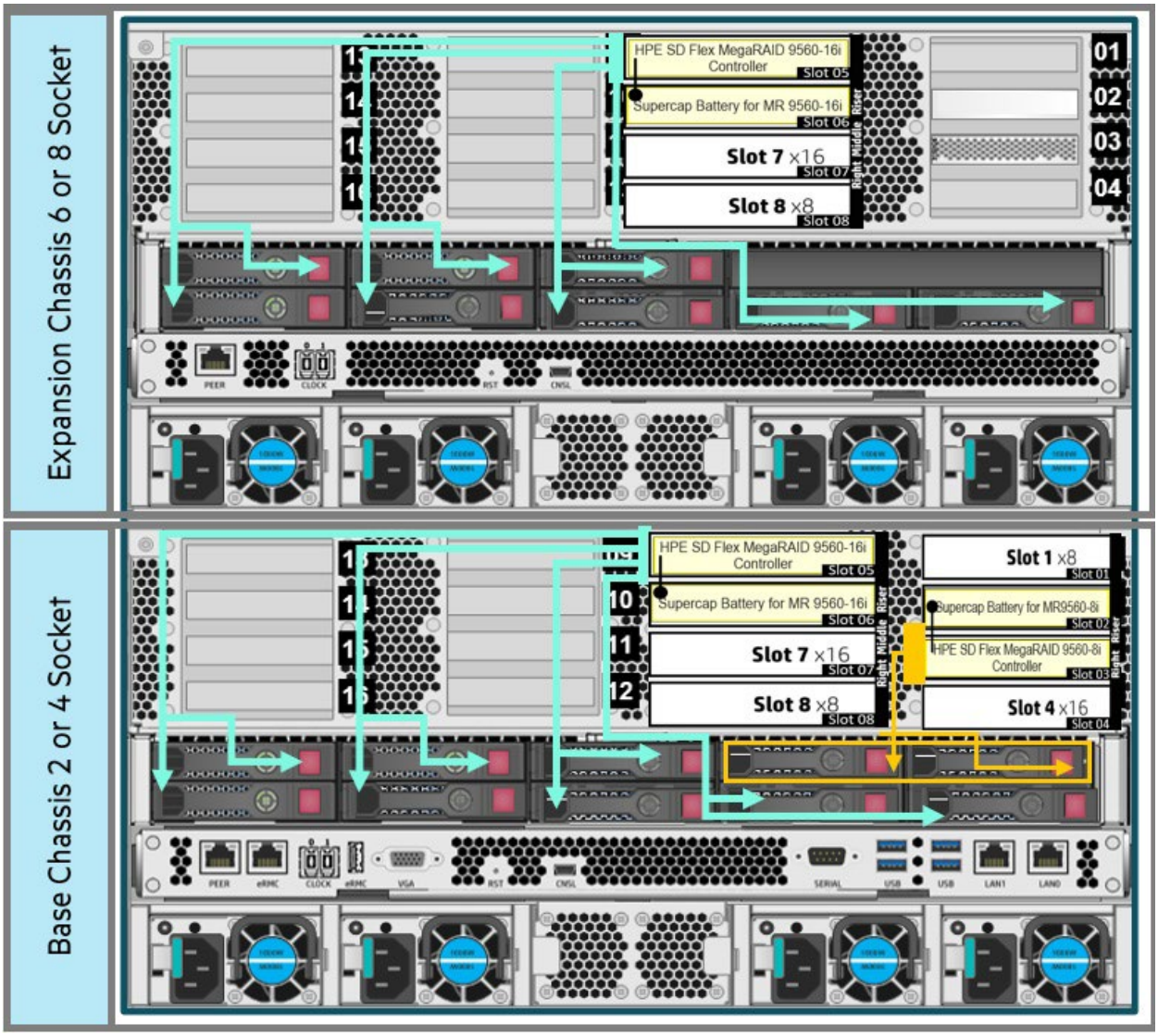

FIGURE 20. 2S/4S (Base) and 6S/8S (Base + Exp. Chassis) with 9560-16i for HANA and 9560-8i for OS boot with premium backplane

TABLE 22. HPE Superdome Flex 280 Smart RAID Storage Controller (9560-16i or 9560-8i) offerings and features

Controller Choice	Chassis	Server	PCI Slot	Max. Disks	Drive Type	Backplane
9560-16i	Expansion	6S/8S	5	8	NVMe U.3 SSD	Premium Backplane
9560-16i	Base	2S/4S	5	8	NVMe U.3 SSD	Premium Backplane
9560-8i	Base (OS)		3	2	NVMe U.3 SSD	Premium Backplane

Table 23 lists the components required for implementing the MegaRAID 9560-16i and MegaRAID 9560-8i Tri-Mode controllers with NVMe drive as options.

TABLE 23. Components of HPE Superdome Flex 280 Scale-up 2S/4S with Persistent Memory implementation

Components	Component description and choice
HPE Superdome Flex 280 Chassis	HPE Superdome Flex 280 Base Chassis or with Expansion Chassis
Processor name	Intel Xeon Scalable 3rd Generation processors (Platinum or Gold) 8380HL, 8376HL, 8360HL, 6328HL 8380H, 8376H, 8360H, 8356H, 8354H, 8353H, 6348H, 6330H, 6328H, 5320H, 5318H
Number of processors	Two Intel Xeon Scalable processors Four Intel Xeon Scalable processors Six Intel Xeon Scalable processors (with Platinum Processor only) Eight Intel Xeon Scalable processors (with Platinum Processor only)
Memory options	32GB Dual Rank x4 DDR4-3200 R-DIMM 64GB Dual Rank x4 DDR4-3200 R-DIMM 64GB Quad Rank x4 DDR4-2933 LR-DIMM 128GB Quad Rank x4 DDR4-3200 LR-DIMM
Memory Configuration	2-socket 384GB to 3.0TB 4-socket 768GB to 12.0TB 6-socket 1152GB to 12.0TB 8-socket 1536GB to 24.0TB
Number of DIMMs	12 or 24: 2-socket 24 or 48: 4-socket 36 or 72: 6-socket 48 or 96: 8-socket
Persistent Memory	Intel Optane 128GB persistent memory 200 Series for HPE (2 and 4-sockets) Intel Optane 256GB persistent memory 200 Series for HPE (2 and 4-sockets) Intel Optane 512GB persistent memory 200 Series for HPE (2 and 4-sockets)
Drive backplanes (10 Drives Max/Chassis)	8SFF+2SFF Premium Storage BP Kit
Storage controller	9560-16i 16-port Internal 8GB Cache Tri-Mode 12G PCIe4 x8 – 8 Drives Max (NVMe SSD Support) 9560-8i 16-port Internal 8GB Cache Tri-Mode 12G PCIe4 x8 – 2 Drives Max (NVMe SSD Support)
Number of the storage controller	1 Controller per chassis with 8x NVMe SSD Maximum
Storage drive	NVMe SSD Mixed Used SFF Basic Carrier U.3 CM6/CD6 From 800GB to 6.4TB NVMe U.3 SSD
Number of storage drive	Maximum 8 Drives per chassis with MR 9560-16i Controller
Network cards	HPE Ethernet 10Gb Adapter HPE Ethernet 10/25Gb Adapter HPE Ethernet 100Gb Adapter

Storage

SAP HANA is an in-memory database that stores and processes the bulk of its data in memory. Additionally, it protects against data loss by saving the data in persistent disk storage. For setting up the SAP HANA system, the storage layer must fulfill several requirements. This section of the document describes the requirements of persistent disk storage for SAP HANA TDI and Appliance implementation on HPE Superdome Flex 280 server.

Hewlett Packard Enterprise recommends best practices and the sizing recommendation to achieve optimum performance on HPE Superdome Flex 280 for SAP HANA implementation.

For more information, see the SAP HANA Sizing portal and SAP HANA TDI - Storage Requirements.

Storage Sizing Chart for TDI Implementation

This is the standard and minimum required sizing for SAP HANA TDI implementation for HPE Superdome Flex 280. As per the customer requirement, the sizing of HANA volumes may be required to be changed. A table with supported memory configuration and choice of SSD combination to meet the minimum requirements is provided.

Table 24 provides the overall formula used to estimate the minimum storage requirement for a TDI implementation.

TABLE 24. Formula to derive TDI Storage requirement

Purpose	Sizing Formula
Operating System	256GB of Drive/Volume for Operating System
/usr/sap	64GB
LOG	[systems ≤ 512GB] Size redo log = 1/2 x RAM [systems > 512GB] Size redo log (min) = 512GB
SHARED	Size installation (single node) = MIN (1x RAM; 1TB)
DATA	Size data = 1.2 x Total Server Memory

NOTE

The capacity requirements may differ based on the customer's requirement for HANA. The described capacity in this section is based on minimum requirement and with this requirement, the various capacity of SSD's are listed.

Based on the TDI storage requirement formula created by SAP, the HPE solution for SAP HANA recommends the following space requirement where the DATA sizing is changing to memory on the system. LOG and SHARED volume space has been kept at a minimum for only one SAP HANA SID installation. Table 25 shows the 2-socket, 4-socket, 6-socket, and 8-socket - Minimum storage requirement for SAP HANA TDI implementation.

TABLE 25. 2, 4, 6, and 8 sockets - Minimum storage requirement for SAP HANA TDI implementation

Total Memory (GB)	DATA x1.2	DATA x1.5	DATA x2.0	DATA x2.5	DATA x3.0
384	1360	1472	1664	1856	2048
768	2521.6	2752	3136	3520	3904
1152	3240	3584	4160	4736	5312
1536 (1.5T)	3699.2	4160	4928	5696	6464
2304	4630	5312	6464	7616	8768
3072 (3.0T)	5542.4	6464	8000	9536	11072
3840	1860	7616	9536	11456	13376
4608 (4.5T)	7385.6	8768	11072	13376	15680
6144 (6.0T)	9228.8	11072	14144	17216	20288

Total Memory (GB)	DATA x1.2	DATA x1.5	DATA x2.0	DATA x2.5	DATA x3.0
6912	10160	12224	15680	19136	22592
7680	11080	13376	17216	21056	24896
9216 (9T)	12915.2	15680	20288	24896	29504
12288 (12T)	16601.6	20288	26432	32576	38720
18432	23980	29504	38720	47936	57152
24576	31350	38720	51008	63296	75584

Table 26 lists the SSD requirements for 2-socket TDI implementation of the HPE Superdome Flex 280 server. The SSD numbers are determined based on the formula described in Table 24 and the DATA volumes are considered as 1.5 times of the server memory. The number of SSD's is proposed based on the sizes but not according to the controller choice and scenarios described.

TABLE 26. Minimum storage requirement for SAP HANA 2-socket TDI implementation

Total Memory (GB)	For TDI, Minimum Space Required	800GB All SSD	1.6TB ALL SSD	3.2TB ALL SSD	6.4TB ALL SSD
384	1472	3 – RAID 5	3 – RAID 5	3 – RAID 5	
768	2752	5 – RAID 5	3 – RAID 5	3 – RAID 5	3 – RAID 5
1536	4160	7 – RAID 5	4 – RAID 5	3 – RAID 5	3 – RAID 5
2304	5312	10 – RAID 50	5 – RAID 5	3 – RAID 5	3 – RAID 5
3072	6464		6 – RAID 5	4 – RAID 5	3 – RAID 5
6144	11072		10 – RAID 50	5 – RAID 5	3 – RAID 5

Table 27 lists the SSD requirement for 4-socket TDI implementation of HPE Superdome Flex 280 Server. The SSD numbers are determined based on the formula described in Table 24 and the DATA volumes are considered as 1.5 times of the server memory. The number of SSD's is proposed based on the sizes but not according to the controller choice and scenarios described.

TABLE 27. Minimum storage requirement for SAP HANA 4-socket TDI implementation

Total Memory (GB)	For TDI, Minimum Space Required	800GB All SSD	1.6TB ALL SSD	3.2TB ALL SSD	6.4TB ALL SSD
768	2752	5 – RAID 5	3 – RAID 5	3 – RAID 5	3 – RAID 5
1536	4160	7 – RAID 5	4 – RAID 5	3 – RAID 5	3 – RAID 5
3072	6464		6 – RAID 5	4 – RAID 5	3 – RAID 5
4606	8768		7 – RAID 5	4 – RAID 5	3 – RAID 5
6144	11072		10 – RAID 50	5 – RAID 5	3 – RAID 5
12288	20288			8 – RAID 5	5 – RAID 5

Table 28 lists the SSD requirement for the 6-socket TDI implementation of the HPE Superdome Flex 280 Server. The SSD numbers are determined based on the formula described in Table 24 and the DATA volumes are considered as 1.5 times of the server memory. The number of SSD's is proposed based on the sizes but not according to the controller choice and scenarios described.

TABLE 28. Minimum storage requirement for SAP HANA 6-socket TDI implementation

Total Memory (GB)	For TDI, Minimum Space Required	800GB All SSD	1.6TB ALL SSD	3.2TB ALL SSD	6.4TB ALL SSD
1152	3584	6 – RAID 5	4 – RAID 5	3 – RAID 5	3 – RAID 5
2304	5312	10 – RAID 50	5 – RAID 5	3 – RAID 5	3 – RAID 5

Total Memory (GB)	For TDI, Minimum Space Required	800GB All SSD	1.6TB ALL SSD	3.2TB ALL SSD	6.4TB ALL SSD
4608	8768		7 – RAID 5	5 – RAID 5	3 – RAID 5
6912	12224		10 – RAID 50	6 – RAID 5	4 – RAID 5
9216	15680			7 – RAID 5	4 – RAID 5
18432	29504				6 – RAID 5

Table 29 lists the SSD requirement for 8-socket TDI implementation of the HPE Superdome Flex 280 server. The SSD numbers are determined based on the formula described in Table 24 and the DATA volumes are considered as 1.5 times of the server memory. The number of SSD's is proposed based on the sizes but not according to the controller choice and scenarios described.

TABLE 29. Minimum storage requirement for SAP HANA 8-socket TDI implementation

Total Memory (GB)	For TDI, Minimum Space Required	800GB All SSD	1.6TB ALL SSD	3.2TB ALL SSD	6.4TB ALL SSD
1536	4160		4 – RAID 5	3 – RAID 5	3 – RAID 5
3072	6464		6 – RAID 5	4 – RAID 5	3 – RAID 5
6144	11072		10 – RAID 50	5 – RAID 5	3 – RAID 5
9216	15680			7 – RAID 5	4 – RAID 5
12288	20288			8 – RAID 5	5 – RAID 5
24576	38720				8 – RAID 5

Hewlett Packard Enterprise recommends using Solid State Drives configured in RAID 5, 50, or 6 for SAP HANA implementation. Though there are a variety of drive options available in TDI menus, in this section the space requirement and number of minimum storage requirements for TDI implementation as shown in Table 18 are recommended.

Storage sizing chart for SAP HANA Appliance implementation

As per the customer requirements, storage sizing can be changed for appliance implementation. Table 30 shows the overall formula used to estimate the minimum storage requirement for SAP HANA Appliance implementation for one HANA SID.

TABLE 30. Formula to derive the storage requirement for appliance configurations

Purpose	Sizing Formula
Operating system	256GB of drive/volume for the operating system
/usr/sap	64GB
LOG	[systems ≤ 512GB] Size redo log = 1/2 x RAM [systems > 512GB] Size redo log (min) = 512GB
SHARED	Size installation (single node) = MIN (1 x RAM)
DATA	Size data = 3 x Total Server Memory

Table 31 shows the minimum storage requirement for appliance implementation. The servers in this paper used RAID 5 or 50, and it is recommended.

TABLE 31. 2-socket, 4-socket, 6-socket, and 8-socket– Memory/Socket and Storage requirement for SAP HANA Appliance

Total Memory (GB)	Sockets	Require Space	Base Chassis	Expansion Chassis	Total No. of 6.4TB SSD
768	2	3904	3 - RAID 5	-	3
1536	2	6976	3 - RAID 5	-	3
2304	2	10048	3 - RAID 5	-	3

Total Memory (GB)	Sockets	Require Space	Base Chassis	Expansion Chassis	Total No. of 6.4TB SSD
3072	2	13120	4 - RAID 5		4
1536 (1.5T)	4	6976	3 - RAID 5	-	3
3072 (3.0T)	4	13120	4 - RAID 5	-	4
4608 (4.5T)	4	19264	5 - RAID 5	-	5
6144 (6.0T)	4	25408	6 - RAID 5	-	6
2304	6	10048	3 - RAID 5	3 - RAID 5	6
4608	6	19264	3 - RAID 5	3 - RAID 5	6
6912	6	28480	4 - RAID 5	4 - RAID 5	8
9216	6	37696	5 - RAID 5	5 - RAID 5	10
3072 (3.0T)	8	13120	3 - RAID 5	3 - RAID 5	6
6144 (6.0T)	8	25408	4 - RAID 5	4 - RAID 5	8
9216 (9.0T)	8	37696	5 - RAID 5	5 - RAID 5	10
12288 (12.0T)	8	49984	6 - RAID 5	6 - RAID 5	12

NOTE

- For 6-socket and 8-socket single-server configurations, it is recommended to use two storage controllers, each for one chassis.
- Storage disk will be equally divided across the chassis for 6-socket and 8-socket large memory configuration.
- The recommendation is to use RAID 50 if disk numbers are more than 7 SSD in an array.

Server storage and file system layout

HPE Superdome Flex 280 comes with 4-socket and 8-socket servers, which is spanning across two chassis. The same way the file system for SAP HANA will be spanned across the two chassis in the case of an 8-socket server. There are many controller options offered and a variety of implementation choices, a Solution Architect needs to balance the HANA Database I/O across the controller. It is recommended to implement the Linux Logical Volume Manager and use the appropriate “stripe” size for each logical volume for HANA.

Also, while using options defined in the Storage Controller options section, the number of combinations of storage layout can be implemented. This section shows how the Logical Volume Manager has been implemented while using SR 3152-24i controller within a chassis and across two chassis.

Figure 21 shows the LVM configuration for one chassis and two chassis of the HPE Superdome Flex 280 with 1x or 2x 3154-24i Controller.

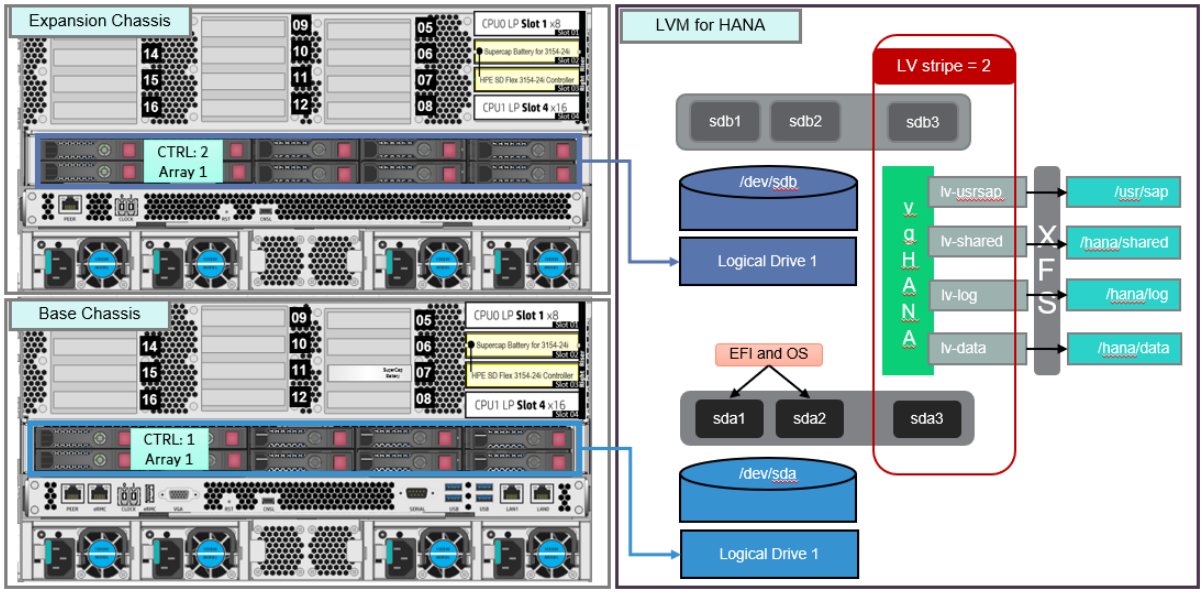

FIGURE 21. LVM configuration for one chassis and two chassis of the HPE Superdome Flex 280 with 1x or 2x 3154-24i Controller

Create Linux Logical Volume Manager (LVM) and directory structure for filesystem and create mount points for HANA SID.

Create a volume group and required logical volumes for /usr/sap, /hana/shared, /hana/log and /hana/data as defined during sizing.
HPE Superdome Flex 280 comes with many storage controller options to deliver the required core to memory ratio and required storage for fulfilling the storage requirement for SAP HANA Appliance and TDI implementation. As the logical drives are used from different controllers, volume groups will be created consisting of many physical volumes. During the creation of the logical volumes, use the number of the physical volume devices along with the `--stripes parameter`.

Figure 22 shows the implementation of SmartRAID 3162-8i /e controller for an 8-socket HPE Superdome Flex 280 server with a total of four SmartRAID 3162-8i /e controller purposed for HANA Volumes.

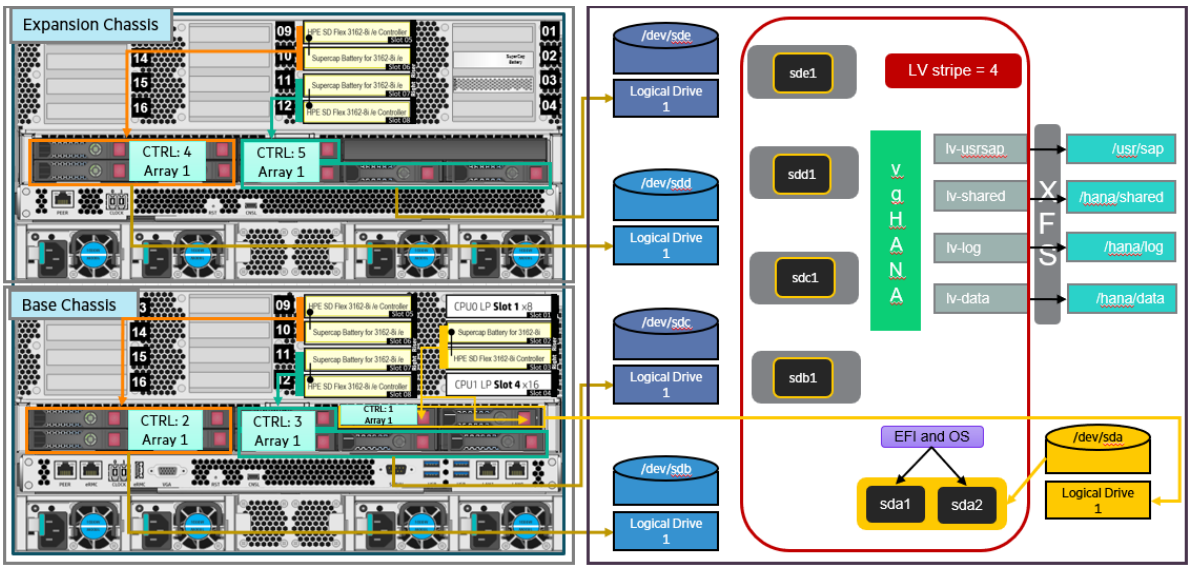

FIGURE 22. LVM configuration for one chassis and two chassis of HPE Superdome Flex 280 with 2x or 4x 3162-8i /e Controller

Use XFS to format the logical volumes, they must be mounted to the respective directories.

Some example commands have been shown to create the Linux Logical Volume Manager according to LVM Layout shown in Figure 22.

Create a physical volume for all required disks for HANA, repeat the command for every HANA disk:

```
pvcreate -f /dev/sda1 -v

pvcreate -f /dev/sdb1 -v

pvcreate -f /dev/sdc1 -v

pvcreate -f /dev/sdd1 -v
```

Create Volume Group consisting of all physical volumes:

```
vgcreate vgHANA /dev/sda1 /dev/sdb1 /dev/sdc1 /dev/sdd1 -v
```

Create Logical Volume using Volume group created for SAP HANA persistent storage. As shown in Figure 22, there are 4x 3162-8i /e controllers installed on the server. One logical drive is created on each controller of equal size. At Operating System-level 4 logical drive will be used to create physical volumes of equal size and used to create volume group "vgHANA".

```
lvcreate --stripes 4 -L <LV_Size> -n <LV_Name> vgHANA /dev/sda1 /dev/sdb1 /dev/sdc1 /dev/sdd1 -y -v
```

`--stripes` will help the LVM to evenly distribute the IO and data across the controllers and disks. In the case of the logical volume, create the LVM Layout shown in Figure 22 as there are two controllers used for two logical disks, the "stripe size" during the lvcreate command will become "2".

```
lvcreate --stripes 2 -L <LV_Size> -n <LV_Name> vgHANA /dev/sda3 /dev/sdb3 -y -v
```

Create XFS filesystem on all HANA Logical Volume and mount them to their respective mount points.

```
/sbin/mkfs -t xfs -f /dev/mapper/<LV_Name>
mount -t xfs /dev/mapper/<LV_Name> /hana/<HANA_Mountpoint>
```

Add the required entry in /etc/fstab so that HANA Logical Volume will be mounted during boot.

Dual-purpose non-production storage

HPE D3710 Disk Enclosure

HPE D3710 offers flexible modular solutions to simplify capacity expansion and tiered external storage systems. It offers hot-pluggable SAS and SATA Small Form Factor (SFF) Drives up to 25 drives in an enclosure. This external storage can help to expand the capacity of storage and can help the user to create non-production SAP HANA instance for Development, QA, and other purposes. This is used with SAP HANA System Replication secondary site.

Each HPE D3710 includes the standard components HPE D3710 base enclosure with redundant power supplies and fan modules, two integrated 12Gb SAS I/O Modules, HD Mini-SAS cables, and two PDU interconnect cords.

For more details, see the HPE D3000 Enclosures more specifically to D3710 QuickSpecs.

Figure 23 shows the HPE D3710 Disk Enclosure.

FIGURE 23. HPE D3710 Disk Enclosure front view

HPE D3710 Disk Enclosure with HPE Superdome Flex 280 can be purposed for non-production HANA instance with SmartRAID 3154-8e external RAID Controller when used with system replication.

HPE D3710 Disk Enclosure features are as follows:

- Modular platform provides investment protection
- Support storage capacity up to 60TB with 2.4TB
- Hassle-free expansion
- Hot-pluggable drives and power modules
- 12Gb SAS host connectivity enables higher data transfer
- HPE SSD Smart Path feature
- Additional drives can be configured as spares
- HPE Secure Encryption is available
- Redundant power and cooling provide increased reliability as a failure of a power supply or fans does not interrupt the system

HPE 3154-8e RAID Controller

The HPE 3154-8e RAID Controller, ideal for enabling 12Gbps storage capabilities in performance-hungry servers and workstation platforms, without compromising proven reliability. Provides high I/O transactions and high bandwidth processing solutions that reduce energy consumption and maintenance costs.

Features

- 12Gbps PCIe Gen3 SAS/SATA SmartRAID adapter with 8 external native ports, ideal for external direct-attached storage connection.
- Accelerates storage with up to 4GB of high-speed DRAM cache with integrated cache protection.
- The drives can be used as physical disks (HBA mode) or hardware RAID 0, 1, 10, 5, 50, 6, 60. Mixed mode allows devices connected to the same adapter to be used in RAID and HBA modes simultaneously.
- Adapter dynamic power management to save up to 30% power.
- Supports up to 256 SAS or SATA devices using SAS expanders.

NETWORK REQUIREMENTS

SAP HANA is an in-memory database, its services and components communicate via independent network channels. It is recommended practice to have a well-defined network topology to allocate the network bandwidth and throughput. In addition to it, apply network security and performance measures as required.

The independent and secured network channel that we can use are as follows:

- Client Network Zone
  - SQL Client Communication
  - HTTP Client Communication
  - Management Network
- Internode Network Zone
- Internode Network
  - System Replication
  - Storage Replication
  - Backup Network

- Storage Network Zone
  - Shared/NFS Network
  - Fiber Channel Network

For more information, see SAP HANA Network Requirements Technical Paper.

Configured networks

Components of the SAP HANA landscape communicate via different network channels. It is recommended by SAP to have a well-defined network topology to control, limit, and isolate the network access and usage to only those communication channels required for the implementation scenarios.

NOTE

Update November 2024

With the EOL of the 1Gb 4P 331T adapter end of November 2024, and no replacement available, we need to review and adapt the network configuration, as 4 ports belonging to 2 bonds are missing.

As we did in the case of the 2-socket previously, there is no bond9 (quorum) and bond4 (management) uses both LOM ports. The tables and VISIOs have been updated accordingly.

2-socket network configuration

Figure 24 shows the recommended network configuration for SAP HANA implementation and it is covering all network zones defined by the SAP HANA Network Requirement Technical Paper. The configuration defined here is best suited for HPE Superdome Flex 280 2-socket configurations as the base chassis holds all network interface cards.

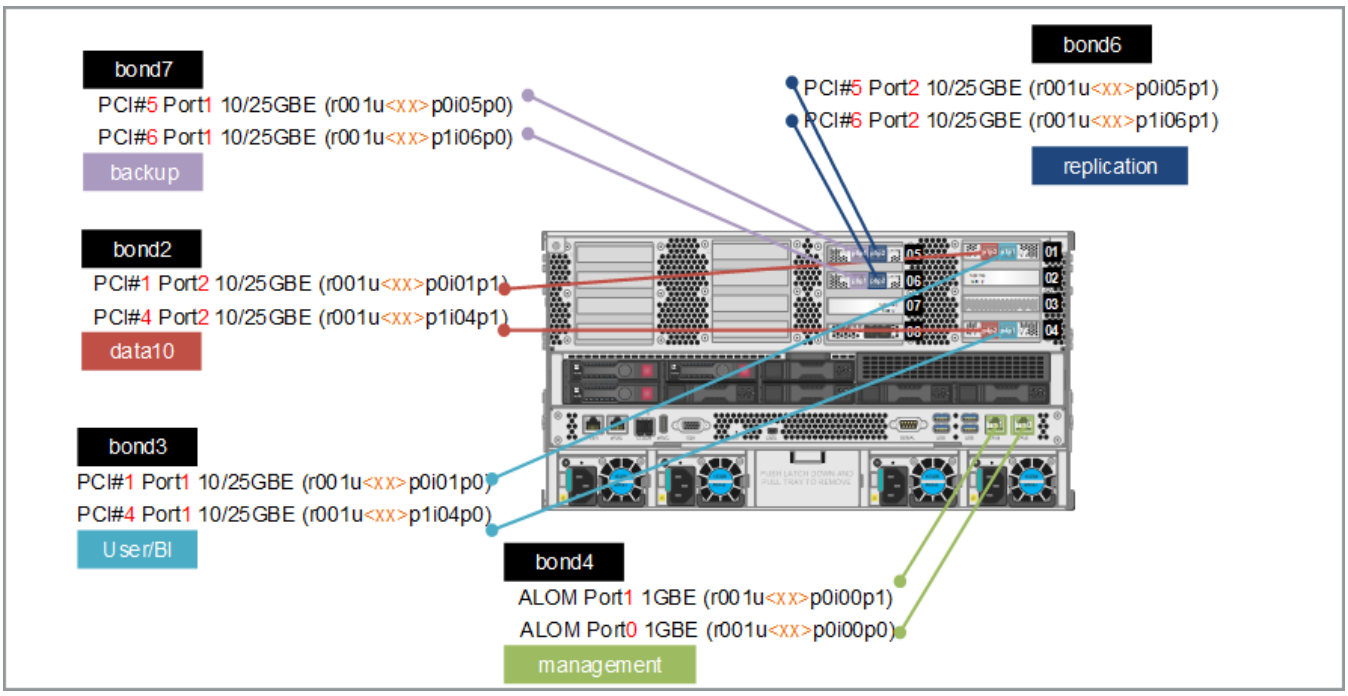

FIGURE 24. Network configuration

4-socket, 6-socket, and 8-socket network configuration

Figure 25 shows the recommended network configuration for SAP HANA implementation and it is covering all network zones defined by the SAP HANA Network Requirement Technical Paper. The configuration defined here is best suited for HPE Superdome Flex 280 4-socket, 6-socket, and 8-socket configurations as the base chassis holds all network interface cards.

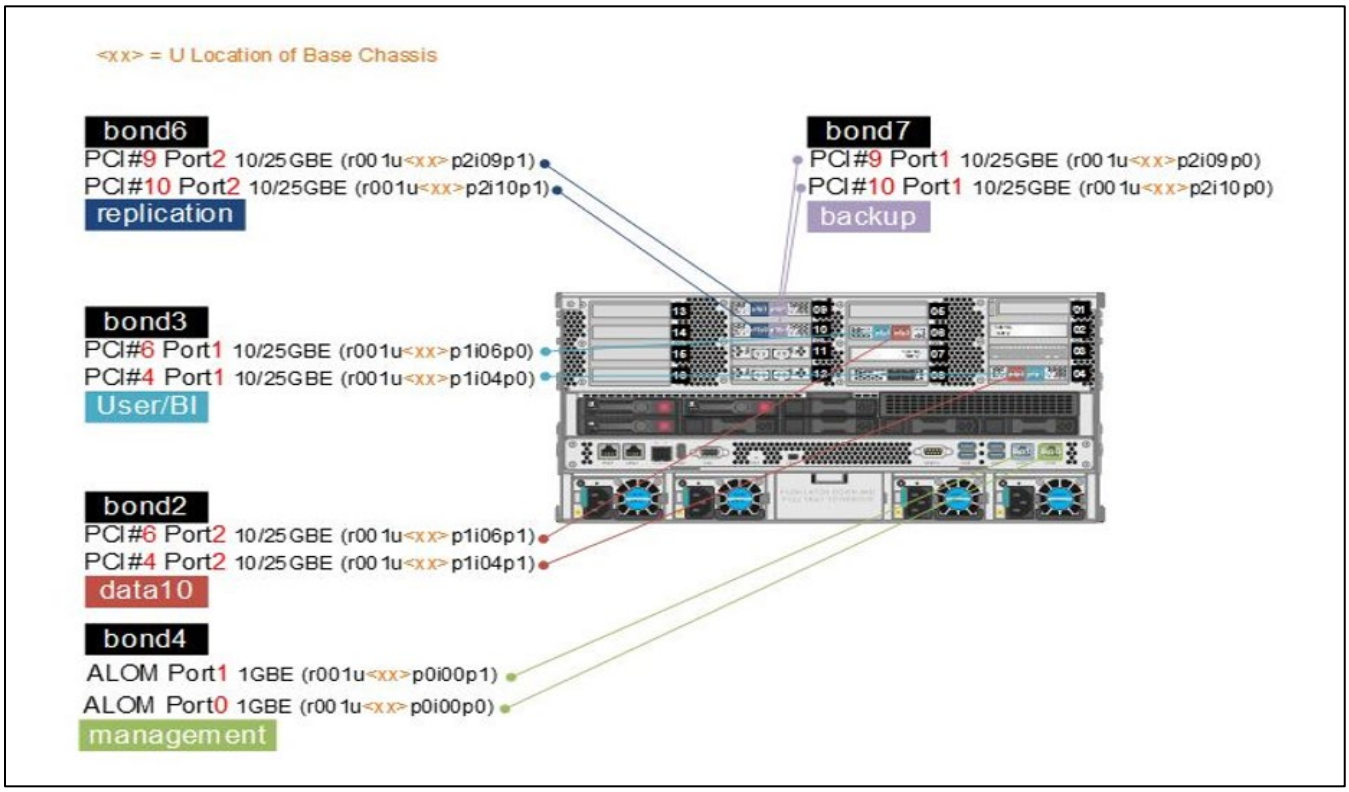

FIGURE 25. Network configuration

Network Bond and VLAN for HANA

Table 32 shows the Network Bond and VLAN for SAP HANA purposes.

TABLE 32. Network Bond and VLAN for SAP HANA purposes

Network Zone	Purpose	Bandwidth and Bond/VLAN
DATA 10	Purposed for data traffic from other SAP applications. Generally, this network is connected to SAP application servers and other source systems, which are supposed to interact with the HANA landscape.	10Gbps / Bond or VLAN; 2 NIC Port
DATA 1	Same as DATA 10 with 1Gbps	1Gbps / Bond or VLAN; 2 NIC Port
Management network	To connect to the landscape and handle the management task	1Gbps / Bond or VLAN; 2 NIC Port
Backup	Dedicated backup link to take the backup of HANA landscape log, data, and shared volumes	10Gbps / Bond or VLAN; 2 NIC Port
User/BI	Purposed to external connection for SAP HANA client to run SQL queries and/or for external application to connect to SAP HANA for fetching the analytical data	10Gbps / Bond or VLAN; 2 NIC Port
Replication	Network connections network two HANA Landscape to replicate the HANA Landscape from primary to secondary HANA system	10Gbps / Bond or VLAN; 2 NIC Port
Quorum for SG	Required if HPE Serviceguard is used to automate failover process across 2 systems, used to manage the failover and failback of HANA Landscape	10Gbps / Bond or VLAN; 2 NIC Port

To provide high availability, it is important to create Bonds between more than one physical NIC. If there are options to use the high-speed Network Adapters, it is a better choice to use the VLAN configuration over the bonding network. It is also important to restrict the maximum utilization of each VLAN.

SOFTWARE

Before deploying SAP HANA, the server must be certified by SAP and it must be listed in SAP Hardware Directory with information about supportability. During this process, the combination of certified hardware, Operating System, and a compatible version of SAP HANA will be deployed. To ensure supportability following software has been used during the SAP Certification Process.

SAP HANA hardware and Cloud Measurement Tools

SAP HANA hardware and cloud measurement tools (HCMT) are a new set of tools that can help the user to measure and analyze hardware or cloud systems performance parameters required before deploying SAP HANA. HCMT is the preferred tool to be used while applying for SAP HANA Certification for Hardware.

The HCMT tools consist of the following components:

- SAP HANA hardware and cloud measurement tool
- SAP HANA hardware and cloud measurement analysis

For more details, see SAP Note: 2493172.

Tuning the SAP HANA operating system

See the following SAP Notes to adhere to the requirement to install HANA Database.

- For recommended OS settings for SLES 15, refer to SAP Note: 2684254.
- For recommended OS settings for RHEL 8, refer to SAP Note: 2777782.
- To optimize the Network Configuration on HANA and OS-Level, refer to SAP Note: 2382421.
- For the supported Operating System, refer to SAP Note: 2235581.
- To prepare SLES for SAP environments, refer to SAP Note: 1275776.

Operating System

During the launch of the HPE Superdome Flex 280 for SAP HANA, the supported Operating Systems are:

- SUSE Linux Enterprise Server 15 SP2
- Red Hat Enterprise Linux Server 8.2

To know more about the latest Operating System support, see SAP HANA Hardware Directory.

SERVICE AND SUPPORT

Hewlett Packard Enterprise is the world's number one vendor for SAP HANA not just because of the sale of the server and the solutions but the support it provides post-sales. Post-sales, Hewlett Packard Enterprise provides world-class and expert service for SAP HANA installation, deployment, and integration. And the lifecycle support through the dedicated team of experts in the area solutions around the SAP Software Stack. Service and support highlights are briefly outlined here. For more details, see HPE Superdome Flex 280 Solutions for SAP HANA.

- Installation, Integration, and Deployment Services for SAP HANA
  - HPE Installation Service and HPE Installation and Startup Service
  - HPE Factory Express Integration Service for SAP HANA
  - HPE Rapid Deployment Services for SAP HANA
- HPE Pointnext Operational Services for SAP HANA
- HPE COE Service for SAP HANA

- HPE Service Credits (Lifecycle Service)

SUMMARY

HPE Superdome Flex 280, an industry-leading compute building block/server equips enterprises of all sizes to power critical SAP S/4HANA and SAP BW/4HANA workloads. Ranks #1 in Scale-up capacity for SAP HANA in-memory database.

This document has shown the SAP HANA landscape and Hewlett Packard Enterprise offering surrounding the HANA Database.

The solution highlighted in this paper is economical, efficient, and flexible for short-term and long-term analytics. The Hewlett Packard Enterprise servers, storage, networking infrastructure, and support services will keep your mission-critical applications functioning at their best while protecting them from the worst.

RESOURCES AND ADDITIONAL LINKS

HPE Reference Architectures, hpe.com/info/ra

HPE Servers, hpe.com/servers

HPE Storage, hpe.com/storage

HPE Networking, hpe.com/networking

To help us improve our documents, please provide feedback at hpe.com/contact/feedback.

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