



Storage sizing

NetApp Solutions

Ivana Devine, Dorian Henderson
July 22, 2021

This PDF was generated from https://docs.netapp.com/us-en/netapp-solutions/ent-apps-db/saphana_fas_fc_storage_sizing.html on August 03, 2021. Always check docs.netapp.com for the latest.

Table of Contents

- Storage sizing 1
 - Performance considerations 1
 - Mixed workloads 2
 - Capacity considerations 2
 - Configuration of performance test tool 2
 - Storage sizing process overview 5

Storage sizing

[Previous: Architecture.](#)

The following section provides an overview of performance and capacity considerations for sizing a storage system for SAP HANA.



Contact your NetApp or NetApp partner sales representative to support the storage sizing process and to create a properly sized storage environment.

Performance considerations

SAP has defined a static set of storage KPIs. These KPIs are valid for all production SAP HANA environments independent of the memory size of the database hosts and the applications that use the SAP HANA database. These KPIs are valid for single-host, multiple-host, Business Suite on HANA, Business Warehouse on HANA, S/4HANA, and BW/4HANA environments. Therefore, the current performance sizing approach depends on only the number of active SAP HANA hosts that are attached to the storage system.



Storage performance KPIs are required only for production SAP HANA systems.

SAP delivers a performance test tool, which must be used to validate the storage performance for active SAP HANA hosts attached to the storage.

NetApp tested and predefined the maximum number of SAP HANA hosts that can be attached to a specific storage model, while still fulfilling the required storage KPIs from SAP for production-based SAP HANA systems.



The storage controllers of the certified FAS product family can also be used for SAP HANA with other disk types or disk back-end solutions, as long as they are supported by NetApp and fulfill SAP HANA TDI performance KPIs. Examples include NetApp Storage Encryption (NSE) and NetApp FlexArray technology.

This document describes disk sizing for SAS hard disk drives and solid-state drives.

Hard disk drives

A minimum of 10 data disks (10k RPM SAS) per SAP HANA node is required to fulfill the storage performance KPIs from SAP.



This calculation is independent of the storage controller and disk shelf used.

Solid-state drives

With solid-state drives (SSDs), the number of data disks is determined by the SAS connection throughput from the storage controllers to the SSD shelf.

The maximum number of SAP HANA hosts that can be run on a disk shelf and the minimum number of SSDs required per SAP HANA host were determined by running the SAP performance test tool.

- The 12Gb SAS disk shelf (DS224C) with 24 SSDs supports up to 14 SAP HANA hosts, when the disk shelf is connected with 12Gb.

- The 6Gb SAS disk shelf (DS2246) with 24 SSDs supports up to 4 SAP HANA hosts.

The SSDs and the SAP HANA hosts must be equally distributed between both storage controllers.

The following table summarizes the supported number of SAP HANA hosts per disk shelf.

	6Gb SAS shelves (DS2246) fully loaded with 24 SSDs	12Gb SAS shelves (DS224C) fully loaded with 24 SSDs
Maximum number of SAP HANA hosts per disk shelf	4	14



This calculation is independent of the storage controller used. Adding more disk shelves does not increase the maximum number of SAP HANA hosts that a storage controller can support.

Mixed workloads

SAP HANA and other application workloads running on the same storage controller or in the same storage aggregate are supported. However, it is a NetApp best practice to separate SAP HANA workloads from all other application workloads.

You might decide to deploy SAP HANA workloads and other application workloads on either the same storage controller or the same aggregate. If so, you must make sure that enough performance is always available for SAP HANA within the mixed workload environment. NetApp also recommends that you use quality of service (QoS) parameters to regulate the impact these other applications could have on SAP HANA applications.

The SAP HCMT test tool must be used to check if additional SAP HANA hosts can be run on a storage controller that is already used for other workloads. However, SAP application servers can be safely placed on the same storage controller and aggregate as the SAP HANA databases.

Capacity considerations

A detailed description of the capacity requirements for SAP HANA is in the [SAP HANA Storage Requirements](#) white paper.



The capacity sizing of the overall SAP landscape with multiple SAP HANA systems must be determined by using SAP HANA storage sizing tools from NetApp. Contact NetApp or your NetApp partner sales representative to validate the storage sizing process for a properly sized storage environment.

Configuration of performance test tool

Starting with SAP HANA 1.0 SPS10, SAP introduced parameters to adjust the I/O behavior and optimize the database for the file and storage system used. These parameters must also be set for the performance test tool from SAP (fsperf) when the storage performance is tested by using the SAP test tool.

Performance tests were conducted by NetApp to define the optimal values. The following table lists the parameters that must be set within the configuration file of the SAP test tool.

Parameter	Value
max_parallel_io_requests	128
async_read_submit	on
async_write_submit_active	on
async_write_submit_blocks	all

For more information about the configuration of SAP test tool, see [SAP note 1943937](#) for HWCCT (SAP HANA 1.0) and [SAP note 2493172](#) for HCMT/HCOT (SAP HANA 2.0).

The following example shows how variables can be set for the HCMT/HCOT execution plan.

```
...{
    "Comment": "Log Volume: Controls whether read requests are
submitted asynchronously, default is 'on'",
    "Name": "LogAsyncReadSubmit",
    "Value": "on",
    "Request": "false"
},
{
    "Comment": "Data Volume: Controls whether read requests are
submitted asynchronously, default is 'on'",
    "Name": "DataAsyncReadSubmit",
    "Value": "on",
    "Request": "false"
},
{
    "Comment": "Log Volume: Controls whether write requests can be
submitted asynchronously",
    "Name": "LogAsyncWriteSubmitActive",
    "Value": "on",
    "Request": "false"
},
{
    "Comment": "Data Volume: Controls whether write requests can be
submitted asynchronously",
    "Name": "DataAsyncWriteSubmitActive",
    "Value": "on",
    "Request": "false"
},
{
    "Comment": "Log Volume: Controls which blocks are written
asynchronously. Only relevant if AsyncWriteSubmitActive is 'on' or 'auto'
and file system is flagged as requiring asynchronous write submits",
    "Name": "LogAsyncWriteSubmitBlocks",
    "Value": "all",
```

```

        "Request": "false"
    },
    {
        "Comment": "Data Volume: Controls which blocks are written
asynchronously. Only relevant if AsyncWriteSubmitActive is 'on' or 'auto'
and file system is flagged as requiring asynchronous write submits",
        "Name": "DataAsyncWriteSubmitBlocks",
        "Value": "all",
        "Request": "false"
    },
    {
        "Comment": "Log Volume: Maximum number of parallel I/O requests
per completion queue",
        "Name": "LogExtMaxParallelIoRequests",
        "Value": "128",
        "Request": "false"
    },
    {
        "Comment": "Data Volume: Maximum number of parallel I/O requests
per completion queue",
        "Name": "DataExtMaxParallelIoRequests",
        "Value": "128",
        "Request": "false"
    }, ...

```

These variables must be used for the test configuration. This is usually the case with the predefined execution plans SAP delivers with the HCMT/HCOT tool. The following example for a 4k log write test is from an execution plan.

```

...
{
  "ID": "D664D001-933D-41DE-A904F304AEB67906",
  "Note": "File System Write Test",
  "ExecutionVariants": [
    {
      "ScaleOut": {
        "Port": "${RemotePort}",
        "Hosts": "${Hosts}",
        "ConcurrentExecution": "${FSConcurrentExecution}"
      },
      "RepeatCount": "${TestRepeatCount}",
      "Description": "4K Block, Log Volume 5GB, Overwrite",
      "Hint": "Log",
      "InputVector": {
        "BlockSize": 4096,
        "DirectoryName": "${LogVolume}",
        "FileOverwrite": true,
        "FileSize": 5368709120,
        "RandomAccess": false,
        "RandomData": true,
        "AsyncReadSubmit": "${LogAsyncReadSubmit}",
        "AsyncWriteSubmitActive":
"${LogAsyncWriteSubmitActive}",
        "AsyncWriteSubmitBlocks":
"${LogAsyncWriteSubmitBlocks}",
        "ExtMaxParallelIoRequests":
"${LogExtMaxParallelIoRequests}",
        "ExtMaxSubmitBatchSize": "${LogExtMaxSubmitBatchSize}",
        "ExtMinSubmitBatchSize": "${LogExtMinSubmitBatchSize}",
        "ExtNumCompletionQueues":
"${LogExtNumCompletionQueues}",
        "ExtNumSubmitQueues": "${LogExtNumSubmitQueues}",
        "ExtSizeKernelIoQueue": "${ExtSizeKernelIoQueue}"
      }
    }, ...
  ]
}

```

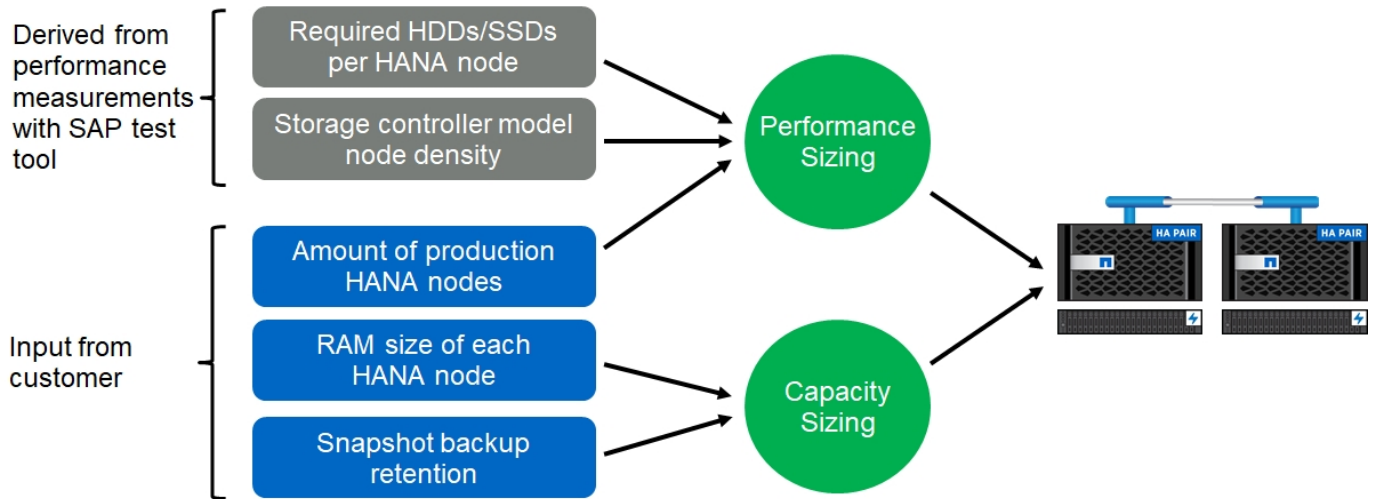
Storage sizing process overview

The number of disks per HANA host and the SAP HANA host density for each storage model were determined with the SAP HANA test tool.

The sizing process requires details such as the number of production and nonproduction SAP HANA hosts, the RAM size of each host, and the backup retention period of the storage-based Snapshot copies. The number of SAP HANA hosts determines the storage controller and the number of disks required.

The size of the RAM, the net data size on the disk of each SAP HANA host, and the Snapshot copy backup retention period are used as inputs during capacity sizing.

The following figure summarizes the sizing process.



Next: Infrastructure setup and configuration.

Copyright Information

Copyright © 2021 NetApp, Inc. All rights reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means-graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system-without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

Trademark Information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.