

Planning Guide

SAP HANA on IBM Power Systems & IBM System Storage

**Overview on available read
acceleration components on Power
9**

Marc Stephan Tauchert

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IBM Corporation

Systems and Technology Group

Route 100

Somers, NY 10589

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Focus: SAP HANA Scale-up and Scale-out solutions

Target:

- SAP HANA 2.0
- POWER8 + POWER9

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Preface

Running SAP HANA on IBM Power Systems offers customers a consistent platform for their HANA-based and traditional applications, best-in-class performance, resilience for critical workloads, and most flexible infrastructure. Existing IT assets - servers, storage, as well as skills and operation procedures - can easily be (re-)used leveraging the SAP HANA Tailored Data Center Integration (TDI) concept, instead of enforcing additional investment into dedicated SAP HANA appliances.

About This Document

This document is intended for architects and specialists planning an SAP HANA® on POWER® deployment. It describes the design considerations for hardware, networking, and software components of the SAP HANA on POWER solution stack.

This guide does not replace existing SAP HANA documentation and sizing guides. It serves as a supplement to the existing SAP HANA documentation and SAP Sizing methods to provide specific guidance on how to meet all SAP requirements when running SAP HANA on IBM Power Systems™, IBM System Storage®, IBM PowerVM®, and Linux Operating System. It describes the requirements for LAN and external SAN topologies. For special topics, own documentation is maintained and referenced at the end.

IBM processes and contacts are introduced helping to obtain a valid configuration based on SAP sizing for SAP HANA.

IBM employees can access the [ISICC SAP HANA on Power Systems Community](#) (IBM only) for up-to-date materials complementary to this guide.

The most recent document version can be downloaded from IBM TechDocs:

<http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP102502>

Feel free to provide feedback and change requests for this document via email to isicc@de.ibm.com

About the Author

Marc-Stephan Tauchert is a System Specialist at IBM Germany. In his 25+ years' experience in designing and implementing SAP Solutions on IBM Power Systems, he has covered various topics and roles. As Technical Sales Consultant and SAP Solution Architect, he supports customer situations regarding the connectivity of SAP Applications and Infrastructure, SAP sizing, and hybrid solutions. He is an expert in SAP Database and Application performance, including SAP HANA.

Table of Contents

Introduction	5
Storage Solutions	5
Storage Solution based on Spectrum Virtualize	5
Storage Solutions based on NVMe technology	5
Latency differences between the different storage solutions	7
Throughput differences between the different storage solutions.....	7
Copyrights and Trademarks	9
Disclaimer and Special Notices	9

Figures

Figure 1 SAN Configuration.....	5
Figure 2 NVMe - Single Memory Module on disjunct cards per HANA filesystem (mirroring).....	6
Figure 3 NVMe - Multiple Memory Modules on disjunct cards per HANA filesystem (striping + mirroring).....	6
Figure 4 NVMe - HANA Filesystems spread across all cards	7

Introduction

This planning guide supports to architecture and implement new technologies on Power in a SAP HANA environment. This technical document is based on experimental tests done by the labs of IBM and SAP. This planning guide will focus on the available storage implementation for SAP HANA based on the following products and features:

- Spectrum Virtualize Family
- Internal NVMe PCIe Gen3

Storage Solutions

This chapter describes the installed setups. In both cases the number stripes are kept identical to have same parallelism build for the above running SAP HANA instance.

Storage Solution based on Spectrum Virtualize

The SAP HANA LPAR used the multipath driver to connect via 2 separate VIO server to a SVC. Each VIO server is connected to the SVC via a PCIe attached 16Gb 2-Port Fibre Channel Adapter. Each port is connected to a SAN switch, so that in summary 4 SAN ports are attached. The storage subsystem is connected via 4 SAN ports to the SAN switch too. The SAP HANA data and log filesystems base on a stripped logical volume across eight LUNs accordingly to the documented SAP HANA Best Practices attached to SAP Note 1944799.

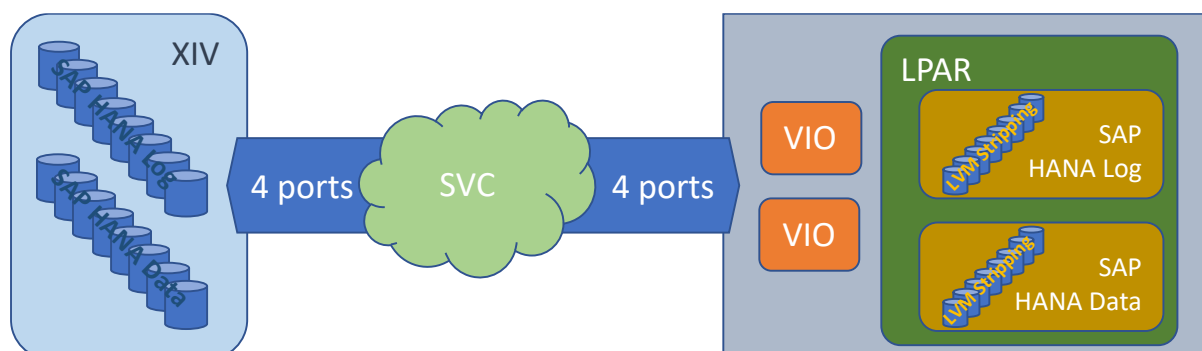


Figure 1 SAN Configuration

Storage Solutions based on NVMe technology

In the SAP HANA environment, the server internal NVMe devices can be used for data and log filesystems.

Note:

For these tests the P9 3.2TB NVMe PCIe3 cards have been used. Smaller or P8 based options have lower performance characteristics.

The next pictures give an impression of the possible setups in regards to redundancy (data protection) and parallelism (performance).

Single memory module per NVMe device configured via Raid 1. Data and Log on different NVMe devices:

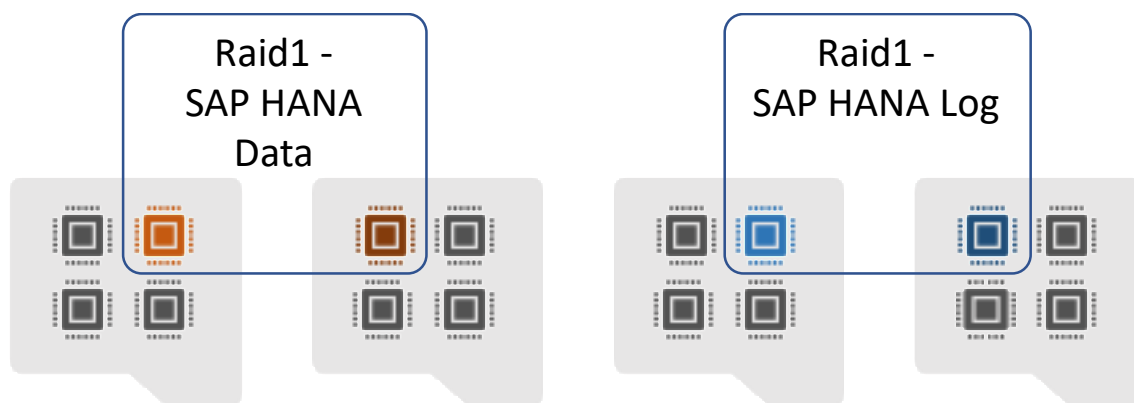


Figure 2 NVMe - Single Memory Module on disjunct cards per HANA filesystem (mirroring)

Each filesystem uses two NVMe cards with all memory modules. Multiple memory modules per NVMe device are combined with Raid 0 for performance optimization and mirrored via Raid 1 between different NVMe devices for data protection. Data and Log are placed on disjunct NVMe devices.

This configuration protects against any SPoF on the physical NVMe layer and PCIe slots.

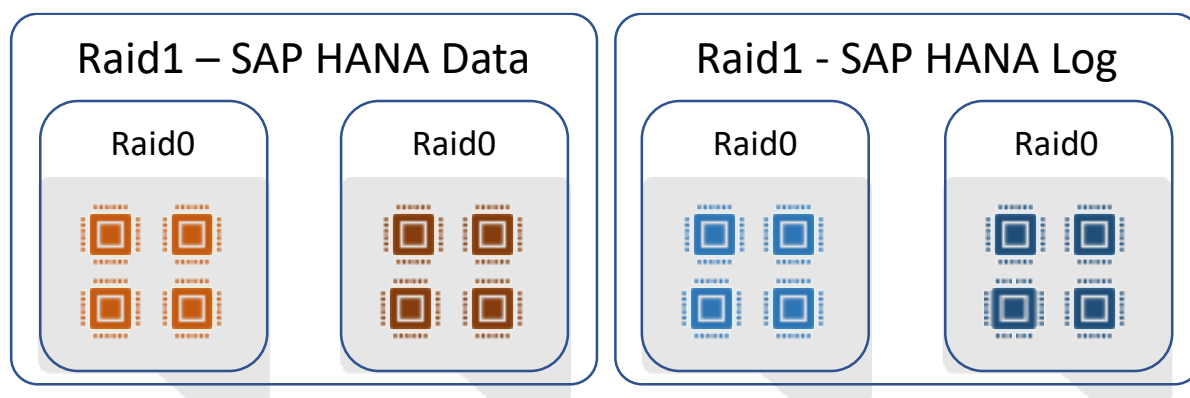


Figure 3 NVMe - Multiple Memory Modules on disjunct cards per HANA filesystem (striping + mirroring)

Both filesystems are sharing the same NVMe cards. Multiple memory modules on different NVMe devices are setup with Raid 0. Two Raid 0 sets mirrored via Raid 1. Data and Log devices sharing the same NVMe devices.

This configuration protects against any SPoF on the physical NVMe layer and PCIe slots.

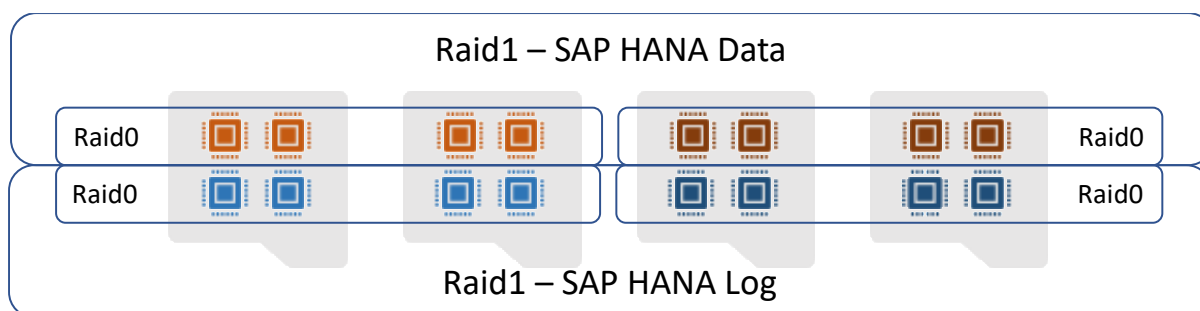


Figure 4 NVMe - HANA Filesystems spread across all cards

Latency differences between the different storage solutions

Internal NVMe drives are up to 9 times better in latency than the tested high-end SAN solution based on an SVC with 20 GB cache attached to a XIV.

Throughput differences between the different storage solutions

The read performance between a NVMe device solution and a Spectrum Virtualize environment can be increased by a factor of 4 depending on the block sizes used by SAP HANA for the NVMe devices.

Tabelle 1 Correlation Blocksize and Performance on read improvement of internal NVMe devices compared to SVC

Block size	64 KB	128 KB	256 KB	1 MB	16 MB	64 MB
Performance increase using NVMe	2,2	2,7	4,0	4,5	4,0	4,1

The write performance between NVMe devices and an Spectrum Virtualize solution is increasing by a nearly a factor of 2 in almost all block sizes for the given setup.

Tabelle 2 Correlation Blocksize and Performance on write improvement of internal NVMe devices compared to SVC

Block size	4 KB	16 KB	64 KB	128 KB	256 KB	1 MB	16 MB	64 MB
Performance increase Initial write using NVMe	n/a	1,1	1,4	1,7	1,9	1,8	1,7	1,7
Performance increase overwrite using NVMe	1,5	1,8	2,0	1,8	1,7	1,9	1,6	1,6

Striping effects for internal NVMe cards:

Raid 0 over multiple NVMe devices will increase the throughput on read operations on block sizes greater equal 256KB nearly by factor 2.

Raid 0 over multiple NVMe devices will increase the throughput on write operations on block sizes greater equal 64KB nearly by factor 1.7. On block sizes greater 256KB the factor will be nearly 2.

Using Raid0 on the multiple memory modules of one NVMe device has no positive effect on the performance, but it can be used for increasing the total amount of storage for the specific SAP HANA solution.

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Systems and Technology Group

Route 100

Somers, NY 10589

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