

2188482 - SAP HANA on IBM Power Systems: Allowed Hardware

Version	76	Type	SAP Note
Language	English	Master Language	English
Priority	Correction with medium priority	Category	Consulting
Release Status	Released for Customer	Released On	24.02.2022
Component	HAN-DB (SAP HANA Database)		

Please find the original document at <https://launchpad.support.sap.com/#/notes/2188482>

Symptom

You are using *SAP HANA, version for IBM Power Systems architecture*.

Other Terms

SAP HANA, Power, in-memory technology, In-Memory Database, IMDB, HANA-on-Power, SAP HANA 1.0, SAP HANA 2.0

Reason and Prerequisites

You need information about the allowed hardware models and LPAR limits for SAP HANA 1.0 or SAP HANA 2.0 production systems on IBM Power Servers.

This SAP Notes does not give recommendations for Hardware or LPAR configurations for your specific workload. To get a hardware configuration based on Workload sizing you have to use latest sizing tools. Size information and derived SAPS information obtained via the SAP HANA Quicksizer as described in SAP Note 1793345 or latest SAP HANA sizing reports must be considered. See <http://www.sap.com/sizing> for details. We recommend testing all workload scenarios before go live.

Solution

The [Certified and Supported SAP HANA® Hardware Directory](#) lists all models of IBM Power Servers supported for production systems of SAP HANA 1.0 and SAP HANA 2.0.

In addition, users can leverage such features as:

- IBM "*Capacity on Demand*" (COD) to turn on/off capacity where applicable
- IBM "*Live Partition Mobility*" (LPM), where the target infrastructure setup is only supported, if all prerequisites from SAP Note [2055470](#) are fulfilled. We recommend to have a valid full backup before moving Live system between host systems and follow all recommendations of the solution vendor.
 - If the operating system is reflecting NUMA topology changes, HANA must be stopped before the LPM process.
 - If the operating system is not reflecting NUMA topology changes (/proc/powerpc/topology_updates is set to off), HANA can be left running during the LPM process. The following OS do not reflect NUMA topology changes by default:
 - SLES 11 up to SLES12 SP2
 - SLES 12 SP3 kernel 4.4.178-94.91.1 and above
 - SLES 12 SP4 kernel 4.12.14-95.16.1 and above
 - SLES 15 SP0 kernel 4.12.14-150.17.1 and above

- SLES 15 SP1 and above
- RHEL 7.7 and above
- RHEL 8.1 and above

You can experience performance degradations after the LPM, as HANA is not notified by the operating system about these changes. Please check the documentation on the [SAP on Power Community](#): "[SAP HANA on Power Advanced Operation Guide](#)" - chapter: "Detect execution of LPM" to find out, if an LPM happened and on how to use DPO and/or a HANA restart at a convenient time on optimizing the NUMA layout (chapter: "Using Life Partition Mobility or Dynamic Platform Optimizer for LPARs running SAP HANA"). In case of persisting issues, IBM will support to reconfigure the NUMA configuration.

- IBM "*Virtual Persistent Memory*" (vPMEM) on POWER9 using volatile DRAM
 - LPARs with vPMEM must use HANA 2.0 SPS04 revision 44 (or newer) and SLES 15 SP1 or RHEL 8.2
 - SAP Note [2786237](#) for sizing SAP HANA with physical PMEM applies for IBM vPMEM with the following changes:
 - Other ratios between DRAM and PMEM capacity are allowed since vPMEM is built on DRAM.
 - Power Systems built with POWER9 architecture can be used.
 - like DRAM, vPMEM should be homogeneously distributed over all sockets
 - Expert sizing is strongly recommended.
 - For correct configuration please read "[Plan and Configure PowerVM Virtual Persistent Memory for SAP HANA](#)" on the [SAP on Power Community](#) and contact IBM experts (isicc@de.ibm.com).
 - In case of problems caused by vPMEM configuration, contact IBM or run LPAR with DRAM only configuration.
- IBM "*Dynamic LPAR*" (DLPAR) operation to add memory to or remove memory from a running LPAR on POWER9
 - LPARs must use HANA 2.0 SPS05 revision 52 (or newer) and SLES 15 SP2 or RHEL 8.2
 - See SAP Note [3114051](#) for more details
 - Use a DLPAR operation to adjust memory if you immediately need more memory to fulfill a critical business task, and shutting down the SAP HANA system is not possible.
 - When using a DLPAR operation on an SAP HANA system, it is recommended to verify the NUMA layout of the system afterwards due to a possible performance impact as described below:

Although the PowerVM Hypervisor attempts to place new memory close to the cores of the LPAR, due to the availability of resources, newly added memory might be located on a socket not yet occupied by that LPAR. As a result, you may experience a performance impact after the DLPAR operation. Please check the documentation on the [SAP on Power Community](#): "[SAP HANA on Power Advanced Operation Guide](#)" - on how to use DPO and/or a HANA restart at a convenient time on optimizing the NUMA layout (chapter: "Using Life Partition Mobility or Dynamic Platform Optimizer for LPARs running SAP HANA"). In case of persisting issues, IBM will support reconfiguring the NUMA configuration.
 - When adding or removing memory permanently to or from an LPAR it is required to verify the sizing of the target configuration to ensure it still satisfies the workload requirements for that LPAR. If the new configuration does not satisfy the workload demand, then corrective actions need to be taken.

Processor cores must be distributed equally among NUMA nodes of the underlying physical server.

This SAP Note refers to **OLTP** workload for the following scenarios

- Products from SAP Business Suite, powered by SAP HANA

- SAP S/4HANA ON-PREMISE
- SAP S/4HANA FINANCE
- SAP SFINANCIALS
- Banking services from SAP (including SAP Bank Analyzer)
- SAP Solution Manager
- SAP Master Data Governance
- SAP Gateway

If SAP Product used with the SAP HANA instance is not listed above or contains analytical workload this SAP note refers to **OLAP** workload

Per introduction of TDI phase 5, TDI allows Configurations based on Workload Sizing. More info about TDI Phase 5 can be found at SAP Note [2613646 - SAP HANA TDI Phase 5](#). The amount of LPAR cores & memory has to be determined by an individual sizing of the customer workload. For Power 9 and Power10 only configurations based on workload sizing are available.

Configurations based on Workload Sizing are based on sizing relevant information and derived SAPS obtained via the latest sizing tools. Sizing and workload analyzes are being constantly improved for these Configurations based on Workload Sizing.

If you don't want to follow the workload based sizing approach you can use Power 8 configurations based on the established **core to memory ratio** and derived from workload measured by SAP and IBM with standard SAP applications (OLTP & OLAP). For information please read SAP Note [2696290](#).

Details

With TDI Phase 5, sizing relevant information and derived SAPS obtained via the latest sizing tools must be considered. Customers can use the CPU sizing information derived from their production workload to determine the required number of cores.

The memory configuration and performance per listed system is dependent on the maximum physical abilities of the individual system.

In all cases the minimal number of cores and memory per LPARs must be **at least 4 cores and 128 GB RAM**.

Power 8: The **maximum of 176 cores & 24 TB** used by single HANA (scale-up) must not be exceeded. For **OLAP** workload (e.g. BW) 192 cores & up to **16TB** can be used.

Power 9: The **maximum 32TB** used by single HANA 2.0 (scale-up) must not be exceeded. (see 'Additional Information' section for configurations larger than 24TB)

Power10: The **current maximum of 120 cores & 23TB** used by a single HANA 2.0 (scale-up) must not be exceeded.

OLTP & Mixed Load

Power10 shows no regression in comparison with same-sized Power9 configurations. The recommendation is to use Power10 with only SMT-4 enabled to support a better balance for different workloads based on internal testing. The scalability behavior of Power 10 follows a similar pattern as Power9 (refer to comments in Power9 section). IBM & SAP request that an extra review takes place when sizing systems for mixed load/OLTP to account for spikes or demanding workloads. Also, the recommendation is to use SAP HANA V2 SPS05 at Revision level 57 or later.

Power 9 shows no regression in comparison with same sized Power 8 configurations, however IBM & SAP

request that an extra review takes place when sizing systems that are larger than 64 cores (LPARs hosted on Power E980 models) for mixed load / OLTP as a typical SAPS rating may not be enough to properly size and account for spikes or demanding workloads based on scaling results from internal tests. We recommend to use HANA 2.0 SPS04 Rev. 41 as we see sufficient scalability for not only OLAP but also for mixed load and OLTP load (in worst case performance comparable to only around 2/3 of maximum SAPS rating can be observed on IBM POWER9 systems with 16 sockets). For lower revisions including HANA 2.0 SPS03 tests showed scalability that deviated from the SAPS rating for mixed load / OLTP above 4 sockets and leveled off above 8 sockets and no further scalability is noticeable from this point onwards as additional CPU resources above 8 sockets could not be utilized.

Power 9 systems hosting LPAR configurations with more than 64 cores must be designed and validated together with an IBM expert taking into account:

- the individual customer workload
- the application KPIs and
- your projected growth assumptions.

Please contact isicc@de.ibm.com for large scale OLTP sizing guidance and an optimized system configuration. You should also follow guidelines of SAP Note [1872170](#), especially if LPAR memory exceeds 8TB.

Test with SAP BW edition for SAP HANA shows scalability for **OLAP**:

Power10 (120 cores, SMT4):

- up to 7TB for L class sizing
- up to 16TB only allowed for M class sizing
- up to 23 TB only allowed for S class sizing

Power9 (192 cores, SMT8):

- up to 16TB for L class sizing
- up to 24 TB only allowed for *M & S sizing* & HANA 2.0 SPS04 or later
- up to 32 TB only allowed for *S sizing* & HANA 2.0 SPS05 or later

We also highly recommend testing initially sized system with all workload scenarios thoroughly before go-live. IBM will work with clients to make sure requirements are met.

In support cases the customer could be asked to provide sizing assumptions and detailed workload analysis which are the basis for all hardware & LPAR configurations. Incorrect sized configurations must be adjusted according to the application workload and sizing results. For application specific sizing information please visit: www.sap.com/sizing

Additional Information

SAP Note [2055470](#) contains some additional details on the server configuration. It also provides information about non-production relaxations.

On Power10 SMT-4 mode needs to be enabled, since it provides the best balance for all workloads.

Except for POWER9 running HANA 2.0 SPS04 Revision 42 (and higher) all LPAR configurations that use more than 96 Cores in OLTP & Mixed Load scenarios (listed above), must run Linux OS in SMT-4 mode. As SMT-4 is used to reduce the number of parallel threads, reducing thus concurrency for POWER8 and older HANA versions.

For LPARs from 12 -16TB (OLTP) HANA 1.0 SPS 12 or newer must be used. For LPARs with more than 10 TB (OLAP) / 16TB (OLTP) RAM HANA 2.0 SPS2 rev 23 or newer and SUSE SLES 12 SP3 or Red Hat RHEL 8 or newer must be used. See also SAP Note [2235581 - SAP HANA: Supported Operating Systems](#).

For LPARs with more than 24TB **and with a suitable sizing** HANA 2.0 SPS05 (or higher) and SLES 15 SP1 (or higher) or RHEL 8.1 (or higher) must be used. An active monitoring process of memory must be established on your system. See SAP Note [2982940](#) for details and/or ask your IBM contact for guidance. Please open an SAP Ticket against the component BC-OP-PLNX when the largest free virtual address space goes below 256TB and provide monitoring data. HANA downtime and system restart must be planned to prevent an out of memory condition.

LPARs on Power 9 systems must use HANA 2.0 SPS03 revision 36 (or newer) and an operating system as specified in SAP Note [2055470](#) and SAP Note [2235581](#).

For POWER8 processor-based systems: Above 9 TB RAM only the POWER8 models E880 and E880C are supported and sizing results must allow LPAR hardware configuration.

For LPARs with more than 3 TB RAM running SLES 11 SP4 without the bigmem kernel provided by SUSE, SAP recommends monitoring the virtual address space available to SAP HANA processes. In the case of HANA 1.0 SPS 12 it is required to use the bigmem kernel variant of SLES 11 SP4. For more information regarding bigmem kernel and how to set up this monitoring, please contact your IBM representative.

This document refers to

SAP Note/KBA	Title
2235581	SAP HANA: Supported Operating Systems
2133369	SAP HANA on IBM Power Systems: Central Release Note for SPS 09 and SPS 10
2055470	HANA on POWER Planning and Installation Specifics - Central Note

This document is referenced by

SAP Note/KBA	Title
2530525	Supported HANA hardware storage and serv
2469025	How-To: Upgrading to SAP HANA 2.0
2947579	SAP HANA on IBM Power Virtual Servers
2378874	Install SAP Solutions on Linux on IBM Power Systems (little endian)
2408419	SAP S/4HANA - Multi-Node Support
2495375	Indexserver Crashes in sse_icc_lib::mgeti_AVX2 After Changing Underlying CPU

2271345	Cost-Optimized SAP HANA Hardware for Non-Production Usage
2235581	SAP HANA: Supported Operating Systems
2055470	HANA on POWER Planning and Installation Specifics - Central Note
2133369	SAP HANA on IBM Power Systems: Central Release Note for SPS 09 and SPS 10

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