

White Paper

FUJITSU Server PRIMERGY & PRIMEQUEST Benchmark Overview SAP BW Edition for SAP HANA® Standard Application Benchmark

This document is an explanation of the SAP BW Edition for SAP HANA Standard Application Benchmark which was released in July 2016. The benchmark is the latest SAP BW benchmark and fully utilizes the capabilities of SAP HANA.

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Document history

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- Original version

SAP Benchmarks – Introduction

Since 1993 the SAP Standard Application Benchmarks have been developed by SAP to provide basic information for configuring, sizing and for platform comparison and to conduct platform certification. The first benchmarks available (for SAP R/3 Release 1.1H) were targeted for FI (Financial Accounting), SD (Sales and Distribution), and MM (Materials Management) followed by ATO (Assemble-To-Order), PP (Production Planning), WM (Warehouse Management), BW (Business Information Warehouse) and now many more.

The SAP Benchmark Council (established in 1995 and consisting of representatives of SAP as well as hardware, logo and technology partners involved in benchmarking) define and control the content of the benchmarks and establish rules that encompass the testing procedures. The procedures involve the hardware companies running most of the benchmarks and sending the results to SAP. On request SAP certifies the results.

By far the most popular benchmarks from the many available are the SAP SD as de-facto standard for SAP platforms, the BW Edition for SAP HANA benchmark, gaining more and more relevance with the increasing importance of SAP HANA, the BW Advanced Mixed Load (BW-AML) benchmark and the SAP Server Power benchmark, measuring power efficiency.

Definition of SAPS

SAP has defined a unit for measuring throughput in a SAP Business Suite environment: **SAPS** (SAP Application Benchmark Performance Standard). Since SAPS is a very important unit that is often being used, it is essential to know the definition.

100 SAPS are defined as 2,000 fully processed order items per hour in the **SD standard application benchmark**. This throughput is achieved by processing 6,000 dialog steps (screen changes) and 2,000 postings per hour or processing 2,400 SAP transactions in the SD benchmark.

In the SD standard benchmark 'fully processed' means the full workflow of an order item (creating the order, creating a delivery note for this order, displaying the order, changing the delivery, posting a goods issue, listing orders and creating an invoice) has completed.

Benchmark Toolkit

In order to have a benchmark environment which enables fairly easy usage and reproducible results, a continuously maintained and updated toolkit is available.

The SAP Standard Application Benchmark tools and scripts of the toolkit are available for SAP Global Technology Partners only. **Their use by any other party is prohibited.** They are no official SAP product and no official support is available.

The SAP BW Edition for SAP HANA Standard Application Benchmark

With the increasing importance of SAP HANA and in particular SAP Business Warehouse (SAP BW) on HANA, a new benchmark was introduced in July 2016: the SAP BW Edition for SAP HANA Standard Application Benchmark, referred to as SAP BWH Benchmark in the following.

The benchmark represents a typical mid-size customer scenario and volumes and utilizes the new capabilities of SAP HANA which enable customers to enhance their BW processes.

Since its first edition in 2016, the SAP BWH Benchmark has been further developed and adapted to customer requirements. In the meantime SAP BWH Benchmark version 3 is available.

Comparability of SAP BW Benchmark Results

The SAP BWH Benchmark goes beyond the scope and features used in the BW-AML benchmark. While BW-AML focuses on traditional BW objects and processes supported by all database platforms, the SAP BWH Benchmark takes advantage of HANA's new features. The workloads of the two benchmarks completely differ and thus are not comparable.

Within the SAP BWH Benchmark, both the data model and the query definitions have changed in the course of the development of version 1 to version 3. That is why the results of different versions must not be compared with each other.

BWH Benchmark version 3 for instance is available for SAP HANA 2.0 only and the Data Load KPI (Phase 1) has been changed - the runtime of the latest data set (1,3 billion records) will be the KPI.

In SAP BWH Benchmark version 2 it was allowed to activate a specific SAP HANA performance enhancement function which materializes intermediate query results. Benchmarks that have used the feature cannot be compared with benchmarks that haven't. Whether the function was used can be seen in the details on www.sap.com/benchmark, "Materializing of the intermediate result of the query was enabled (phase 2 and phase 3)" is shown.

In addition, SAP BWH Benchmark results with different number of data sets cannot be compared either.

Currently released version of the benchmark is version 3. Benchmarks with the older versions won't be certified anymore.

Features of the SAP BW Edition for SAP HANA Standard Application Benchmark

The SAP BWH Benchmark consists of 3 phases:

- Data load phase
- Query throughput phase
- Query runtime phase

Data load phase

The data flow starts with a data load from the source object into the corporate memory layer. The source object is shipped with the backup.

The source object contains 1.3 billion records (= 1 data set). It is possible to load this data set of 1.3 billion records multiple times.

The data set stored in the source is fetched and propagated through the different layers in 25 load cycles. In other words, 1 load cycle processes 1/25 of the data set.

One of the central rules of the benchmark stipulates that the memory utilization must be at least 65 percent. The permissible data volumes are a multiple of 1.3 billion initial data records.

The data load phase takes several hours and is a combination of CPU- and IO-intensive load. When several HANA nodes are used (see "SAP HANA Scale-up and Scale-out Configuration Architecture" below), significant network load is generated.

Query throughput phase

The queries for the throughput phase must be executed via an ABAP program with a variant containing 190 query steps. Users execute the set of navigation steps in random order (via asynchronous RFCs). The queries contain typical query patterns which can be found in BW productive systems of customers.

The query throughput phase runs one hour and is CPU bound. In a HANA multi-node environment, also significant network load is generated.

Query runtime phase

For the query runtime phase the same ABAP program as for the throughput phase is used with a different variant. The variant contains 10 queries which are executed sequentially. These queries are used to measure the runtime. They contain complex query patterns which are executed in BW productive systems of customers but which are typically not executed by many users in parallel but selectively by some power users. Therefore they are executed sequentially.

The query runtime phase takes a short time and generates a small load. Only a few processors cores are used, single thread performance is important for short runtimes.

Metrics of the SAP BW Edition for SAP HANA Standard Application Benchmark

The SAP BW edition for SAP HANA Benchmark Version 3 KPIs are:

- Benchmark phase 1 - data load phase:
 - Number of initial records
 - Runtime of last data set in seconds
- Benchmark phase 2 - query throughput phase:
 - Query executions per hour
 - CPU utilization of database server in percent
- Benchmark phase 3 - query runtime phase:
 - Total runtime of complex query phase in seconds

The following page shows as an example the full certificate of the SAP BW edition for SAP HANA Benchmark Version 3 for the PRIMEQUEST 3800B.

Certified and published SAP BWH Benchmarks are published on SAP's benchmark site [here](#) .

Certification

SAP® Standard Application Benchmarks

The SAP BW edition for SAP HANA Standard Application Benchmark Version 3 performed on October 19, 2018, by Fujitsu in Kawasaki, Japan, with a total of 5,200,000,000 initial records, was certified by SAP on behalf of the SAP Benchmark Council on November 6, 2018, with the following data:

Benchmark Phase 1	
Number of initial records:	5,200,000,000
Runtime of last Data Set (seconds):	20,836
Benchmark Phase 2	
Query Executions per Hour:	9,785
CPU utilization of database server:	97%
Benchmark Phase 3	
Total Runtime of complex query phase (seconds):	119
Operating Systems:	SUSE Linux Enterprise Server 12
Database:	SAP HANA 2.0
Technology platform release:	SAP NetWeaver 7.50
Configuration:	

No. of Servers	Usage	Hardware
1	Database	FUJITSU Server PRIMEQUEST 3800B, 8 processors / 224 cores / 448 threads, Intel Xeon Platinum 8180 processor, 2.50 GHz, 64 KB L1 cache and 1,024 KB L2 cache per core, 38.5 MB L3 cache per processor, 3,072 GB main memory

Certification number: 2018047

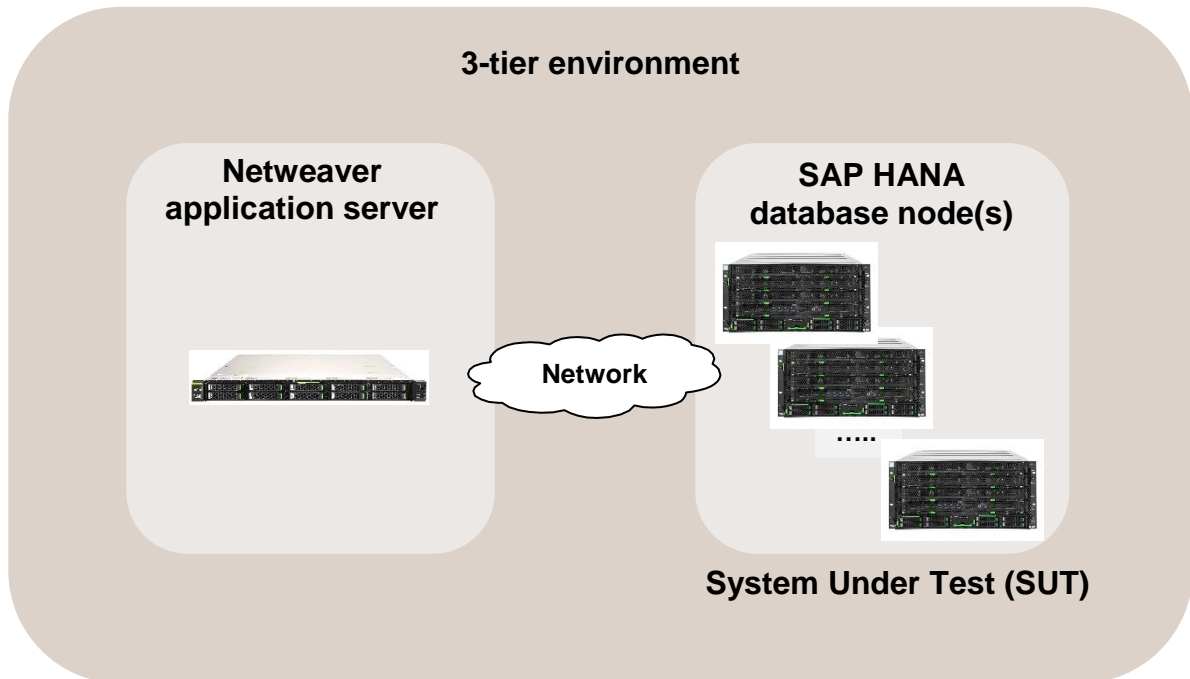
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SAP HANA Scale-up and Scale-out Configuration Architecture

In general, a single database node or multiple database nodes can be used for SAP benchmarks to scale the workload. In the context of SAP HANA and particularly the SAP BW Edition for SAP HANA Standard Application Benchmark it is referred to as a scale-up configuration in the case of a single database node and a scale-out configuration in the case of multi database nodes.



Although an application server is involved in the benchmark, neither performance metrics are measured nor does the server appear on the benchmark certificate.

Literature

[L1] PRIMERGY & PRIMEQUEST Servers

<http://www.fujitsu.com/fts/products/computing/servers/>


[L2] PRIMERGY & PRIMEQUEST Performance


<http://www.fujitsu.com/fts/x86-server-benchmarks>

[L3] Benchmark descriptions

<http://www.fujitsu.com/fts/products/computing/servers/primergy/benchmarks/benchmark-descriptions.html>

This White Paper:

 <http://docs.ts.fujitsu.com/dl.aspx?id=70a4c869-586c-49f3-a6a4-47f188dd72b3>

 <http://docs.ts.fujitsu.com/dl.aspx?id=a1a3dee2-aa7f-4e4b-9276-309ef19bf7ef>

[L4] Benchmark Overview SAP SD Standard Application Benchmark

<http://docs.ts.fujitsu.com/dl.aspx?id=0a1e69a6-e366-4fd1-a1a6-0dd93148ea10>

[L5] Benchmark Overview SAP Server Power Standard Application Benchmark

<http://docs.ts.fujitsu.com/dl.aspx?id=9a500709-589c-4a36-9a5d-bcf28debadb7>

[L6] SAP Standard Application Benchmarks

<http://www.sap.com/benchmark>

<https://www.sap.com/dmc/exp/2018-benchmark-directory/#/bwh>

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