SAP Standard
Application Benchmarks

Report Sheet

Please return to:

> SAP SE
> Performance, Architecture, Scalability
> Tel.: +49-6227-7-67038
> Email: **benchmark@sap.com**

Benchmark Submission Process
1. Benchmark packages should be ZIP archives.
2. Package name should contain a company identifier, e.g. ibm_mynewserver.zip, hp_bm_package.zip, …
3. Request a SAPMats container from benchmark@sap.com
   We will create a SAPMats container and send the link for uploading the file to you.
4. Upload your benchmark package to the provided link at https://sapmats-de.sap-ag.de/upload/index.cgi?id=... (You can upload exactly one file, maximum size 200 MB, the link is available for 21 days)
5. Send a short notice about the upload to benchmark@sap.com (attach this report sheet and include the package name).

Always check: http://service.sap.com/benchmark → Documentation for the current version of this document.

1) General Information

General information about the benchmark environment			
Hardware partner	Cisco Systems, Inc	Location	San Jose, CA USA
Contact(s) (Name & tel./mail-ID)	Klaus Aker +49.151.46129054 kaker@cisco.com Babu Mahadevan Venkata Subramanian babvenka@cisco.com +91.80.44295303	Software release (for example BW, APO, SD)	SAP Enhancement Package 5 for SAP ERP 6.0
Date of benchmark run	27 April 2016	DBMS version	IBM DB2 10.5
		32/64 bit	64 bit
When will the tested configuration be available	June 2016	liveCache Version	
Do you want the result to be certified? Any certified benchmark result will be published at www.sap.com/benchmark	yes	HW -price (internal)	
Optional: enter a not-sooner-than-date for certification[1]	Intel Broadwell EX launch date		

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[1] Note, however, that we will not guarantee that the benchmark will be certified at that particular date.

1.1) Publication Guidelines Acknowledgement

Acknowledgement of Publication Guidelines		
Benchmarking partners are required to comply with the SAP Benchmark Publication Guidelines at http://www.sap.com/solutions/benchmark/publication/index.epx	Enter "yes" to acknowledge your awareness of these guidelines.	yes

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SAP

2) Detailed Hardware and System Software Configuration

Please enter the **exact external (marketing) server and processor names** as **we will copy them as-is** into the certification. We do not check their exact wording or capitalization.

Database server (& Application server for 2-tier)

Product name of the server	UCS	Model	C460 M4		
Processor type / clock rate	Intel Xeon E7-8890v4 / 2.20GHz	Describe processor technology: total number of processors / cores / threads	**Processors** 4	**Cores** 96	**Threads** 192
Caches (must be filled in completely)	Level / L1 / L2 / L3 — Size / 32+32 kB / 256 kB / 60 MB	Describe multitasking technology on the processor (e.g. hyperthreading, multithreading), if used.	Intel HT		
		Memory in GB	1024 GB		
Operating System	Windows Server 2012 R2 Datacenter Edition	Describe virtualization technology, if used (e.g. VMware, Xen, Advanced POWER Virtualization, Windows Server Virtualization, HP VM, etc.)	n/a		
32/64 bit	64bit	Describe virtualization configuration (e.g. using n virtual CPUs, n% entitlement, etc., memory (optional))	n/a		
CPU binding manually modified after SAP system startup (yes/no)?	yes	File containing final CPU binding, if modified	pst_sap.out		
SCU Performance Category (see chapter 8 for additional info)	AAA				

The caches table:

Level	Size
L1	32+32 kB
L2	256 kB
L3	60 MB

I/O subsystem and storage

Total number of physical disk drives	n/a	Total database disk space (GB):	249+46GB
Storage Architecture (e.g. NAS, SAN,... briefly describe)	SAN (boot) +DAS (database)	Total number of controllers	2
Controller type (e.g. fibre channel, SCSI, ...) / number	# of physical disk drives per controller (if applicable)	RAID level	Contents
1x Cisco VIC1225	SAN boot image and others	-	System, SAP execs, DB execs, Pagefile, Backups
1x Emulex LP16002	IBM V9000	-	db data, db log
		-	

SAP power benchmarks

Power supply unit(s) (number, type; list the order number in section 6):	
Disks or non-volatile memory assigned to server as per specification (number, type; list the order number in section 6):	
Other components	Network (three-tier)

(number and type; list the order number in section 6):	Other	

Short info: Applied tuning on database, Operating System, others (description, notes, support statement) – **use chapter 7) to provide detailed information.**
• Database: • Operating System: • Others: SAP notes 161932, 1624950, 1652185

Application servers (no. & type)

Number of servers				
Product name of the server		Model		
Processor type / clock rate		Describe processor technology: total number of processors / cores / threads	Processors	Cores	Threads

Cache (level/size)	Level	Size			
	L1				
	L2		Memory in GB		
	L3				

Operating System		Describe multitasking technology on the processor (e.g. hyperthreading, multithreading), if used.	
32/64 bit			
SCU Performance Category (see chapter 8 for additional info)			
Total number of physical disk drives (for non-SAP power benchmarks)			

Specials (additional information)		

SAP power benchmarks	
Power supply unit(s) (number, type; list the order number in section 6):	
Disks or non-volatile memory assigned to server as per specification (number, type; list the order number in section 6):	

Other components (number and type; list the order number in section 6):		

Short info: Applied tuning on Operating System, others (description, notes, support statement) – **use chapter 7) to provide detailed information.**
• Database: • Operating System:

- Others:

SAP power benchmarks – Measurement Devices

Power meter(s) (number, type)		Temperature meter (type)	
File containing calibration and adjustment certificate			

BI Accelerator servers (no. & type)

Number of servers					
Product name of the server		Model			
Processor type / clock rate		Describe processor technology: total number of processors / cores / threads	Processors	Cores	Threads

Caches (must be filled in completely)	Level	Size		
	L1			
	L2		Memory in GB	
	L3			

Operating System		Describe multitasking technology on the processor (e.g. hyperthreading, multithreading), if used	
32/64 bit			
SCU Performance Category (see chapter 8 for additional info)			
Total number of physical disk drives		Total database disk space (GB):	
Storage Architecture, if applicable (e.g. NAS, SAN,... briefly describe)		Total number of controllers	

IO Subsystem if applicable

Controller type (e.g. fibre channel, SCSI, ...) / number	Number of physical disk drives per controller (if applicable)	RAID level	Contents

Specials

liveCache servers (no. & type)

Product name of the server		Model			
Processor type / clock rate		Describe processor technology: total number of processors / cores / threads	Processors	Cores	Threads
Caches (must be filled in completely)	Level / Size / L1 / L2 / L3				
		Memory in GB			
Operating System		Describe multitasking technology on the processor (e.g. hyperthreading, multithreading), if used.			
32/64 bit		Total disk space (GB):			
CPU binding manually modified after SAP system startup (yes/no)?		File containing final CPU settings, if modified			
		Total database disk space (GB):			
Total number of physical disk drives		Total number of controllers			

IO Subsystem					
Controller type (e.g. fibre channel, SCSI, ...) / number	Number of physical disk drives per controller (if applicable)	RAID level	Contents		

Specials					

(Please provide a detailed description of all application servers used for the benchmark and extend table if necessary.)

Internet Transaction Server (no.)					
Product name of the server		Model			
Processor type / Clock rate		Describe processor technology: total number of processors / cores / threads	Processors	Cores	Threads
Cache (level/size)	Level / Size				
	L1 /				
	L2 /	Memory in GB			
	L3 /				
Operating System		Describe multitasking technology on the processor (e.g. hyperthreading, multithreading), if used.			
32/64 bit					
SCU Performance Category (see chapter 8 for additional info)					
Total number of physical disk drives					
Specials (additional information)					

Network configuration		
Type	Number of segments	Speed
10-Gigabit Ether (VIC to N5k to Boot-SAN)	1	10 Gbps
16-Gigabit FC (FC Controller to SAN)	1	16 Gbps

(Please describe the network connecting frontend, ITS, application- and DB Server used)-

3) Detailed SAP Software configuration:

SAP Configuration	
SAP Version (SAP Application or SAP NetWeaver Capabilities & Patch level)	SAP enhancement package 5 for SAP ERP 6.0
SAP Version (SAP NetWeaver Appl. Server ABAP: Kernel & Patch level SAP NetWeaver Appl. Server Java: J2EE Engine Release & Patch level)	7.20 PL436
Java Standard Edition (JSE) & Version	
Applied changes (Description / SAP Note)	SAP notes 161932, 1624950, 1652185
Number of used benchmark clients (if applicable)	22 (900-921)
Unicode	yes
32/64 bit	64 bit

SAP NetWeaver Application Server ABAP: Application server configuration

	Work process distribution						
Instance number and name	D	V	V2	E	B	M	S
00	4	5		1	1	1	1
01-05	4						
10-15	2	10					
20-79	4						
82-87	4						

SAP NetWeaver Application Server Java: Application server configuration

	Node configuration			
Instance number and name	Dispatcher	Server Nodes	E	M

Dispatcher: JVM settings	
Application node: JVM settings	

Short info Applied tuning on SAP level (description, notes, support statement) – **use chapter 7) to provide detailed information.**
• SAP Level: SAP notes 161932, 1624950, 1652185

4) Benchmark Driver Configuration

Benchmark Driver					
Product name of the server	UCS	Model	C240M3		
Processor type / clock rate	Intel Xeon E5-2697v2 2.70GHz	Describe processor technology: total number of processors / cores / threads	Processors	Cores	Threads
			2	12	24
Cache (level/size)	Level / Size: L1 / , L2 / , L3 / 15 MB per processor	Memory in GB	265 GB		
Operating System		Describe multitasking technology on the processor (e.g. hyperthreading, multithreading), if used.	Intel HT		
32/64 bit	64 bit	Avg. CPU utilization			
		SAPS			
Total number of physical disk drives		Used disk space:			
Specials (additional information)					

5) Results

5.1) Dialog Benchmarks:

Com-po-nent°	Number of simulated benchmark users	Number of dialog steps / hour or SAPS for SD	Average dialog response time (Dialog & Update)	Average CPU utilization of Application Servers **	Average CPU utilization of Database Server **	Average Database request times
SD	41,025	224,330 SAPS	dia: 1214 ms upd: 2112 ms			dia: 8.61 ms upd: 18.03 ms
Mix:						

** as in SAP Operating System Monitor; *** as in SAP Workload Monitor; °Dialog benchmarks are: FI, MM, SD, PP, PS, WM or a mix of these.

5.2) Batch Benchmarks (HR):

Number of employees	Number of parallel jobs	Average duration per job in seconds	Average CPU utilization of Database Server **	Number processes payroll periods per hour	Total duration of benchmark run in seconds

** as in SAP Operating System Monitor

5.3) Internet Transaction Server:

R/3 Com-ponent	Number of simulated ITS benchmark users	Number of processed internet orders / hour	Number of dialog steps in Web Bench	Average response time ITS server	Hits / second	Hits / hour	Average CPU utilization of ITS server
ITS							

General description:

Problems encountered:
Additional publications about this benchmark test? If yes, where and when?

5.4) SAP NetWeaver Portal Benchmarks

Component°	Number of benchmark users	Number of top level navigation steps/hour	Average online response time	Number of iViews/hour (only EP-PCC)	Average CPU utilization of Server

°Portal benchmarks are: EP-ESS, EP-PCC

5.5) CRM Interaction Center Benchmark

Component°	Number of benchmark users	Average online response time	Number of user interaction steps/hour	Average CPU utilization of Server
IC				

5.6) BI Data Mart Benchmark

Component	Number of benchmark users	Number of query navigation steps/hour	Average dialog response time	Average CPU utilization of Central System
BI-D				

5.7) BI Mixed Load Benchmark

Component	Initial data load**	Number of benchmark users	Number of query navigation steps/hour	Average dialog response time	Average CPU utilization of Central System	Average CPU utilization of BI Accelerator servers
BI-MXL						

** one of: 300 million records, 1000 million records, or 3000 million records

5.8) BW Enhanced Mixed Load (BW-EML) Benchmark

Component	Initial data load**	Number of benchmark users	Number of ad- hoc navigation steps/hour	Average dialog response time	Average CPU utilization of Database Server / Application Servers
BW-EML					

** one of: 500 million records, 1000 million records, or 2000 million records

5.9) CRM E-Selling Benchmark

Component	Type*	Number of benchmark users	Average online response time	Number of user navigation steps/hour	Average CPU utilization of Server
CRM E-Selling					

* Either B2C (Business-to-Consumer) or B2B (Business-to-Business)

5.10) TRBK Benchmark

Component	No. of postings to bank accounts/ hour:	No. of balanced accounts/ hour:	Average dialog response time (Dialog & Update)	Average CPU utilization of Application Servers	Average CPU utilization of Database Server	Average Database request times
TRBK Day processing						
TRBK Night processing						

5.11) SAP Power Benchmarks

Benchmark Type (SEP = SAP server power benchmark SYP = SAP system power benchmark)	Average throughput over all load levels (SAPS)	Power efficiency Indicator (overall)	Power efficiency indicator – server	Power efficiency indicator – storage	Minimum ambient temperature
Results for individual load levels:	SAPS	Power efficiency Indicator (per load level)	Watts / load level – server	Watts / load level – storage	# simulated benchmark users
Active idle					
10%					
20%					
30%					
40%					
50%					
65%					
80%					
100%					

Scope of measurement and power cabling maps

Provide schematic maps of the benchmark setup, to show the scope of the power measurement and the power cabling. The two maps must contain all devices (components with a separate power supply) used in the benchmark.

It should be possible to reconstruct the benchmark setup based on these maps and the hardware disclosure list in section 6.

a. Schematic map: scope of power measurement

Provide a schematic map of how the devices were connected to each other and how the power consumption of the devices was allocated to the individual components under test (server/storage). This graphic will be used as the basis for the "scope of measurement" graphic in the benchmark certificate.

b. Schematic map: power cabling

Provide a schematic map of how the power cables were plugged during the benchmark. Add each device, including the measurement device(s), and list this in the hardware disclosure (section 6).

6) Attachments

Hardware disclosure		
Quantity	Part number	Description
1	**UCSC-C460-M4**	Server UCS C460 M4 w/o CPU, mem, HD, PCIe, PSU w/ rail kit
4	**UCSC-PSU2V2-1400W**	PSU 1400W
4	**UCS-CPU-E78890E**	CPU 2.2 GHz E7-8890v4 165W 24C/60MB Cache/DDR4
4	**UCSC-HS-01-EX**	Heat Sink for UCS C460 M4 Rack Server
16	**UCS-MR-1x162RU-G**	16GB DDR4-2133-MHz RDIMM dual rank/x4/1.2v
1	**UCSC-PCIE-CSC-02**	UCS VIC1225 2x10Gbps for UCS rack server
2	**UCSC-PCIE-E16002**	Emulex LPe16002 16Gbps 2-port FibreChannel Controller
1	n/a	VTrack E310f (for SAN boot only)
2	846/9848-AC2	FlashSystem V9000 Control Enclosure
1	846/9848-AE2	FlashSystem V9000 Storage Enclosure
12	AF24	2.6 TB MicroLatency Flash Module
1	DS-C9148S-12PK9	MDS9148S 48port 16Gbps managed FibreChannel switch

Extend table as required.
For SAP power benchmarks: group hardware according to schematic scope of power measurement map.

7) Applied tuning - details:

Detailed info on applied tuning on SAP, Database, Operating System, others (description, notes, support statement)
• SAP: SAP notes 161932, 1624950, 1652185   • Database:

- Operating System:

- Others:

8) Benchmark Rules (as defined through the SAP Benchmark Council):

In general only those tuning features are allowed that can also be used and applied in a productive customer installation.

A benchmark run has to satisfy the following rules in order to be acceptable as a valid and certifiable run:

- The combination of operating system, database and SAP solution releases used must be generally available and officially released by SAP.

- The hardware and system software components used must be generally available or have to become generally available within the next six months from certification. Otherwise the benchmark has to be repeated in order to be accepted as a valid run.

- The hardware listed on a certificate must be sold directly (be on the price list and branded) by the hardware partner listed on the certificate.

- The *.err files may not contain any entries.

- Syslog entries may not exist.

- SAP monitors must be used as in a standard customer installation (Workload Monitor, SAPOSCOL, call statistic).

- The time interval of constant load (high-load phase) must be greater than 15 minutes.

- The Enqueue Monitor must be running in the start-up, high-load and ramp-down phase.

- There must be an Enqueue interval in the high-load phase. This interval must be at least 900 seconds. The average, weighted dialog response time must be less than 2 seconds. For the ERP benchmarks (most notably the SD benchmark) and the IC benchmark, the average, weighted response time must be less than 1 second.

- Archiving is not necessary during the benchmark run.

- There must be at least one checkpoint starting at least 5 minutes after the beginning of the high- load phase (multiple checkpoints allowed). This checkpoint has to be finished within the high-load phase. Additional checkpoints are allowed. The checkpoint has to be logged by the database log, which is part of the certification procedure. Or the amount of created dirty blocks must be written to disk during the high-load phase of the benchmark for at least 5 minutes. Each database partner must provide SAP with the key figures that are necessary to determine whether or not the rule has been met.

- 10 seconds of fixed think time must be applied for each benchmark user.

- The minimal number of benchmark clients needed for the amount of tested benchmark users must be used. The benchmark user numbering has to be consecutive. It can start at any number.

- Allowed customizing changes
    - number buffer for RV_BELEG, KONV
    - switch off VBLOG delete

- Allowed database tuning
    - buffers
    - additional indexes
    - storage parameters

- Allowed SAP Tuning
    - number of instances
    - number of dialog work processes
    - number of update processes
    - size of ROLL_SHM and PG_SHM
    - size of SAP buffers

- BI-D Benchmark rule: No condenser shall be running during the benchmark

9) Explanation SCU (Single Computing Unit) Performance Category

Category	Description
A	This SAP solution has no specific requirements towards single thread Performance
AA	This SAP solution benefits from a good single thread performance
AAA	This SAP solution strongly benefits from a very good single thread performance

Possible ways of determining Single Computing Unit Performance categories:

1. Category is determined by hardware partners by a measurement. One possibility is the measurement of the average response time for SD at 50% or 66% load levels / Minimum of 4 cores in measurement to exclude queuing effects / Ranges for categories (S / M / L) are set and determine the category result.

2. Category is determined by hardware partners from Power Benchmark results Measurements of SD response times at different load levels

3. Category is derived by hardware partners from the SD benchmark result by model calculation

4. Category is derived by hardware partners from other publically available sources / benchmarks

5. Category is derived by hardware partners by running the SD benchmark on one single thread. All processes are bound to one thread

6. Category is derived by hardware partners by measuring the runtime of some specific single threaded procedure and compare CPUs on basis of this result