White Paper
FUJITSU Server PRIMEQUEST
Performance Report PRIMEQUEST 2800E3

This document contains a summary of the benchmarks executed for the FUJITSU Server PRIMEQUEST 2800E3.

The PRIMEQUEST 2800E3 performance data are compared with the data of other PRIMEQUEST models and discussed. In addition to the benchmark results, an explanation has been included for each benchmark and for the benchmark environment.

Version
1.0
2016-06-07

Contents

Document history

Version 1.0 (2016-06-07)

New:

- Technical data
- SPECcpu2006
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  Measurements with “PRAID EP420i” controller
- SAP SD
  Certification number 2016023

Technical data

PRIMEQUEST 2800E3

Decimal prefixes according to the SI standard are used for measurement units in this white paper (e.g. 1 GB = 10^9 bytes). In contrast, these prefixes should be interpreted as binary prefixes (e.g. 1 GB = 2^{30} bytes) for the capacities of caches and memory modules. Separate reference will be made to any further exceptions where applicable.

Model	PRIMEQUEST 2800E3
Form factor	Rack server
Number of system boards orderable	1 – 4
Number of I/O units orderable	1 – 4
Number of disk units orderable	0 – 2
Per system board:	
Chipset	Intel® C602 Chipset
Number of sockets	2
Number of processors orderable	1 – 2
Processor type	Intel® Xeon® Processor E7-8800 v4 Product Family
Number of memory slots	48 (24 per processor)
Maximum memory configuration	3 TB
Max. number of internal hard disks	4
Per I/O unit:	
Onboard LAN controller	I/O Unit L (1GbE, 2xbaseTports) PQ2800E: 2 × 1 Gbit/s I/O Unit F (10GbE, 2xbaseTports) PQ2800E: 2 × 10 Gbit/s
PCI slots	I/O Unit L (1GbE, 2xbaseTports) PQ2800E: 4 × PCI-Express 3.0 x8 I/O Unit F (10GbE, 2xbaseTports) PQ2800E: 1 × PCI-Express 3.0 x8 2 × PCI-Express 3.0 x16
Per disk unit:	
Max. number of internal hard disks	4

Processors (since system release)								
Processor	Cores	Threads	Cache [MB]	QPI Speed [GT/s]	Rated Frequency [Ghz]	Max. Turbo Frequency [Ghz]	Max. Memory Frequency 1) [MHz]	TDP [Watt]
Xeon E7-8893 v4	4	8	60	9.60	3.20	3.50	1600	140
Xeon E7-8891 v4	10	20	60	9.60	2.80	3.50	1600	165
Xeon E7-8855 v4	14	28	35	8.00	2.10	2.80	1333	140
Xeon E7-8860 v4	18	36	45	9.60	2.20	3.20	1600	140
Xeon E7-8867 v4	18	36	45	9.60	2.40	3.30	1600	165
Xeon E7-8870 v4	20	40	50	9.60	2.10	3.00	1600	140
Xeon E7-8880 v4	22	44	55	9.60	2.20	3.30	1600	150
Xeon E7-8890 v4	24	48	60	9.60	2.20	3.40	1600	165

1) BIOS setting: *Memory Operation Mode = Performance Mode*

All the processors that can be ordered with the PRIMEQUEST 2800E3 support Intel® Turbo Boost Technology 2.0. This technology allows you to operate the processor with higher frequencies than the nominal frequency. Listed in the processor table is "Max. Turbo Frequency" for the theoretical frequency maximum with only one active core per processor. The maximum frequency that can actually be achieved depends on the number of active cores, the current consumption, electrical power consumption and the temperature of the processor.

As a matter of principle Intel does not guarantee that the maximum turbo frequency will be reached. This is related to manufacturing tolerances, which result in a variance regarding the performance of various examples of a processor model. The range of the variance covers the entire scope between the nominal frequency and the maximum turbo frequency.

The turbo functionality can be set via BIOS option. Fujitsu generally recommends leaving the "Turbo Mode" option set at the standard setting "Enabled", as performance is substantially increased by the higher frequencies. However, since the higher frequencies depend on general conditions and are not always guaranteed, it can be advantageous to disable the "Turbo Mode" option for application scenarios with intensive use of AVX instructions and a high number of instructions per clock unit, as well as for those that require constant performance or lower electrical power consumption.

Memory modules (since system release)								
Memory module	Capacity [GB]	Ranks	Bit width of the memory chips	Frequency [MHz]	Low voltage	Load reduced	Registered	ECC
16GB (2x8GB) 1Rx4 DDR4-2400 R ECC	16	1	4	2400			✓	✓
32GB (2x16GB) 1Rx4 DDR4-2400 R ECC	32	1	4	2400			✓	✓
32GB (2x16GB) 2Rx4 DDR4-2400 R ECC	32	2	4	2400			✓	✓
64GB (2x32GB) 2Rx4 DDR4-2400 R ECC	64	2	4	2400			✓	✓
128GB (2x64GB) 4Rx4 DDR4-2133 LR ECC	128	4	4	2133		✓	✓	✓

Power supplies (since system release)	Max. number
Power supply 2.880W	6
Power Supply 2.880W platinum hp	6

Some components may not be available in all countries or sales regions.

Detailed technical information is available in the data sheet PRIMEQUEST 2800E3.

SPECcpu2006

Benchmark description

SPECcpu2006 is a benchmark which measures the system efficiency with integer and floating-point operations. It consists of an integer test suite (SPECint2006) containing 12 applications and a floating-point test suite (SPECfp2006) containing 17 applications. Both test suites are extremely computing-intensive and concentrate on the CPU and the memory. Other components, such as Disk I/O and network, are not measured by this benchmark.

SPECcpu2006 is not tied to a special operating system. The benchmark is available as source code and is compiled before the actual measurement. The used compiler version and their optimization settings also affect the measurement result.

SPECcpu2006 contains two different performance measurement methods: the first method (SPECint2006 or SPECfp2006) determines the time which is required to process single task. The second method (SPECint_rate2006 or SPECfp_rate2006) determines the throughput, i.e. the number of tasks that can be handled in parallel. Both methods are also divided into two measurement runs, “base” and “peak” which differ in the use of compiler optimization. When publishing the results the base values are always used; the peak values are optional.

Benchmark	Arithmetics	Type	Compiler optimization	Measurement result	Application
SPECint2006	integer	peak	aggressive	Speed	single-threaded
SPECint_base2006	integer	base	conservative		
SPECint_rate2006	integer	peak	aggressive	Throughput	multi-threaded
SPECint_rate_base2006	integer	base	conservative		
SPECfp2006	floating point	peak	aggressive	Speed	single-threaded
SPECfp_base2006	floating point	base	conservative		
SPECfp_rate2006	floating point	peak	aggressive	Throughput	multi-threaded
SPECfp_rate_base2006	floating point	base	conservative		

The measurement results are the geometric average from normalized ratio values which have been determined for individual benchmarks. The geometric average - in contrast to the arithmetic average - means that there is a weighting in favour of the lower individual results. Normalized means that the measurement is how fast is the test system compared to a reference system. Value “1” was defined for the SPECint_base2006-, SPECint_rate_base2006, SPECfp_base2006 and SPECfp_rate_base2006 results of the reference system. For example, a SPECint_base2006 value of 2 means that the measuring system has handled this benchmark twice as fast as the reference system. A SPECfp_rate_base2006 value of 4 means that the measuring system has handled this benchmark some 4/[# base copies] times faster than the reference system. “# base copies” specify how many parallel instances of the benchmark have been executed.

Not every SPECcpu2006 measurement is submitted by us for publication at SPEC. This is why the SPEC web pages do not have every result. As we archive the log files for all measurements, we can prove the correct implementation of the measurements at any time.

Benchmark environment

System Under Test (SUT)	
Hardware	
Model	PRIMEQUEST 2800E3
Processor	Intel® Xeon® Processor E7-8800 v4 Product Family
Memory	2 sockets: 8 × 32GB (2x16GB) 2Rx4 DDR4-2400 R ECC 4 sockets: 16 × 32GB (2x16GB) 2Rx4 DDR4-2400 R ECC 8 sockets: 32 × 32GB (2x16GB) 2Rx4 DDR4-2400 R ECC
Software	
BIOS settings	Energy Performance = Performance Uncore Frequency Override = Maximum
Operating system	SUSE Linux Enterprise Server 12 SP1 (x86_64)
Operating system settings	echo always > /sys/kernel/mm/transparent_hugepage/enabled
Compiler	C/C++: Version 16.0.0.101 of Intel C++ Studio XE Fortran: Version 16.0.0.101 of Intel Fortran

Some components may not be available in all countries or sales regions.

Benchmark results

In terms of processors the benchmark result depends primarily on the size of the processor cache, the support for Hyper-Threading, the number of processor cores and on the processor frequency. The number of cores, which are loaded by the benchmark, determines the maximum processor frequency that can be achieved.

Processor	Number of processors	SPECint_rate_base2006	SPECint_rate2006	Number of processors	SPECint_rate_base2006	SPECint_rate2006	Number of processors	SPECint_rate_base2006	SPECint_rate2006
Xeon E7-8893 v4	2			4			8		
Xeon E7-8891 v4	2			4			8		
Xeon E7-8855 v4	2			4			8		
Xeon E7-8860 v4	2			4			8		
Xeon E7-8867 v4	2			4			8		
Xeon E7-8870 v4	2			4			8	5890	6130
Xeon E7-8880 v4	2			4			8	6440	6690
Xeon E7-8890 v4	2	1760	1830	4	3490	3630	8	6930	7200

Processor	Number of processors	SPECfp_rate_base2006	SPECfp_rate2006	Number of processors	SPECfp_rate_base2006	SPECfp_rate2006	Number of processors	SPECfp_rate_base2006	SPECfp_rate2006
Xeon E7-8893 v4	2			4			8		
Xeon E7-8891 v4	2			4			8		
Xeon E7-8855 v4	2			4			8		
Xeon E7-8860 v4	2			4			8		
Xeon E7-8867 v4	2			4			8		
Xeon E7-8870 v4	2			4			8	4060	4130
Xeon E7-8880 v4	2			4			8	4230	4310
Xeon E7-8890 v4	2	1180	1210	4	2320	2380	8	4410	4490

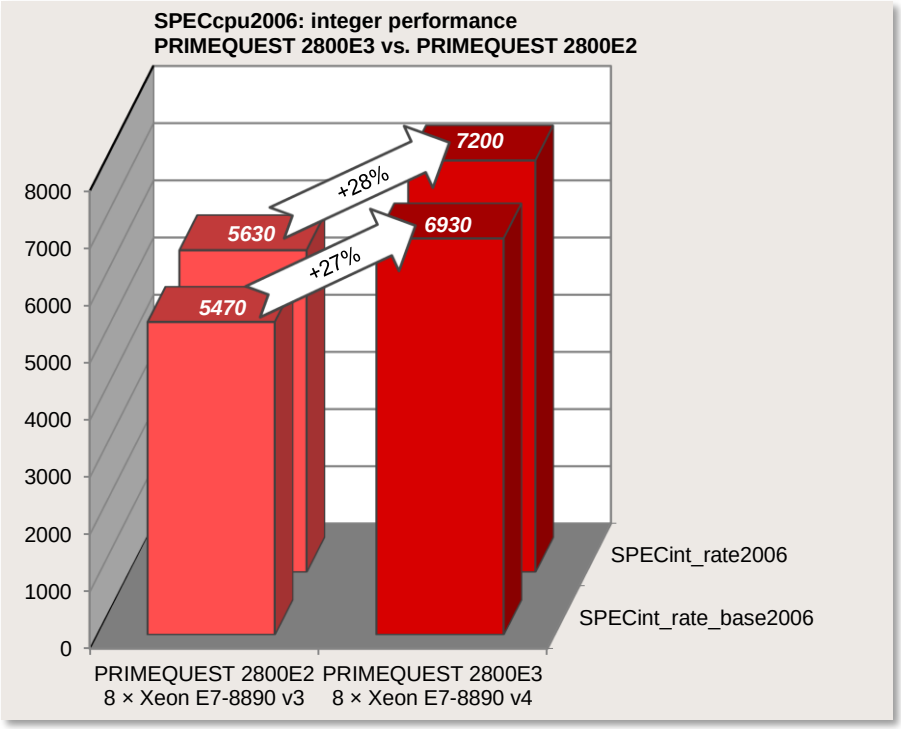
On 6th June 2016 the PRIMEQUEST 2800E3 with eight Xeon E7-8890 v4 processors was ranked first in the 8-socket systems category for the benchmark SPECint_rate_base2006.

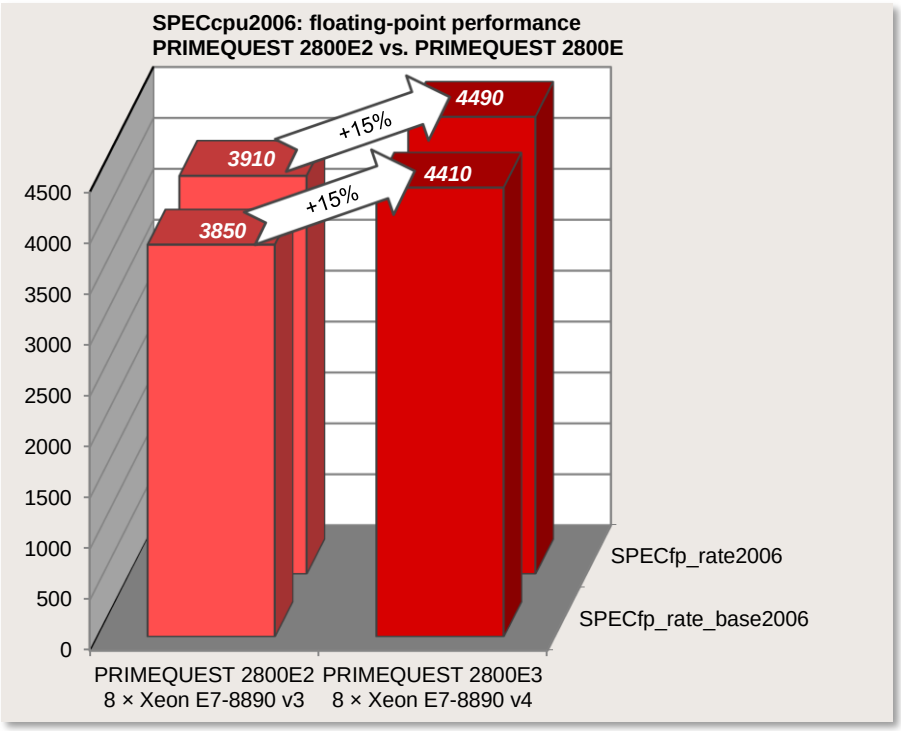
On 6th June 2016 the PRIMEQUEST 2800E3 with two Xeon E7-8890 v3 processors was ranked first in the 2-socket systems category for the benchmark SPECfp_rate_base2006.

On 6th June 2016 the PRIMEQUEST 2800E3 with eight Xeon E7-8890 v3 processors was ranked first in the 8-socket x86 systems category for the benchmark SPECfp_rate_base2006.

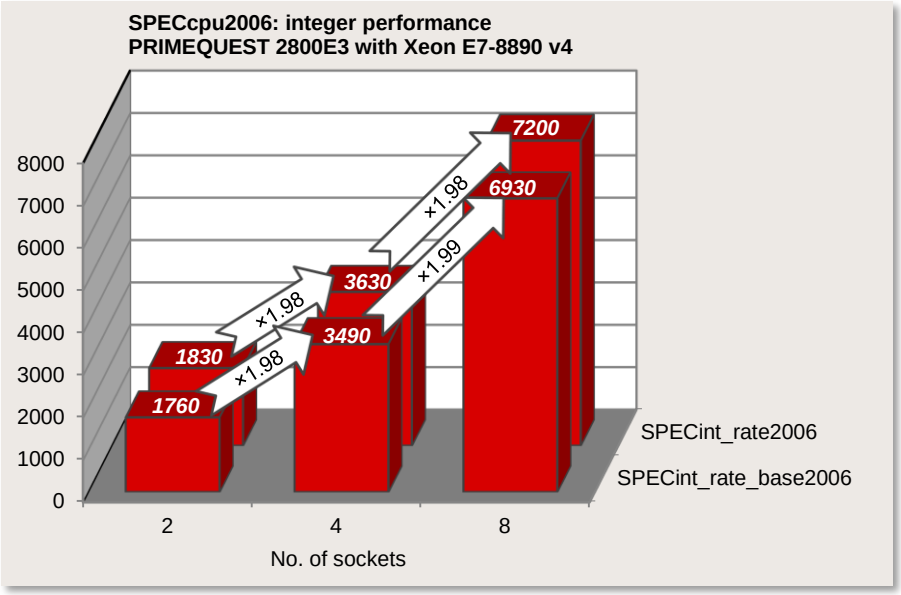
The current results can be found at http://www.spec.org/cpu2006/results.

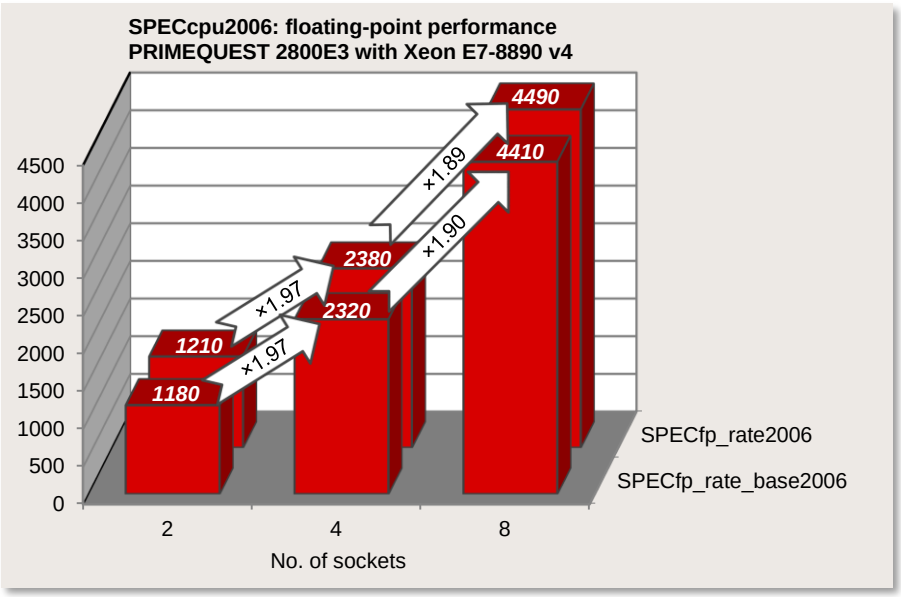
The following two diagrams illustrate the throughput of the PRIMEQUEST 2800E3 in comparison to its predecessor PRIMEQUEST 2800E2, in their respective most performant configuration.





The two diagrams below reflect how the performance of the PRIMEQUEST 2800E3 scales from two to eight processors when using the Xeon E7-8890 v4.





Disk I/O: Performance of RAID controllers

Benchmark description

Performance measurements of disk subsystems for PRIMERGY and PRIMEQUEST servers are used to assess their performance and enable a comparison of the different storage connections for these servers. As standard, these performance measurements are carried out with a defined measurement method, which models the accesses of real application scenarios on the basis of specifications.

The essential specifications are:

- Share of random accesses / sequential accesses
- Share of read / write access types
- Block size (kB)
- Number of parallel accesses (# of outstanding I/Os)

A given value combination of these specifications is known as “load profile”. The following five standard load profiles can be allocated to typical application scenarios:

Standard load profile	Access	Type of access		Block size [kB]	Application
		read	write		
File copy	random	50%	50%	64	Copying of files
File server	random	67%	33%	64	File server
Database	random	67%	33%	8	Database (data transfer) Mail server
Streaming	sequential	100%	0%	64	Database (log file), Data backup; Video streaming (partial)
Restore	sequential	0%	100%	64	Restoring of files

In order to model applications that access in parallel with a different load intensity, the “# of Outstanding I/Os” is increased from 1 to 512 (in steps to the power of two).

The measurements of this document are based on these standard load profiles.

The main results of a measurement are:

- Throughput [MB/s] Throughput in megabytes per second
- Transactions [IO/s] Transaction rate in I/O operations per second
- Latency [ms] Average response time in ms

The data throughput has established itself as the normal measurement variable for sequential load profiles, whereas the measurement variable “transaction rate” is mostly used for random load profiles with their small block sizes. Data throughput and transaction rate are directly proportional to each other and can be transferred to each other according to the formula

Data throughput [MB/s]	*= Transaction rate [IO/s] × Block size [MB]*
Transaction rate [IO/s]	*= Data throughput [MB/s] / Block size [MB]*

This section specifies capacities of storage media on a basis of 10 (1 TB = 10^{12} bytes) while all other capacities, file sizes, block sizes and throughputs are specified on a basis of 2 (1 MB/s = 2^{20} bytes/s).

All the details of the measurement method and the basics of disk I/O performance are described in the white paper “Basics of Disk I/O Performance”.

Benchmark environment

All the measurement results discussed in this chapter were determined using the hardware and software components listed below:

System Under Test (SUT)		
Hardware		
Model	1 × PRIMEQUEST 2800E3	
Number of partitions	1	
Configuration of the partition	System Boards: SB#0 I/O Units: IOU#0 + IOU#1 Disk Units: DU#0	
Hardware per partition		
Processor	2 × Xeon E7-8891 v4 @ 2.80GHz	
Controller	2 × „PRAID EP420i“: Driver name: megasas2.sys, Driver version: 6.706.06 Firmware package: 24.7.0-0061	
Storage media	SSDs	HDDs
	4 × Toshiba PX02SMF040 (SAS 12G)	4 × HGST HUC156045CSS204 (SAS 12G)
Software		
BIOS settings	Intel Virtualization Technology = Disabled VT-d = Disabled Energy Performance = Performance Utilization Profile = Unbalanced CPU C6 Report = Disabled	
Operating system	Microsoft Windows Server 2012 Standard R2	
Operating system settings	Choose or customize a power plan: High performance For the processes that create disk I/Os: set the AFFINITY to the CPU node to which the PCIe slot of the RAID controller is connected	
Administration software	ServerView RAID Manager 6.2.6	
Benchmark version	3.0	
Stripe size	Controller default	
Measuring tool	Iometer 1.1.0	
Measurement area	The first 10% of the usable LBA area is used for sequential accesses; the next 25% for random accesses.	
File system	raw	
Total number of Iometer workers	1	
Alignment of Iometer accesses	Aligned to whole multiples of 4096 bytes	

Some components may not be available in all countries / sales regions.

Benchmark results

The results presented here are designed to help you choose the right solution from the various configuration options of the PRIMEQUEST 2800E3 in the light of disk-I/O performance. Various combinations of RAID controllers and storage media will be analyzed below.

Hard disks

The hard disks are the first essential component. If there is a reference below to “hard disks”, this is meant as the generic term for HDDs (“hard disk drives”, in other words conventional hard disks) and SSDs (“solid state drives”, i.e. non-volatile electronic storage media).

Model versions

The maximum number of hard disks in the system depends on the system configuration. The PRIMEQUEST 2800E3 permits up to four system boards (SB), which can be optionally configured with one RAID controller each for the connection to local hard disks. The system can be extended with up to two disk units (DU). The system boards and disk units are also referred to below with the generic term "subunit".

The following table lists the essential cases. The two configuration versions of the disk unit are abbreviated as follows: "Disk Unit (1C)" is a disk unit with one controller and "Disk Unit (2C)" is a disk unit with two controllers.

Only the highest supported version is named for all the interfaces we have dealt with in this section.

Subunit	Form factor	Interface	Number of PCIe controllers	Maximum number of hard disks
System Board	2.5"	SAS 12G	1	4
Disk Unit (1C)	2.5"	SAS 12G	1	4
Disk Unit (2C)	2.5"	SAS 12G	2	2 × 2

Thanks to the modular architecture of the system it is sufficient to consider the disk-I/O performance for each controller. The possible overall performance of the system is the result of the sum of the performance maximums of all the controllers contained in the system.

RAID controller

In addition to the hard disks the RAID controller is the second performance-determining key component.

The following table summarizes the most important features of the available RAID controllers of the PRIMEQUEST 2800E3. A short alias is specified here for each controller, which is used in the subsequent list of the performance values.

Controller name / mounting position	Alias	Cache	Supported interfaces		Max. # disks in the subunit	RAID levels in the subunit	FBU
PRAID EP420i in System Board	PRAID EP420i (SB)	2 GB	SAS 12G	PCIe 3.0 x8	4 × 2.5"	0, 1, 1E, 5, 6, 10	✓
PRAID EP420i in Disk Unit (1C)	PRAID EP420i (DU-1C)	2 GB	SAS 12G	PCIe 3.0 x8	4 × 2.5"	0, 1, 1E, 5, 6, 10	✓
PRAID EP420i in Disk Unit (2C)	PRAID EP420i (DU-2C)	2 GB	SAS 12G	PCIe 3.0 x8	2 × 2.5"	0, 1	✓

System-specific interfaces

The interfaces of a controller to the system board (also applies for the disk unit / system board interface) and to the hard disks have in each case specific limits for data throughput. These limits are listed in the following table. The minimum of these two values is a definite limit, which cannot be exceeded. This value is highlighted in bold in the following table.

Controller alias	Effective in the configuration					Connection via expander
	# Disk channels	Limit for throughput of disk interface	PCIe-version	PCIe width	Limit for throughput of PCIe interface	
PRAID EP420i (SB)	4 × SAS 12G	4120 MB/s	2.0	x4	**1716 MB/s**	-
PRAID EP420i (DU-1C)	4 × SAS 12G	4120 MB/s	2.0	x4	**1716 MB/s**	-
PRAID EP420i (DU-2C)	2 × SAS 12G	2060 MB/s	2.0	x4	**1716 MB/s**	-

More details about these RAID controllers are available in the white paper “RAID Controller Performance”.

Settings

In most cases, the cache of HDDs has a great influence on disk-I/O performance. It is frequently regarded as a security problem in case of power failure and is thus switched off. On the other hand, it was integrated by hard disk manufacturers for the good reason of increasing the write performance. For performance reasons it is therefore advisable to enable the hard disk cache. To prevent data loss in case of power failure you are recommended to equip the system with a UPS.

In the case of controllers with a cache there are several parameters that can be set. The optimal settings can depend on the RAID level, the application scenario and the type of data medium. In the case of RAID levels 5 and 6 in particular (and the more complex RAID level combinations 50 and 60) it is obligatory to enable the controller cache for application scenarios with write share. If the controller cache is enabled, the data temporarily stored in the cache should be safeguarded against loss in case of power failure. Suitable accessories are available for this purpose (e.g. an FBU).

For the purpose of easy and reliable handling of the settings for RAID controllers and hard disks it is advisable to use the software “ServerView RAID Manager” that is supplied for the server. All the cache settings for controllers and hard disks can usually be made en bloc – specifically for the application – by using the pre-defined modi “Performance”, “Data Protection” or “Fast Path optimum”. The “Performance” mode ensures the best possible performance settings for the majority of the application scenarios with HDDs. In connection with the “FastPath” RAID controller option, the “Fast Path optimum” mode should be selected if maximum transaction rates are to be achieved with SSDs for random accesses with small blocks (≤ 8 kB, e. g. OLTP operation of databases).

More information about the setting options of the controller cache is available in the white paper “RAID Controller Performance”.

Performance values

In general, disk-I/O performance of a logical drive depends on the type and number of hard disks, on the RAID level and on the RAID controller if the limits of the system-specific interfaces are not exceeded. This is why all the performance statements of the document “RAID Controller Performance” also apply for the PRIMEQUEST 2800E3 if the configurations measured there are also supported by this system.

The performance values of the PRIMEQUEST 2800E3 are listed in table form below, specifically for different RAID levels, access types and block sizes. Substantially different configuration versions are dealt with separately. The established measurement variables, as already mentioned in the subsection Benchmark description, are used here. Thus, transaction rate is specified for random accesses and data throughput for sequential accesses. To avoid any confusion among the measurement units the tables have been separated for the two access types.

The table cells contain the maximum achievable values. This has three implications: On the one hand hard disks with optimal performance were used (the components used are described in more detail in the subsection Benchmark environment). Furthermore, cache settings of controllers and hard disks, which are optimal for the respective access scenario and the RAID level, are used as a basis. And ultimately each value is the maximum value for the entire load intensity range (# of outstanding I/Os).

In order to also visualize the numerical values each table cell is highlighted with a horizontal bar, the length of which is proportional to the numerical value in the table cell. All bars shown in the same scale of length have the same color. In other words, a visual comparison only makes sense for table cells with the same colored bars.

Since the horizontal bars in the table cells depict the maximum achievable performance values, they are shown by the color getting lighter as you move from left to right. The light shade of color at the right end of the bar tells you that the value is a maximum value and can only be achieved under optimal prerequisites. The darker the shade becomes as you move to the left, the more frequently it will be possible to achieve the corresponding value in practice.

2.5" - Random accesses (maximum performance values in IO/s):

Base Unit PQ2800E3							
Configuration version			RAID level	HDDs random 8 kB blocks 67% read [IO/s]	HDDs random 64 kB blocks 67% read [IO/s]	SSDs random 8 kB blocks 67% read [IO/s]	SSDs random 64 kB blocks 67% read [IO/s]
RAID Controller	Hard disk type	#Disks					
PRAID EP420i (SB) / (DU-1C)	HUC156045CSS204 SAS HDD PX02SMF040 SAS SSD	2	1	1544	994	68518	10381
		4	10	2453	1614	113567	15165
		4	0	2799	1918	208847	25805
		4	5	2438	1112	73260	10188
PRAID EP420i (DU-2C)	HUC156045CSS204 SAS HDD PX02SMF040 SAS SSD	2	1	1544	994	68518	10381
		2	0	1447	1049	112242	14946

2.5" - Sequential accesses (maximum performance values in MB/s):

Base Unit PQ2800E3							
Configuration version			RAID level	HDDs sequential 64 kB blocks 100% read [MB/s]	HDDs sequential 64 kB blocks 100% write [MB/s]	SSDs sequential 64 kB blocks 100% read [MB/s]	SSDs sequential 64 kB blocks 100% write [MB/s]
RAID Controller	Hard disk type	#Disks					
PRAID EP420i (SB) / (DU-1C)	HUC156045CSS204 SAS HDD PX02SMF040 SAS SSD	2	1	375	232	1467	390
		4	10	606	471	1477	693
		4	0	977	948	1477	1388
		4	5	751	709	1483	1268
PRAID EP420i (DU-2C)	HUC156045CSS204 SAS HDD PX02SMF040 SAS SSD	2	1	375	232	1467	390
		2	0	510	469	1472	778

Conclusion

The use of one controller at its maximum configuration with powerful hard disks enables the PRIMEQUEST 2800E3 to achieve a throughput of up to 1483 MB/s for sequential load profiles and a transaction rate of up to 208847 IO/s for typical, random application scenarios.

In the maximum system configuration with four system boards and two disk units with two controllers each, i.e. a total of eight controllers, a maximum of 24 hard disks could be run. If powerful hard disks are used in this maximum configuration, the system would mathematically achieve a total throughput of up to 11796 MB/s for sequential load profiles and a total transaction rate of up to 1284356 IO/s for typical random application scenarios.

SAP SD

Benchmark description

The SAP application software consists of modules used to manage all standard business processes. These include modules for ERP (Enterprise Resource Planning), such as Assemble-to-Order (ATO), Financial Accounting (FI), Human Resources (HR), Materials Management (MM), Production Planning (PP) plus Sales and Distribution (SD), as well as modules for SCM (Supply Chain Management), Retail, Banking, Utilities, BI (Business Intelligence), CRM (Customer Relation Management) or PLM (Product Lifecycle Management).

The application software is always based on a database so that a SAP configuration consists of the hardware, the software components operating system, zhe database and the SAP software itself.

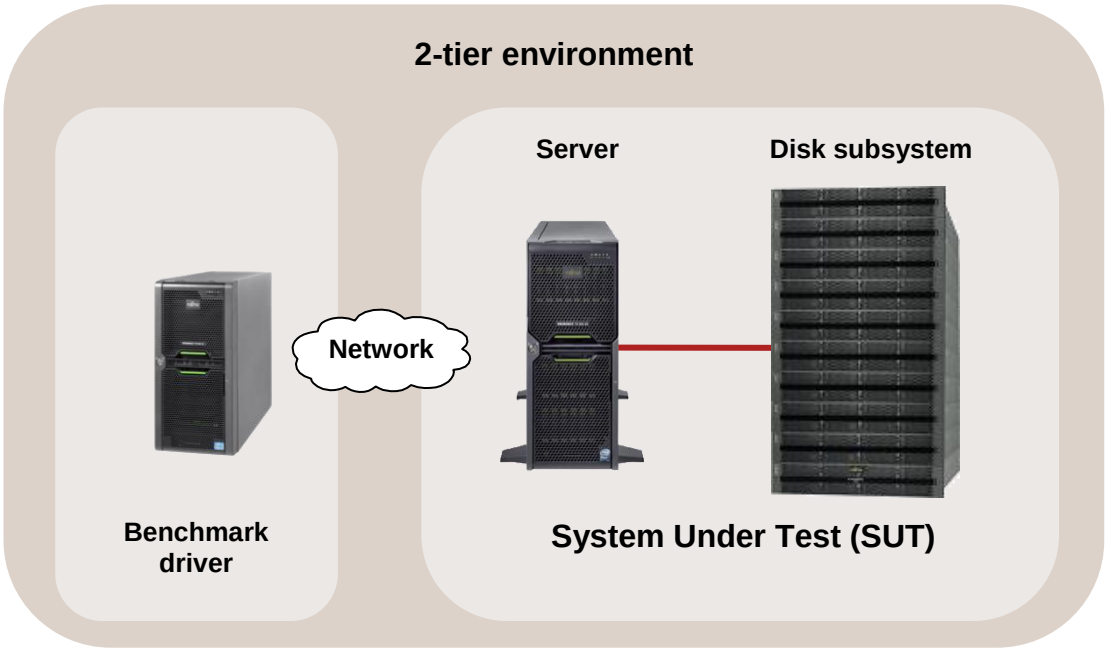
SAP AG has developed SAP Standard Application Benchmarks in order to verify the performance, stability and scaling of a SAP application system. The benchmarks, of which SD Benchmark is the most commonly used and most important, analyze the performance of the entire system and thus measure the quality of the integrated individual components.

The benchmark differentiates between a 2-tier and a 3-tier configuration. The 2-tier configuration has the SAP application and database installed on one server. With a 3-tier configuration the individual components of the SAP application can be distributed via several servers and an additional server handles the database.

The entire specification of the benchmark developed by SAP AG, Walldorf, Germany can be found at: http://www.sap.com/benchmark.

Benchmark environment

The measurement set-up is symbolically illustrated below:



System Under Test (SUT)	
Hardware	
Model	PRIMEQUEST 2800E3
Processor	8 × Xeon E7-8890 v4
Memory	64 × 32GB (2x16GB) 2Rx4 DDR4-2400 R ECC
Network interface	1Gbit/s LAN
Disk subsystem	PRIMEQUEST 2800E3: 4 × HD SAS 6G 300GB 15K HOT PL 2.5” EP 1 × PRAID EP420i 1 × RAID Ctrl SAS 6G 8Port ex 1GB LP LSI V3 2 × Eternus JX40
Software	
BIOS settings	Energy Performance = Performance
Operating system	Microsoft Windows Server 2012 R2 Standard Edition
Database	Microsoft SQL Server 2012 (64-bit)
SAP Business Suite Software	SAP enhancement package 5 for SAP ERP 6.0

Benchmark driver	
Hardware	
Model	PRIMERGY RX300 S4
Processor	2 × Xeon X5460
Memory	32 GB
Network interface	1Gbit/s LAN
Software	
Operating system	SUSE Linux Enterprise Server 11 SP1

Some components may not be available in all countries or sales regions.

Benchmark results

Certification number 2016023	
Number of SAP SD benchmark users	74,000
Average dialog response time	0.98 seconds
Throughput Fully processed order line items/hour Dialog steps/hour SAPS	 8,084,000 24,252,000 404,200
Average database request time (dialog/update)	0.010 sec / 0.019 sec
CPU utilization of central server	99%
Operating system, central server	Windows Server 2012 R2 Standard Edition
RDBMS	SQL Server 2012
SAP Business Suite software	SAP enhancement package 5 for SAP ERP 6.0
Configuration Central Server	Fujitsu PRIMEQUEST 2800E3 8 processors / 192 cores / 384 threads Intel Xeon E7-8890 v4, 2.20 GHz, 64 KB L1 cache and 256KB L2 cache per core, 60 MB L3 cache per processor 2048 GB main memory

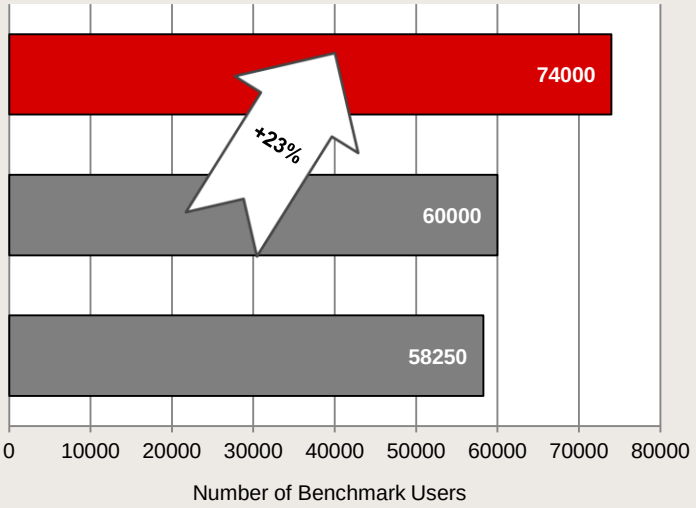
The PRIMEQUEST 2800E3 obtained the best two-tier SAP SD Standard Application Benchmark 8-way result on Windows (as of June 6, 2016). The latest SAP SD 2-tier results can be found at http://www.sap.com/solutions/benchmark/sd2tier.epx.

Two-Tier SAP SD results 8-way on Windows: Fujitsu vs next best server vendors

Fujitsu PRIMEQUEST 2800E3
8 x Xeon E7-8890 v4
8 processors/192 cores/384 threads
Windows Server 2012 R2/ SQL Server 2012
SAP enhancement package 5 for SAP ERP 6.0
Certification number: 2016023

Lenovo System x3950 X6
8 x Xeon E7-8890 v3
8 processors/144 cores/288 threads
Windows Server 2012 / DB2 10
SAP enhancement package 5 for SAP ERP 6.0
Certification number: 2015041

Hitachi Compute Blade 520XB2
8 x Xeon E7-8890 v3
8 processors/144 cores/288 threads
Windows Server 2012 R2 / SQL Server 2012
SAP enhancement package 5 for SAP ERP 6.0
Certification number 2015040

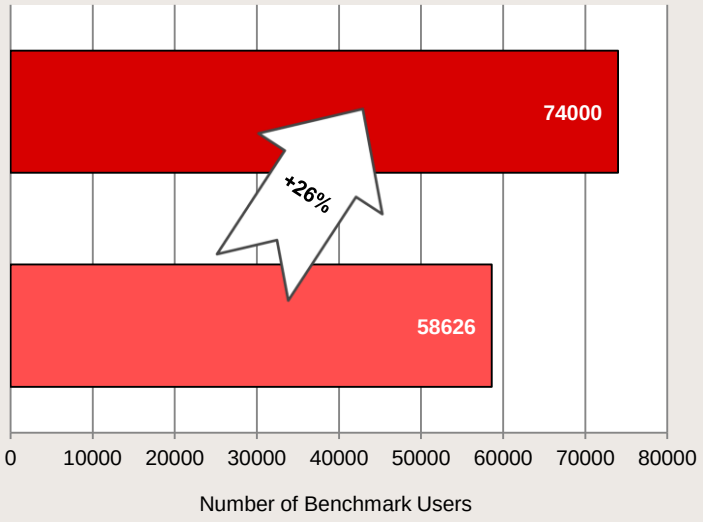


The following diagram illustrates the throughput of the PRIMEQUEST 2800E3 in comparison to its predecessor, the PRIMEQUEST 2800E2, in the respective most performant configuration.

Two-Tier SAP SD results: PRIMEQUEST 2800E3 vs. predecessor

Fujitsu PRIMEQUEST 2800E3
8 x Xeon E7-8890 v4
8 processors/192 cores/384 threads
Windows Server 2012 R2/ SQL Server 2012
SAP enhancement package 5 for SAP ERP 6.0
Certification number: 2016023

Fujitsu PRIMEQUEST 2800E2
8 x Xeon E7-8890 v3
8 processors/144 cores/288 threads
Windows Server 2012 R2/ SQL Server 2012
SAP enhancement package 5 for SAP ERP 6.0
Certification number 2015013



Literature

PRIMEQUEST Servers

http://ts.fujitsu.com/primequest

PRIMEQUEST 2800E3

This White Paper:

http://docs.ts.fujitsu.com/dl.aspx?id=048b2f06-cbf9-4ad7-82e5-01ee7019fff3

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PRIMEQUEST Performance

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

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http://docs.ts.fujitsu.com/dl.aspx?id=7bd26a0c-a46c-4717-be6d-78abebba56b2

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Basics of Disk I/O Performance
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Information about Iometer
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SAP SD

http://www.sap.com/benchmark

Benchmark overview SAP SD
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Contact

FUJITSU

Website: http://www.fujitsu.com/

PRIMEQUEST Product Marketing

mailto:Primergy-PM@ts.fujitsu.com

PRIMERGY Performance and Benchmarks

mailto:primergy.benchmark@ts.fujitsu.com

2016-06-07 WW EN