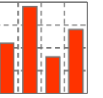


Performance Baseline of Exadata X4-2

Part I: Processor (CPU) Performance

Technical Presentation

June 2014



1 Introduction to CPU Performance Tests

2 CPU and Server Configuration

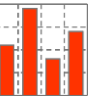
3 CPU Benchmark Results – Basic Arithmetic Operations

4 CPU Benchmark Results – Mixed Operations with SQL built-in functions

5 CPU Benchmark Results – Algorithms

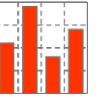
6 Reviewing CPU Benchmark Results

Introduction to CPU Performance



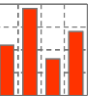
- Why measure CPU performance?
- What is measured?
- How is CPU performance measured?
- Overview Benchware CPU performance test for Oracle
- Monitoring Benchware CPU performance tests

- Look at www.benchware.ch/methodology for detailed information



- 1 Introduction to CPU Performance Tests
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CPU Performance



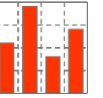
CPU architecture

CPU	X2-2	X3-2	X4-2
CPU Type	X5675	E5-2690	E5-2697 V2
CPU Launch date	Q1 2011	Q1 2012	Q3 2013
Intel Generation	Westmere	Sandy Bridge	Ivy Bridge
Clock rate [GHz]	3.06	2.9	2.7
Max number of sockets	2	2	2
#cores per socket	6	8	12
Multithreading	2-fach	2-fach	2-fach
Performance Numbers from other Benchmarks			
SPECint_base2006 (speed)	40.8	54.3	88.1
Oracle CPU speed in sys.aux_stats\$	2'795	1'751	3'074

Remark:

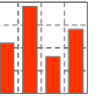
- Oracle has an internal estimation about CPU speed in sys.aux_stats\$, but none estimation about CPU throughput.
- This value does not correlate with SPECint_base2006

CPU Performance



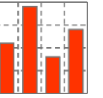
Server configuration

Server	X2-2	X3-2	X4-2
CPU Type	X5675	E5-2690	E5-2697 V2
CPU Launch date	Q1 2011	Q1 2012	Q3 2013
#sockets	2	2	2
#cores	12	16	24
#threads	24	32	48
Memory capacity [GByte]	96	512	512
Performance Numbers from other Benchmarks			
SPECint_base_rate_2006 (throughput)	367	630	806
Software			
Operating System	Oracle Lx	Oracle Lx	Oracle Lx
Oracle Database System	11.2	11.2	11.2
Benchmark Performance Suite	8.6	8.6	8.6

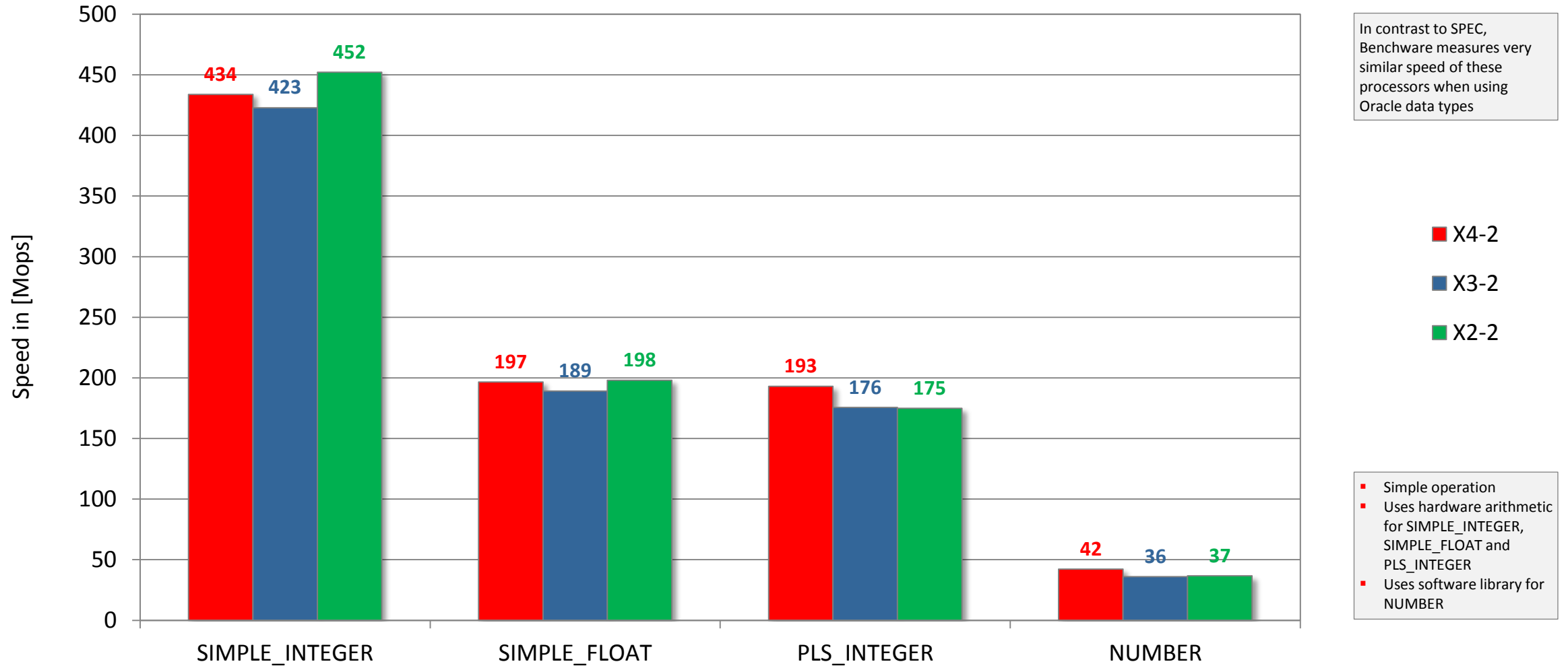


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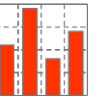
CPU Performance



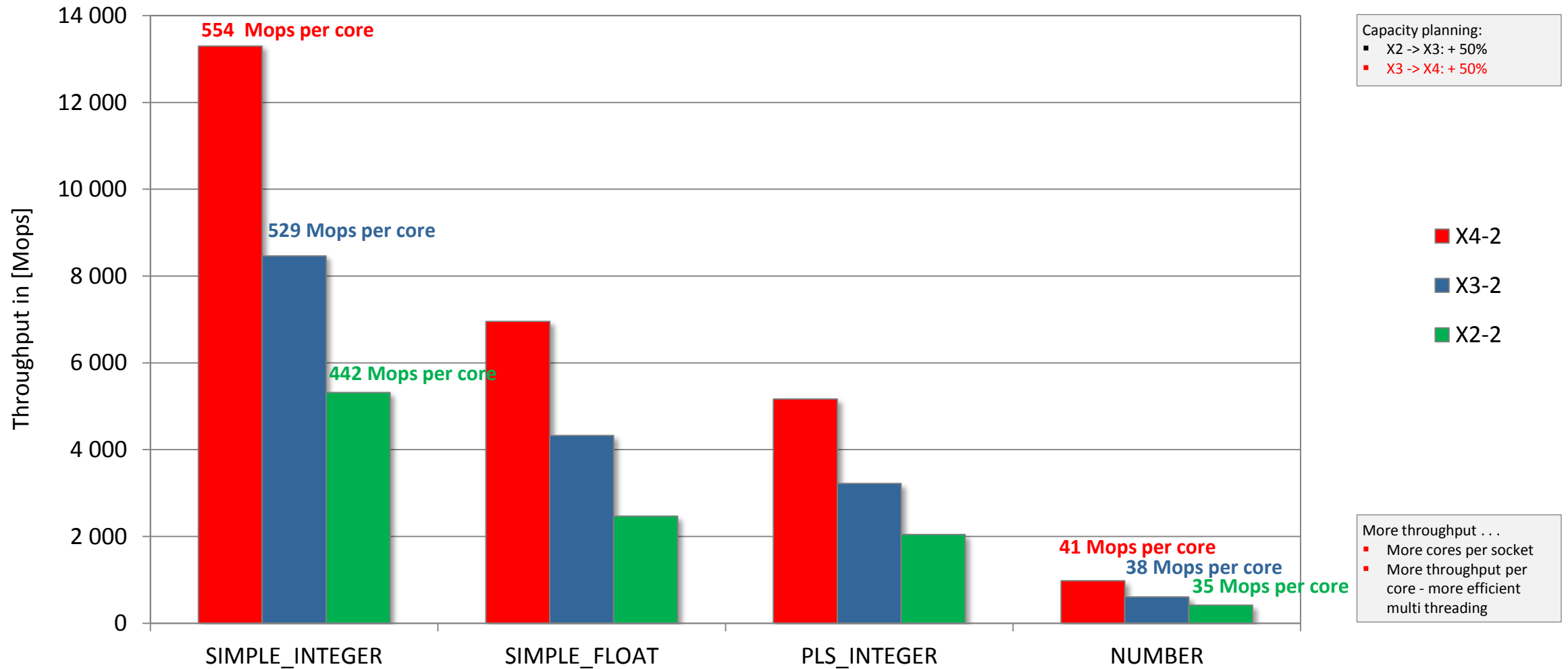
Oracle CPU speed: arithmetic ADD operation, single process



CPU Performance



Oracle CPU throughput: arithmetic ADD operation, system saturation



CPU Performance



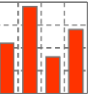
Oracle CPU performance: arithmetic ADD operation, data type SIMPLE_INTEGER

Exadata X4-2 FR

Run	Tst	Code	#N	#J	#T	CPU busy [%]	CPU user [%]	CPU sys [%]	CPU idle [%]	Throughput ops/sec [ops]	Elap time [s]
3	1	CPU-11	1	1	1	1	1	0	99	4.339E+08	302
	2	CPU-11	1	2	1	1	1	0	99	8.678E+08	302
	3	CPU-11	1	4	1	2	1	0	98	1.696E+09	303
	4	CPU-11	1	8	1	3	2	0	97	3.327E+09	302
	5	CPU-11	1	16	1	5	4	0	95	6.727E+09	303
	6	CPU-11	1	32	1	9	9	0	91	1.119E+10	304
	7	CPU-11	1	64	1	13	13	0	87	1.330E+10	306
	8	CPU-11	2	64	1	17	17	0	83	2.247E+10	303
	9	CPU-11	2	128	1	25	25	0	75	2.666E+10	306
	10	CPU-11	4	128	1	34	33	0	66	4.471E+10	304
	11	CPU-11	4	256	1	50	49	0	50	5.309E+10	307
	12	CPU-11	8	256	1	67	66	0	33	8.930E+10	304
	13	CPU-11	8	512	1	98	98	0	2	1.059E+11	307

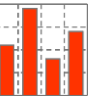
Legend:

Run	benchmark run id	#N	number of RAC nodes	[rps]	rows per second	[iops]	i/o operations per second	[s]	time in seconds
Tst	benchmark test id	#J	number of load generators (jobs)	[tps]	transactions per second	[dbps]	database blocks per second	[ms]	time in milli seconds
Code	benchmark test code	#T	number of threads (PX)	[ops]	operations per second	[MBps]	mega byte per second	[μs]	time in micro seconds



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Summary



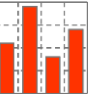
Reviewing CPU Performance

	Metric	X2-2	X3-2	X4-2
#cores		12	16	24
#threads		24	32	48
Basic arithmetic ADD operation	Metric	X2-2	X3-2	X4-2
Single thread speed				
▪ SIMPLE_INTEGER	[Mops]	452	398	434
▪ SIMPLE_FLOAT	[Mops]	198	189	197
▪ PLS_INTEGER	[Mops]	175	174	193
▪ NUMBER	[Mops]	37	36	42
Throughput				
▪ SIMPLE_INTEGER	[Mops]	21'119	67'470	105'900
▪ SIMPLE_FLOAT	[Mops]	9'861	34'960	55'680
▪ PLS_INTEGER	[Mops]	8'203	25'810	41'320
▪ NUMBER	[Mops]	1'679	4'834	7'809

Legend:

[Mops] million operations per second

Summary



Reviewing CPU Performance

- These 3 different Intel processor generations provide
 - Similar speed for numeric operations in Oracle
 - More throughput due to more cores and more efficient multi-threading

BENCHWARE

swiss precision in performance measurement

www.benchmarkware.ch

info@benchmarkware.ch