

# Oracle Performance on VMware

April 2009  
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# Oracle Database Platform



- Real Server
  - IBM blade HS21
  - 2 x Xeon 5130 dual core
  - 2.0 GHz
  - 4 Gbyte RAM
  - Suse Linux 10 EE 64-bit
- Virtual Server
  - ESX 3.5 upgrade 2
- Storage
  - IBM DS 4700
  - 16 spindles, 15k rpm
  - 4 Gbit/sec FC
- Oracle
  - 10.2.0.4 EE 64-bit
- Database configuration
  - 8 Kbyte block size
  - 2 Gbyte SGA
  - 1 Gbyte PGA

# Benchmark Suite OraBench (1)



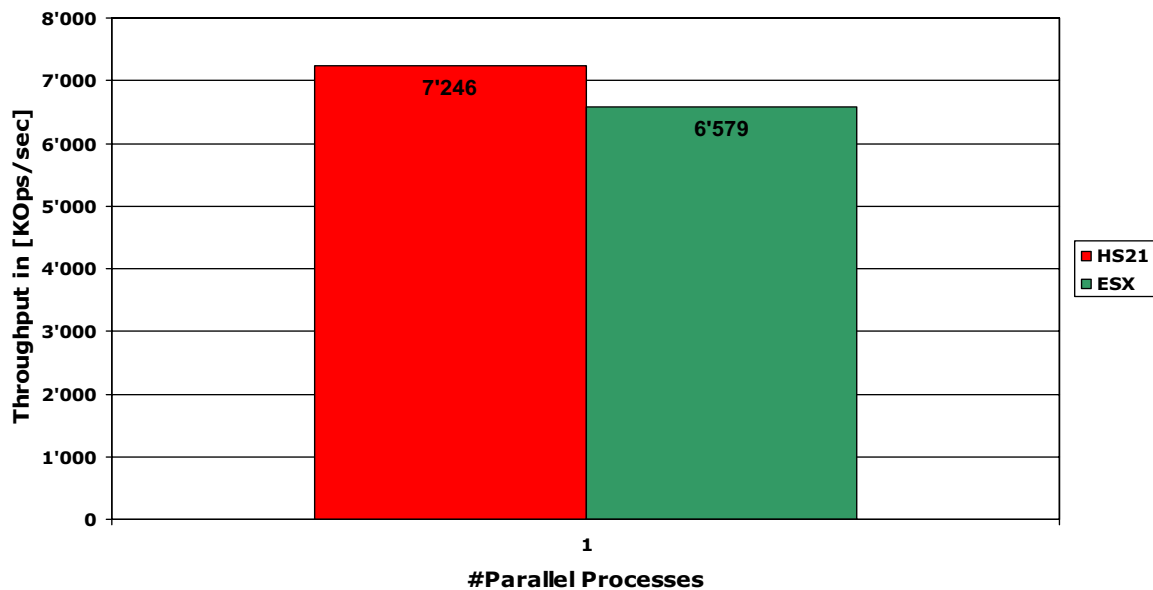
- Release 6.4
- Synthetic Benchmark
  - small database size, 64 Gbyte
  - benchmark table  
28 Gbyte, 128 million rows
- Useful for
  - platform performance certification
  - comparison of
    - o platforms
    - o components
    - o configurations
- Complete set of performance tests
  - all basic database ops - not only TPC-C like tx
  - independent of application profile (OLTP, DWH)
  - parallel degree from 1 up to platform saturation
- measures limitations of all platform resources
  - CPU
  - Memory
  - I/O

# Benchmark Suite OraBench (2)

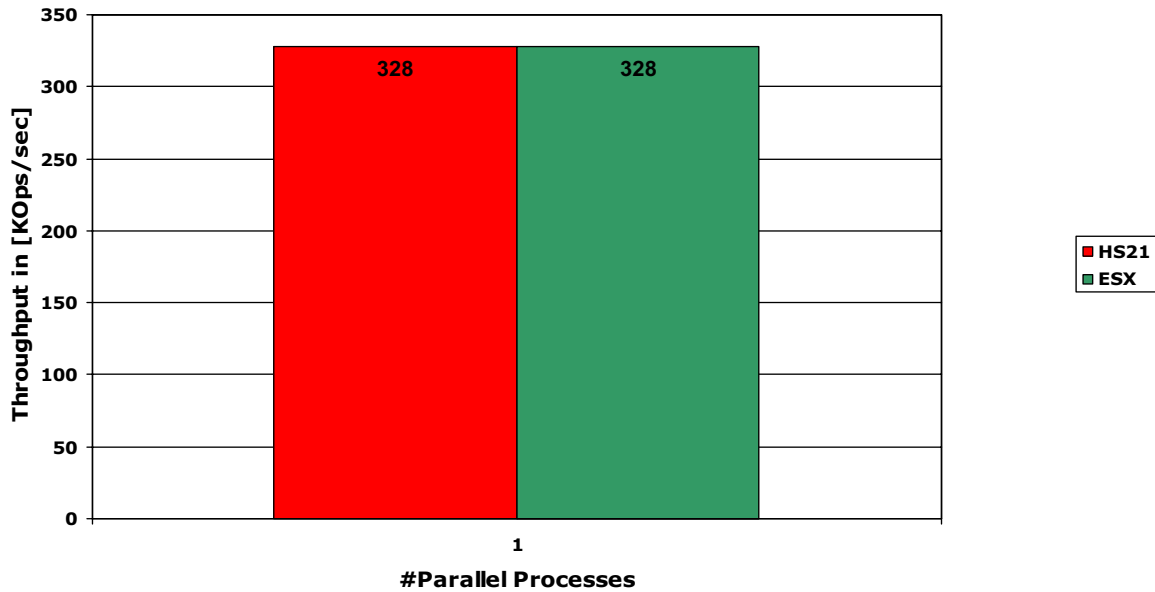


- Performance metrics
  - cpu speed & throughput
  - database throughput
    - o processed rows
    - o processed operations
    - o processed transactions
  - I/O throughput
    - o random I/O (single database blocks)
    - o sequential I/O (multiple database blocks)
  - service time
  - optimal degree of parallelism

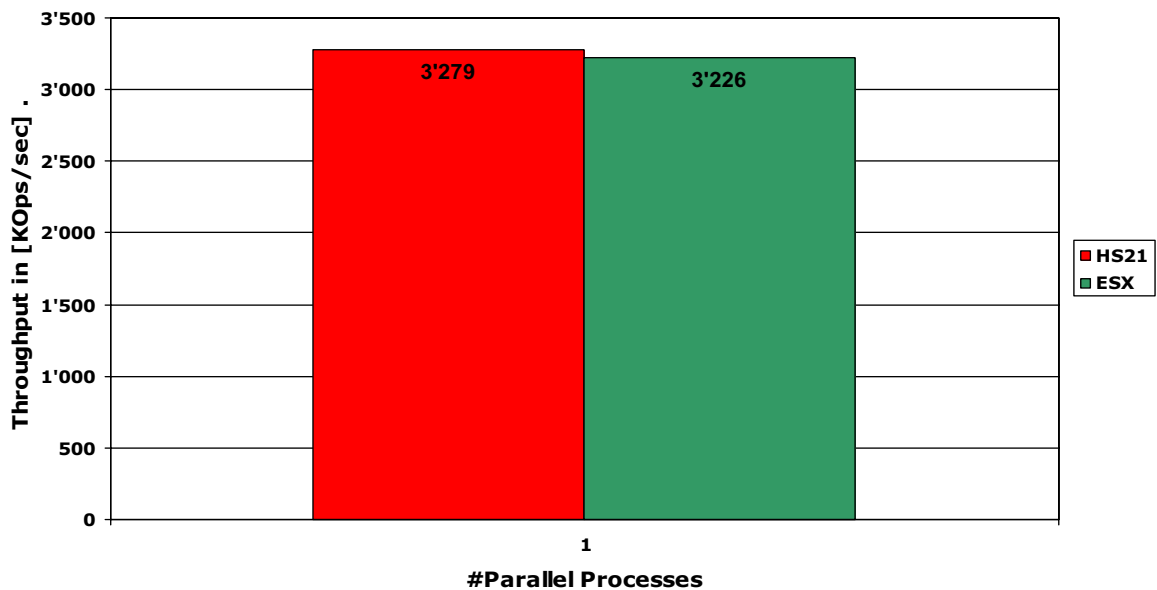
# T111 PL/SQL – Loop



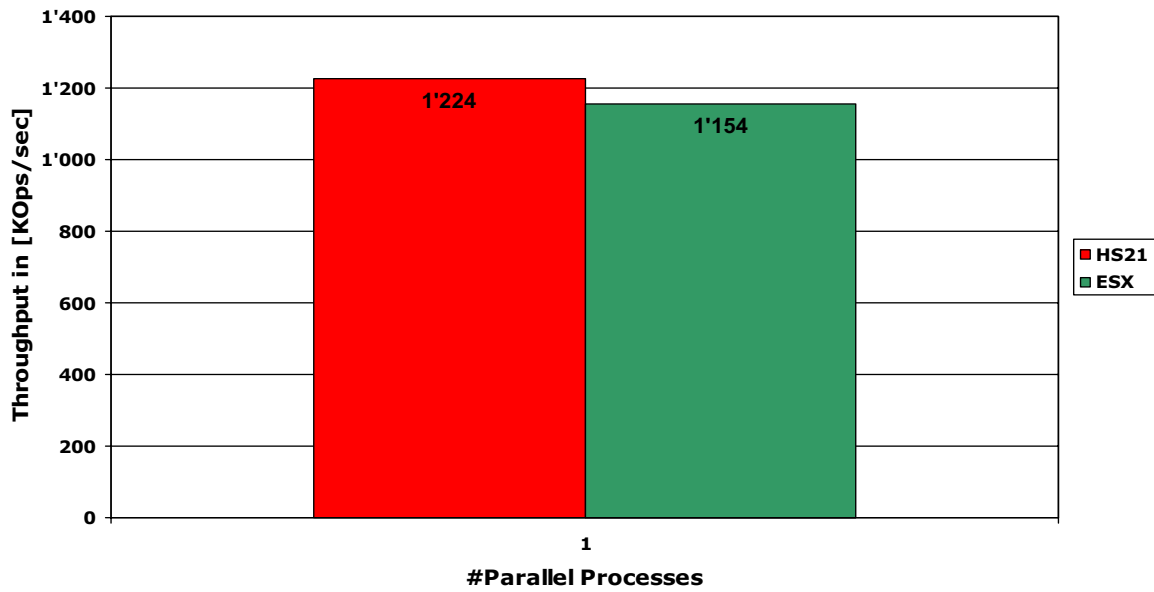
# T132 PL/SQL – Arithmetic Mix Datatype NUMBER



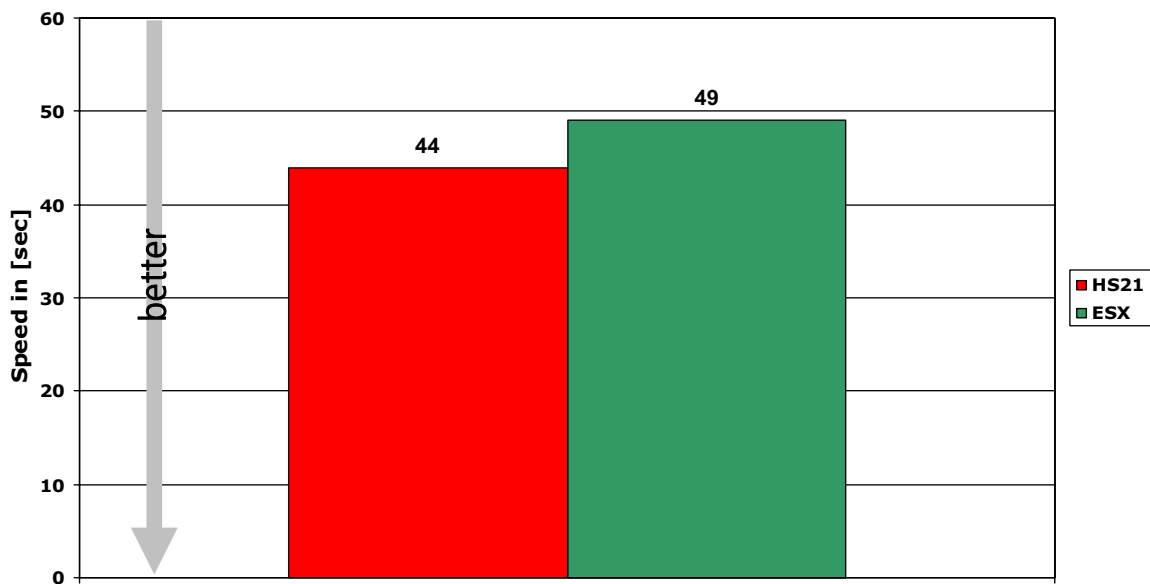
# T133 PL/SQL – Arithmetic Mix Datatype BINARY FLOAT



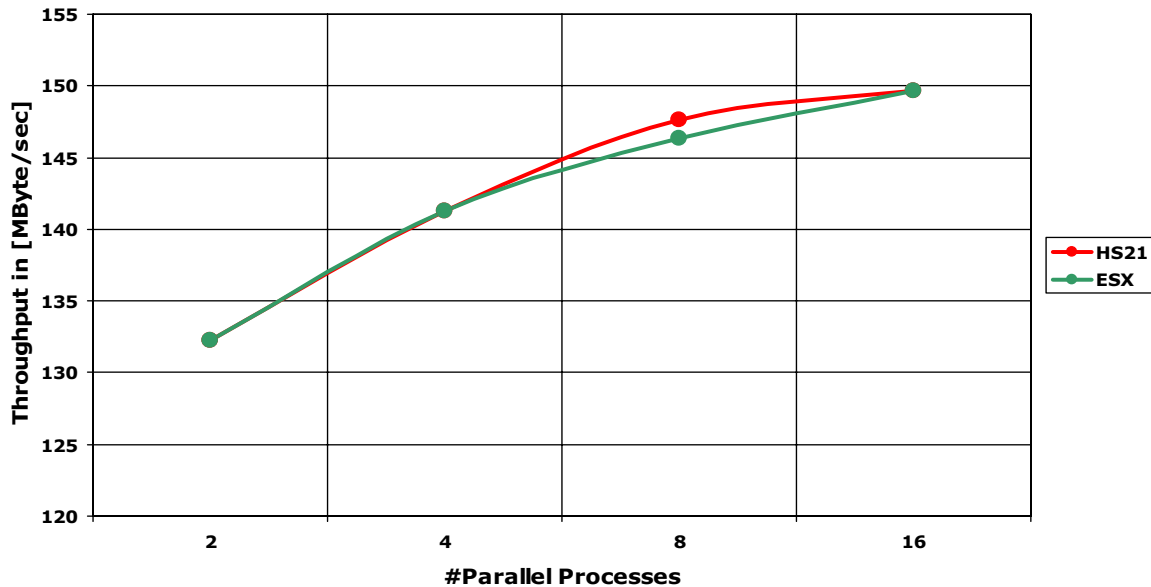
# T141 PL/SQL – String Mix



# T151 PL/SQL – Fibonacci Numbers Recursive Algorithm, n=39



# T211 Data Write (sequential)



# T211 Data Write (sequential)



Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOFS]	Disk Write [IOFS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
9	11	T211	Data Write DBFile Seq	1	2	1	0.000	0.000	21.0	4.8	144.3	0.07	132.26	1	31
12	T211	Data Write DBFile Seq	1	4	1	0.000	0.000	25.9	5.4	148.1	0.08	141.32	1	58	
13	T211	Data Write DBFile Seq	1	8	1	0.000	0.000	28.0	4.9	153.0	0.07	147.66	1	111	
14	T211	Data Write DBFile Seq	1	16	1	0.000	0.000	29.1	5.0	154.1	0.07	149.67	1	219	

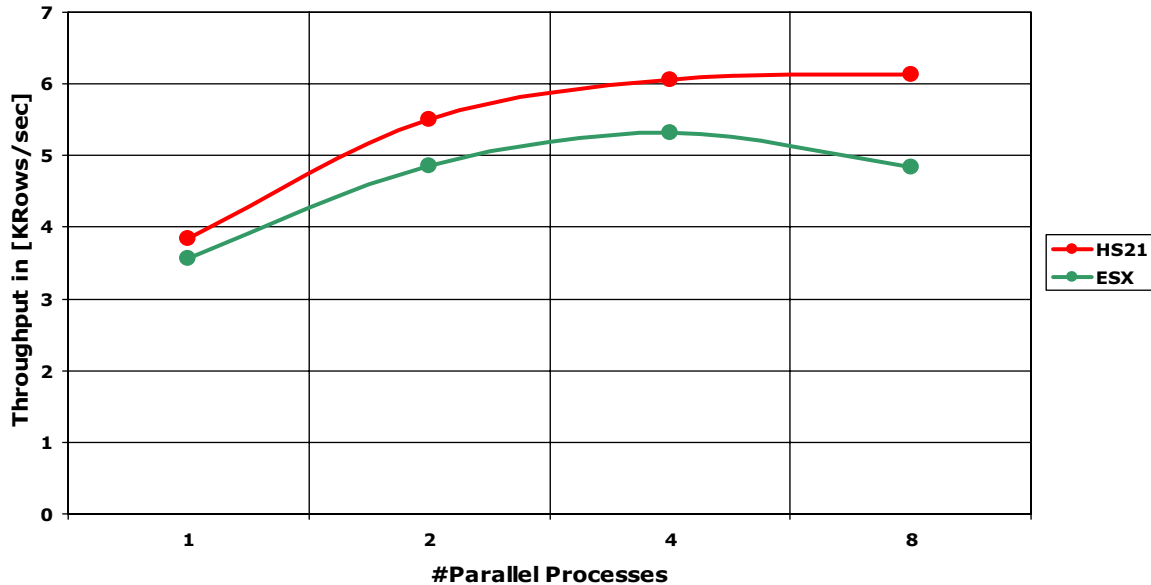
HS21

Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOFS]	Disk Write [IOFS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
2	11	T211	Data Write DBFile Seq	1	2	1	0.000	0.000	25.3	4.4	142.3	0.06	132.25	1	31
12	T211	Data Write DBFile Seq	1	4	1	0.000	0.000	30.5	5.4	148.2	0.08	141.31	1	58	
13	T211	Data Write DBFile Seq	1	8	1	0.000	0.000	31.2	4.7	151.7	0.07	146.34	1	112	
14	T211	Data Write DBFile Seq	1	16	1	0.000	0.000	32.7	4.9	154.5	0.07	149.67	1	219	

ESX

• 1 MByte I/O unit  
 • no performance impact  
 • performance of I/O system disappointing (file system?)

# T311 Data Load (conventional) 250 KRows/process, 2 rows/commit



# T311 Data Load (conventional) 250 KRows/process, 2 rows/commit



Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
9	15	T311	Data Load CNV HEAP_NP	1	1	1	3.906	1.953	25.0	2.8	1268.4	0.03	6.28	3743	64
16	T311	Data Load CNV HEAP_NP	1	1	1	3.846	1.923	24.8	1.6	1184.2	0.02	6.26	3689	65	
17	T311	Data Load CNV HEAP_NP	1	2	1	5.495	2.747	40.4	13.0	943.0	11.25	20.55	5541	91	
18	T311	Data Load CNV HEAP_NP	1	4	1	6.061	3.030	42.9	7.7	831.9	6.21	17.87	6838	165	
19	T311	Data Load CNV HEAP_NP	1	8	1	6.135	3.067	47.0	7.8	719.2	6.29	18.45	7098	326	

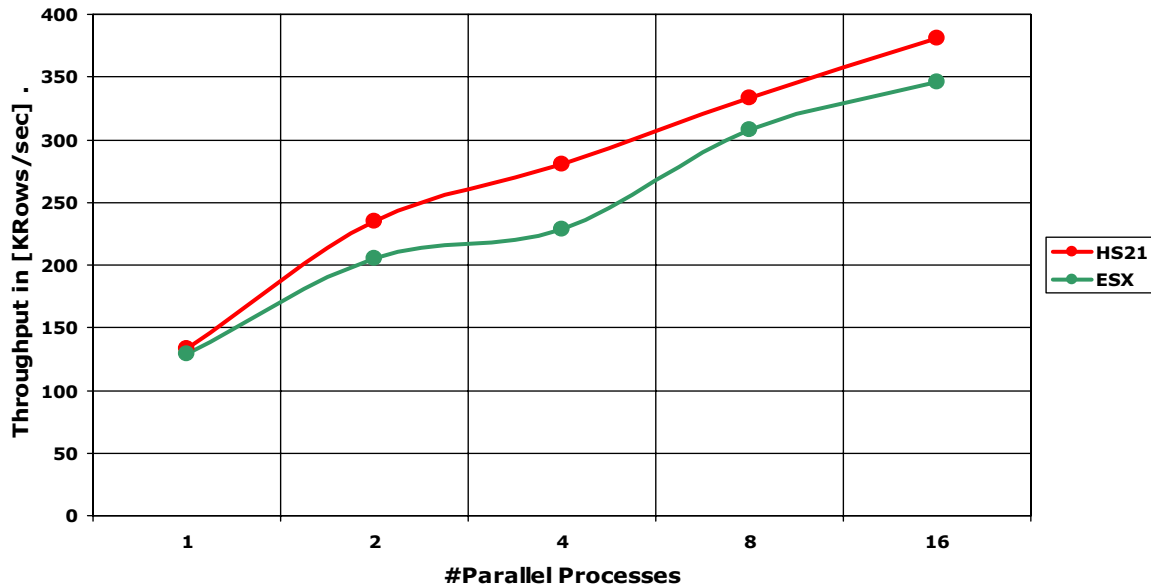
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Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
2	15	T311	Data Load CNV HEAP_NP	1	1	1	3.378	1.689	25.8	2.5	1239.1	0.03	5.47	3243	74
16	T311	Data Load CNV HEAP_NP	1	1	1	3.571	1.786	27.4	1.5	1349.3	0.02	5.88	3436	70	
17	T311	Data Load CNV HEAP_NP	1	2	1	4.854	2.427	37.8	12.0	633.0	9.94	17.88	4794	103	
18	T311	Data Load CNV HEAP_NP	1	4	1	5.319	2.660	48.5	7.1	655.5	5.46	15.41	5878	188	
19	T311	Data Load CNV HEAP_NP	1	8	1	4.843	2.421	50.2	6.2	576.2	4.96	14.68	5598	413	

ESX

• high random I/O rate  
• difference < 30%

# T331 Data Load (direct, uncompressed) 250 KRows/process, 250 KRows/commit



# T331 Data Load (direct, uncompressed) 250 KRows/process, 250 KRows/commit



Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
9	20	T331	Data Load DIR HEAP_RLP	1	1	1	102.564	0.000	14.9	92.8	138.2	11.64	23.29	43	39
21	T331	Data Load DIR HEAP_RLP	1	1	1	133.333	0.000	18.2	117.5	171.7	15.23	30.22	56	30	
22	T331	Data Load DIR HEAP_RLP	1	2	1	235.294	0.000	32.9	118.5	295.6	13.78	53.23	98	34	
23	T331	Data Load DIR HEAP_RLP	1	4	1	280.702	0.000	40.5	81.5	344.5	8.41	63.40	117	57	
24	T331	Data Load DIR HEAP_RLP	1	8	1	333.333	0.000	48.1	46.1	406.4	4.58	75.25	139	96	
25	T331	Data Load DIR HEAP_RLP	1	16	1	380.952	0.000	55.0	39.3	463.6	2.11	85.98	159	168	

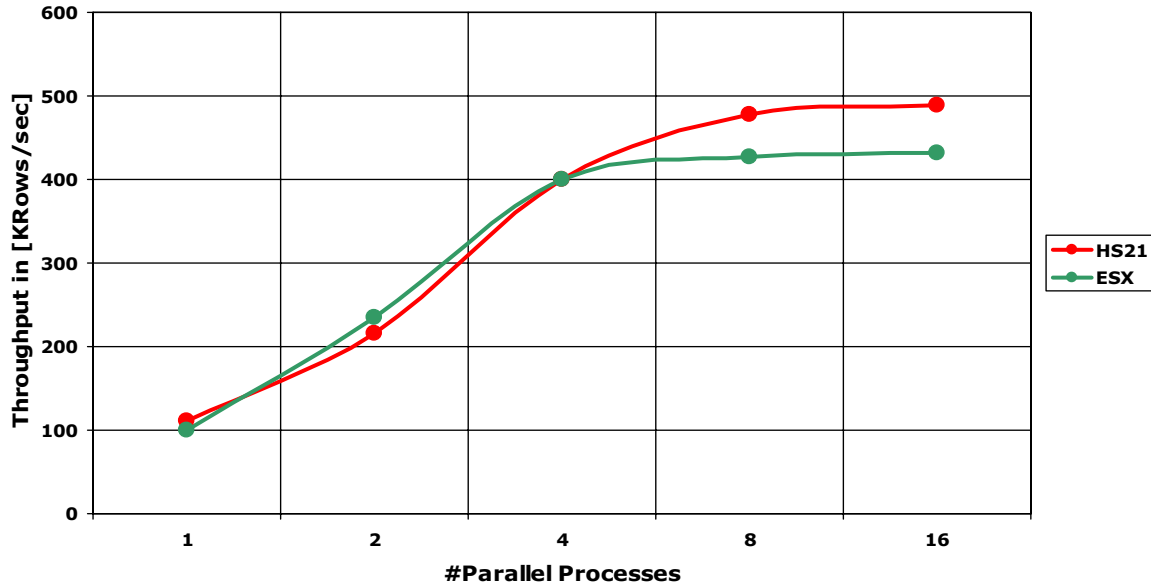
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Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
2	20	T331	Data Load DIR HEAP_RLP	1	1	1	88.889	0.000	14.8	127.1	116.2	8.53	20.16	37	45
21	T331	Data Load DIR HEAP_RLP	1	1	1	129.032	0.000	19.4	191.3	167.6	12.67	29.26	54	31	
22	T331	Data Load DIR HEAP_RLP	1	2	1	205.128	0.000	32.4	166.2	257.1	10.37	46.39	85	39	
23	T331	Data Load DIR HEAP_RLP	1	4	1	228.571	0.000	38.6	100.7	281.0	5.91	51.63	95	70	
24	T331	Data Load DIR HEAP_RLP	1	8	1	307.692	0.000	51.6	51.0	375.4	3.31	69.46	128	104	
25	T331	Data Load DIR HEAP_RLP	1	16	1	345.946	0.000	59.3	41.4	419.8	1.52	78.07	144	185	

ESX

• difference < 25%

# T332 Data Load (direct, compressed) 250 KRows/process, 250 KRows/commit



# T332 Data Load (direct, compressed) 250 KRows/process, 250 KRows/commit



Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
9	26	T332	Data Load DIR CHEP_RLP	1	1	1	88.889	0.000	18.1	94.2	29.6	6.47	3.16	7	45
27	T332	Data Load DIR CHEP_RLP	1	1	1	111.111	0.000	21.2	108.3	34.1	9.85	3.93	8	36	
28	T332	Data Load DIR CHEP_RLP	1	2	1	216.216	0.000	41.8	107.3	53.8	10.69	7.49	16	37	
29	T332	Data Load DIR CHEP_RLP	1	4	1	400.000	0.000	78.7	112.9	91.9	10.82	13.76	29	40	
30	T332	Data Load DIR CHEP_RLP	1	8	1	477.612	0.000	93.8	124.7	102.7	10.71	16.36	34	67	
31	T332	Data Load DIR CHEP_RLP	1	16	1	488.550	0.000	95.3	35.8	103.0	3.60	16.70	35	131	

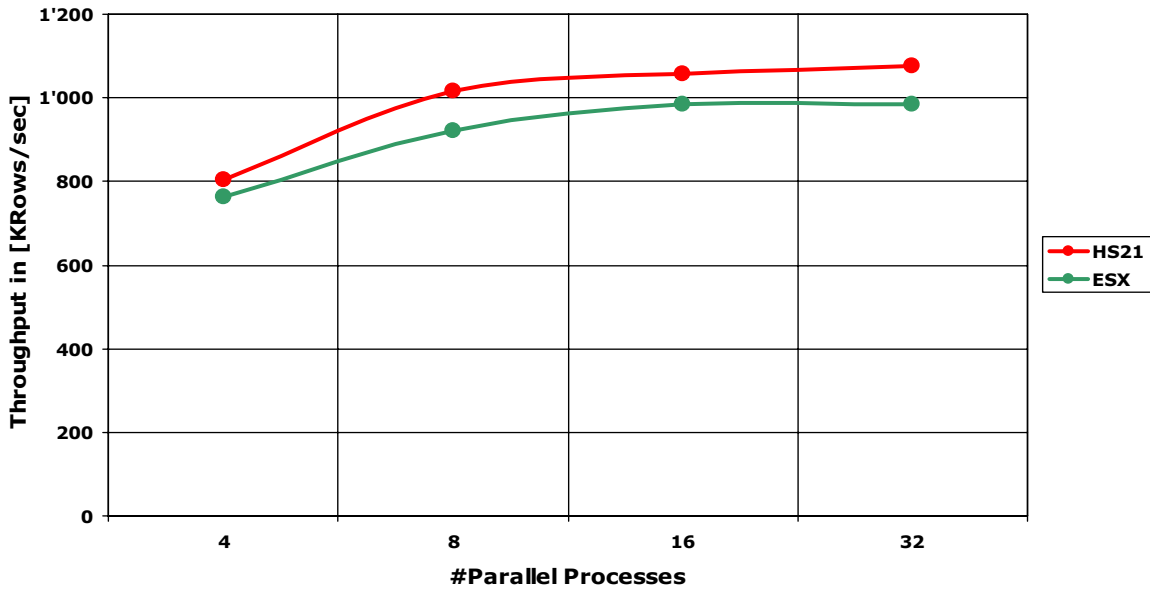
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Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
2	26	T332	Data Load DIR CHEP_RLP	1	1	1	85.106	0.000	19.9	100.6	29.1	5.63	2.98	6	47
27	T332	Data Load DIR CHEP_RLP	1	1	1	100.000	0.000	20.3	135.3	31.3	8.73	3.48	7	40	
28	T332	Data Load DIR CHEP_RLP	1	2	1	235.294	0.000	47.8	161.4	60.0	10.48	8.01	17	34	
29	T332	Data Load DIR CHEP_RLP	1	4	1	400.000	0.000	84.9	155.6	90.8	9.78	13.52	28	40	
30	T332	Data Load DIR CHEP_RLP	1	8	1	426.667	0.000	88.8	88.0	92.0	5.38	14.36	30	75	
31	T332	Data Load DIR CHEP_RLP	1	16	1	432.432	0.000	95.3	137.8	89.7	6.77	14.52	31	148	

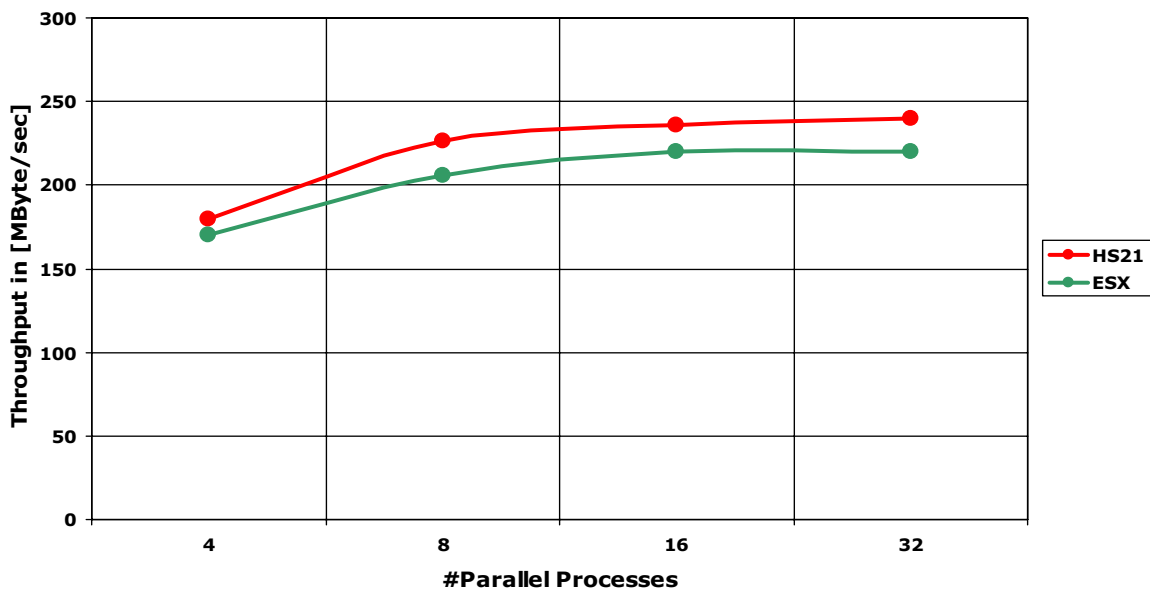
ESX

• difference < 15%  
• operation cpu bound

# T426 Data Scan (sequential) 128 MRows, 32 partitions x 0.85 GByte



# T426 Data Scan (sequential) 128 MRows, 32 partitions x 0.85 GByte



# T426 Data Scan (sequential) 128 MRows, 32 partitions x 0.85 GByte



Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
9	40	T426	Data Scan HEAP_RLP	1	1	1	280.088	0.000	7.3	129.7	1.3	62.58	0.02	0	457
41	T426	Data Scan HEAP_RLP	1	1	2	501.961	0.000	10.3	282.3	2.3	112.06	0.02	0	255	
42	T426	Data Scan HEAP_RLP	1	1	4	805.031	0.000	17.5	452.3	2.9	179.71	0.03	0	159	
43	T426	Data Scan HEAP_RLP	1	1	8	1015.873	0.000	23.6	570.6	3.7	226.77	0.04	0	126	
44	T426	Data Scan HEAP_RLP	1	1	16	1057.851	0.000	25.9	594.5	2.8	236.15	0.03	0	121	
45	T426	Data Scan HEAP_RLP	1	1	32	1075.630	0.000	27.6	604.1	3.6	240.11	0.04	0	119	

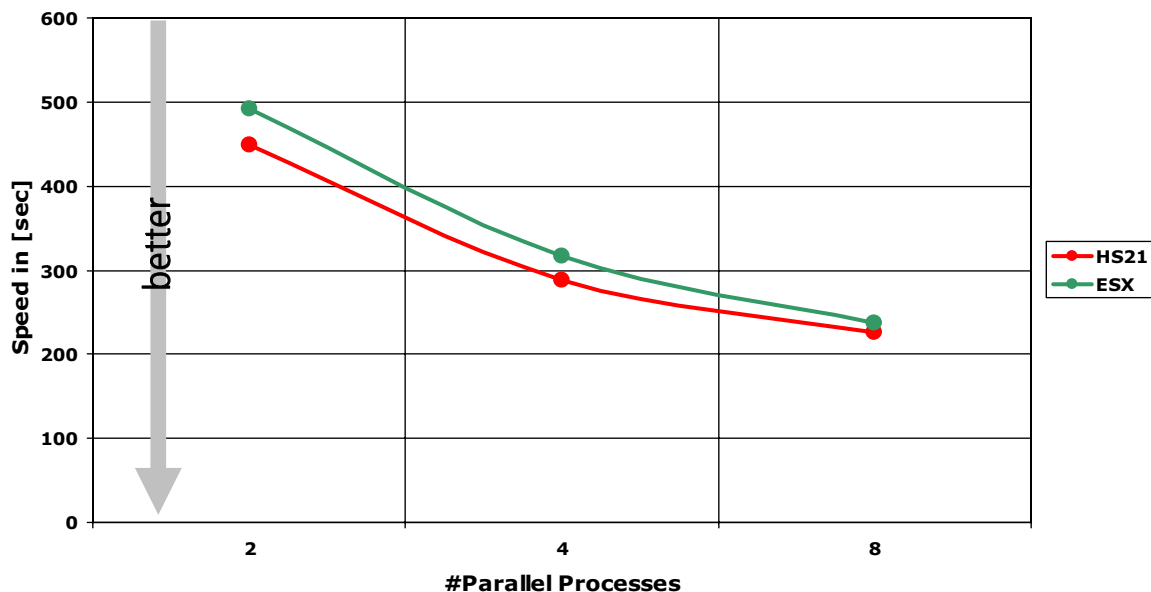
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Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
2	40	T426	Data Scan HEAP_RLP	1	1	1	272.921	0.000	7.7	123.3	1.3	60.93	0.02	0	469
41	T426	Data Scan HEAP_RLP	1	1	2	481.203	0.000	11.1	270.6	2.0	107.42	0.02	0	266	
42	T426	Data Scan HEAP_RLP	1	1	4	761.905	0.000	18.4	428.1	2.2	170.08	0.03	0	168	
43	T426	Data Scan HEAP_RLP	1	1	8	920.863	0.000	23.7	517.3	2.6	205.56	0.03	0	139	
44	T426	Data Scan HEAP_RLP	1	1	16	984.615	0.000	26.1	553.0	2.9	219.79	0.04	0	130	
45	T426	Data Scan HEAP_RLP	1	1	32	984.615	0.000	27.3	553.3	2.8	219.80	0.03	0	130	

ESX

• difference < 10%  
• performance of I/O system disappointing (file system?)

# T511 Data Aggregate – btree idx nolog 128 MRows, 32 partitions x 0.85 GByte



# T511 Data Aggregate – btree idx nolog 128 MRows, 32 partitions x 0.85 GByte



Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]		
9	52	T511	Data Aggr	CreBTree	NoL	1	1	2	0.000	0.000	17.1	1230.3	197.1	72.54	15.91	20	449
	53	T511	Data Aggr	CreBTree	NoL	1	1	4	0.000	0.000	28.6	1917.3	316.6	113.07	24.79	31	288
	54	T511	Data Aggr	CreBTree	NoL	1	1	8	0.000	0.000	36.5	2442.8	404.6	144.10	31.60	40	226

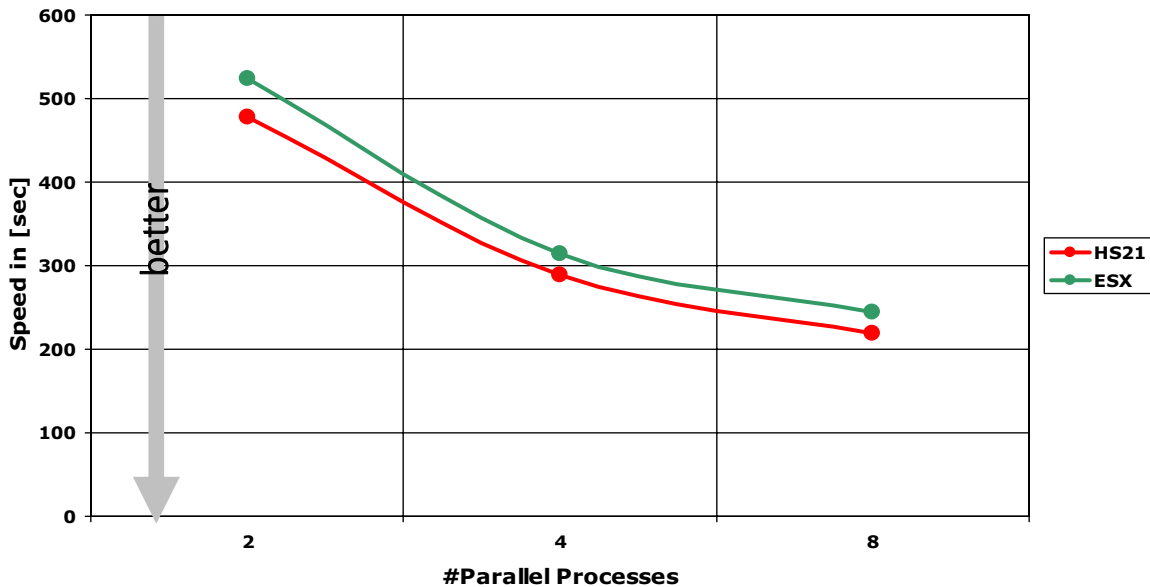
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Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]		
2	52	T511	Data Aggr	CreBTree	NoL	1	1	2	0.000	0.000	16.7	1124.5	177.9	66.32	14.54	18	491
	53	T511	Data Aggr	CreBTree	NoL	1	1	4	0.000	0.000	27.6	1746.8	287.6	103.05	22.59	28	316
	54	T511	Data Aggr	CreBTree	NoL	1	1	8	0.000	0.000	39.0	2328.7	385.1	137.40	30.13	38	237

ESX

• difference < 10%

# T521 Data Aggregate – bitmap idx nolog 128 MRows, 32 partitions x 0.85 GByte



# T521 Data Aggregate – bitmap idx nolog 128 MRows, 32 partitions x 0.85 GByte



Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
9	55	T521	Data Aggr CreBitmap NoL	1	1	2	0.000	0.000	24.7	689.4	83.3	64.61	7.26	9	477
56	T521	Data Aggr CreBitmap NoL	1	1	4	0.000	0.000	44.7	1137.2	146.2	106.63	11.98	15	289	
57	T521	Data Aggr CreBitmap NoL	1	1	8	0.000	0.000	65.3	1681.9	200.5	142.19	17.30	20	219	

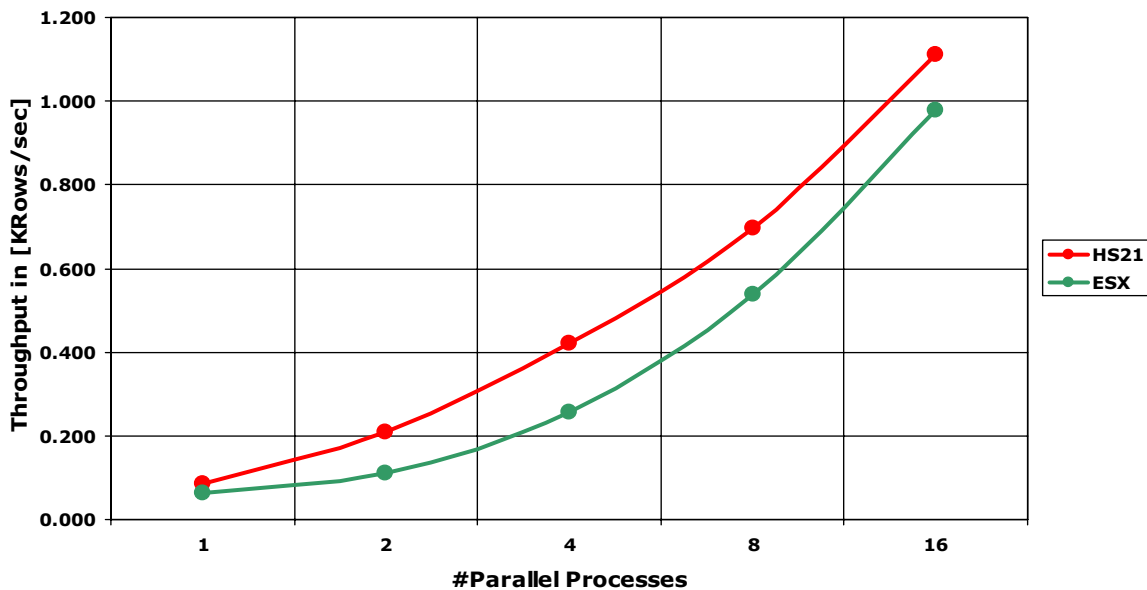
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Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
2	55	T521	Data Aggr CreBitmap NoL	1	1	2	0.000	0.000	24.0	627.3	74.3	58.81	6.61	8	524
56	T521	Data Aggr CreBitmap NoL	1	1	4	0.000	0.000	44.6	1042.8	133.6	97.82	10.99	13	315	
57	T521	Data Aggr CreBitmap NoL	1	1	8	0.000	0.000	68.0	1504.0	176.3	127.12	15.48	17	245	

ESX

• difference < 10%  
• bitmap index need more cpu resources than b-tree

# T616 Data Select (random) pkey 128 MRows, 32 partitions x 0.85 GByte



# T616 Data Select (random) pkey 128 MRows, 32 partitions x 0.85 GByte



Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
9	58	T616	Data Sel PKey HEAP_RLP	1	1	1	0.085	0.003	0.8	184.3	93.4	1.45	0.77	8	48
59	T616	Data Sel PKey HEAP_RLP	1	2	1	0.210	0.007	1.9	415.3	219.1	3.25	1.76	18	39	
60	T616	Data Sel PKey HEAP_RLP	1	4	1	0.420	0.013	3.5	819.8	429.0	6.41	3.42	36	39	
61	T616	Data Sel PKey HEAP_RLP	1	8	1	0.697	0.022	5.8	1312.6	692.9	10.26	5.53	60	47	
62	T616	Data Sel PKey HEAP_RLP	1	16	1	1.111	0.035	9.6	2048.7	1069.3	16.01	8.61	94	59	

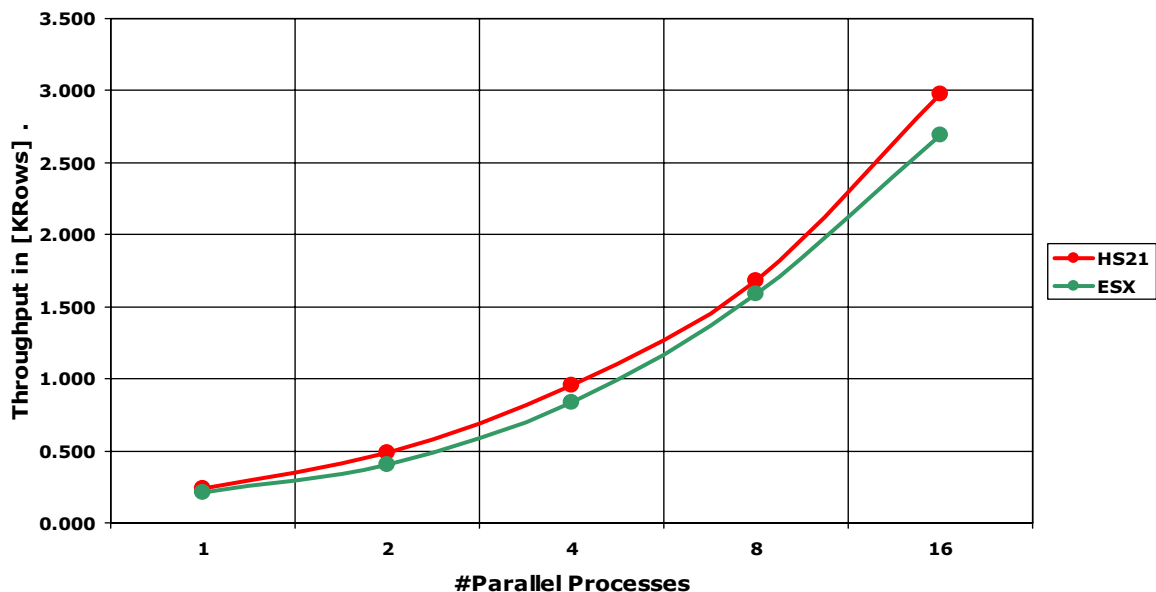
HS21

Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
2	58	T616	Data Sel PKey HEAP_RLP	1	1	1	0.062	0.002	2.1	136.5	68.9	1.07	0.57	7	66
59	T616	Data Sel PKey HEAP_RLP	1	2	1	0.112	0.004	3.3	223.1	118.0	1.75	0.95	10	73	
60	T616	Data Sel PKey HEAP_RLP	1	4	1	0.256	0.008	6.7	499.5	261.4	3.91	2.08	22	64	
61	T616	Data Sel PKey HEAP_RLP	1	8	1	0.537	0.017	12.0	1009.1	535.5	7.89	4.28	46	61	
62	T616	Data Sel PKey HEAP_RLP	1	16	1	0.978	0.031	26.6	1808.9	942.4	14.14	7.57	82	67	

ESX

• difference < 90%  
• ESX needs much more cpu resources

# T626 Data Select (random) skey 128 MRows, 32 partitions x 0.85 GByte



# T626 Data Select (random) skey 128 MRows, 32 partitions x 0.85 GByte



Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
9	63	T626	Data Sel SKey HEAP_RLP	1	1	1	0.235	0.001	0.8	268.3	36.4	2.10	0.31	3	67
	64	T626	Data Sel SKey HEAP_RLP	1	2	1	0.483	0.002	1.5	533.6	66.9	4.17	0.55	5	67
	65	T626	Data Sel SKey HEAP_RLP	1	4	1	0.959	0.004	2.9	1053.8	127.7	8.24	1.03	11	67
	66	T626	Data Sel SKey HEAP_RLP	1	8	1	1.680	0.006	4.9	1833.0	210.5	14.33	1.70	18	79
	67	T626	Data Sel SKey HEAP_RLP	1	16	1	2.976	0.012	9.1	3233.5	372.1	25.27	3.00	33	88

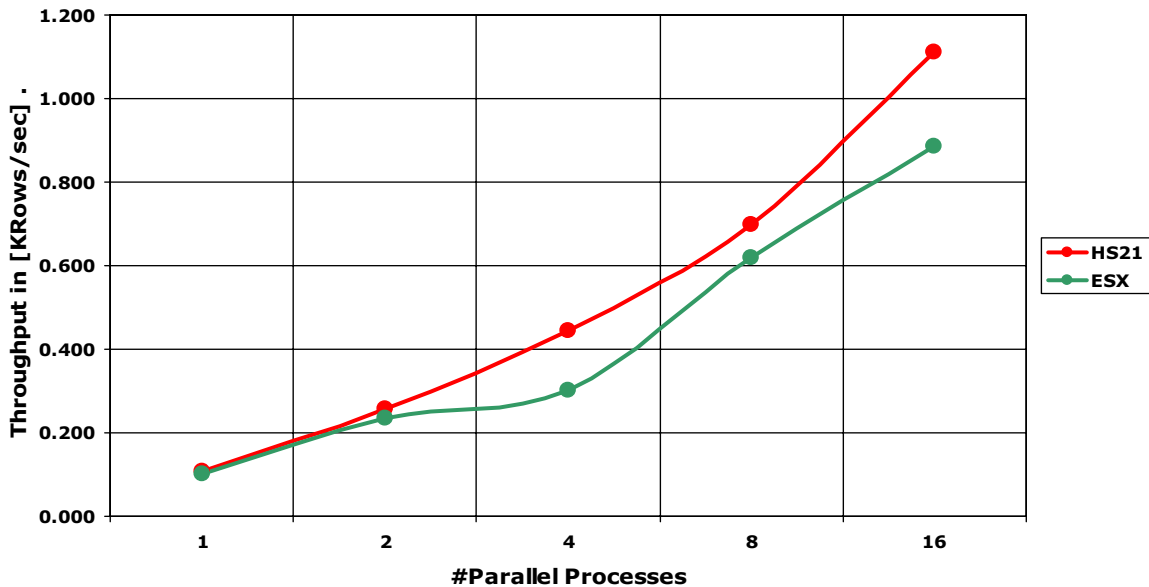
HS21

Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
2	63	T626	Data Sel SKey HEAP_RLP	1	1	1	0.214	0.001	2.7	240.9	30.2	1.89	0.26	2	81
	64	T626	Data Sel SKey HEAP_RLP	1	2	1	0.400	0.002	3.2	444.6	55.9	3.48	0.46	5	80
	65	T626	Data Sel SKey HEAP_RLP	1	4	1	0.834	0.003	5.3	904.7	106.8	7.07	0.87	9	80
	66	T626	Data Sel SKey HEAP_RLP	1	8	1	1.586	0.006	11.6	1729.5	202.9	13.52	1.64	18	82
	67	T626	Data Sel SKey HEAP_RLP	1	16	1	2.695	0.011	24.2	2927.5	337.5	22.88	2.72	30	97

ESX

• difference < 20%  
• ESX needs much more cpu resources  
• avg 225 IOPS per sindle

# T716 Data Update (random) pkey 128 MRows, 32 partitions x 0.85 GByte



# T716 Data Update (random) pkey 128 MRows, 32 partitions x 0.85 GByte



Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
9	68	T716	Data Upd PKey HEAP_RLP	1	1	1	0.108	0.003	1.4	215.5	123.8	1.69	1.03	39	38
	69	T716	Data Upd PKey HEAP_RLP	1	2	1	0.256	0.008	2.2	493.9	276.8	3.87	2.25	92	32
	70	T716	Data Upd PKey HEAP_RLP	1	4	1	0.443	0.014	3.8	843.2	468.6	6.60	3.79	159	37
	71	T716	Data Upd PKey HEAP_RLP	1	8	1	0.697	0.022	6.3	1294.5	727.9	10.13	5.88	250	47
	72	T716	Data Upd PKey HEAP_RLP	1	16	1	1.111	0.035	10.0	2015.6	1139.8	15.75	9.25	400	59

HS21

Run	Tst	Code	Comment	#N	#S	#T	kRows /sec	kOps /sec	CPU Util [%]	Disk Read [IOPS]	Disk Write [IOPS]	Disk Read [MB/sec]	Disk Write [MB/sec]	Redo Size [kb/s]	Time [sec]
2	68	T716	Data Upd PKey HEAP_RLP	1	1	1	0.102	0.003	5.1	200.4	117.6	1.57	0.98	39	40
	69	T716	Data Upd PKey HEAP_RLP	1	2	1	0.234	0.007	4.5	452.5	253.6	3.54	2.07	88	35
	70	T716	Data Upd PKey HEAP_RLP	1	4	1	0.303	0.009	9.4	600.4	342.5	23.36	21.41	111	54
	71	T716	Data Upd PKey HEAP_RLP	1	8	1	0.618	0.019	14.0	1134.5	645.3	8.87	5.21	222	53
	72	T716	Data Upd PKey HEAP_RLP	1	16	1	0.886	0.028	28.0	1614.2	913.6	12.62	7.40	319	74

ESX

• difference < 45%  
• ESX needs much more cpu resources

## Conclusion (1)



### ▪ Oracle Performance on VMware

	Elapsed Time	CPU Resources	
T100 - PL/SQL	+ 15%	-	😊
T200 - data write	No impact	No impact	😊
T310 - data load cv	+ 15%	No impact	😊
T330 - data load dir	+ 25%	No impact	😐
T400 - data scan	+ 10%	No impact	😊
T500 - data aggr	+ 10%	No impact	😊
T600 - data select pkey	+ 30% up to + 90%	x 2.8	😐
T600 - data select skey	+5% up to + 20%	x 2.7	😐
T700 - data update pkey	+5% up to + 45%	x 2.8	😐

## Conclusion (2)



- Oracle in a virtualized VMware environment is useful for consolidating database servers with
  - low to medium cpu utilization
  - low to medium performance requirements
  - non critical service times for transactions

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# About the Author



**Manfred Drozd**  
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Manfred Drozd studied Computer Science at the University of Paderborn (Germany). He observed the relational database technology from the beginning when he started his career in 1980 as a programmer developing a relational database system. A life science company in Basle hired him in 1984 to implement Oracle Version 3.1 at the R&D data center. During that time he also lectured courses in Computer Architecture and Database Systems at the HTL in Berne and Basle. Between 1986 and 1990 he managed several database development teams. From 1990 to 2001 Manfred Drozd was employee of Oracle Corp. Switzerland, lastly founding and heading the consulting practice *Server Technology & Performance Architecture* as a Director. Currently he is working as an independent Consultant designing, implementing and supporting Oracle database platforms.

Since 1995 Manfred Drozd focuses on Oracle performance and architecture. On behalf of customers he periodically runs performance tests in the benchmark centers of the hardware vendors. He also lectures training courses and public seminars about scalable Oracle systems and Oracle performance tuning. He is frequently speaker at SOUG (Swiss Oracle User Group) and DOAG (Deutsche Oracle Anwendergruppe) events. Manfred Drozd and his team have developed OraBench over the last years to identify key performance metrics of Oracle platforms. OraBench helps to understand platform performance based on factual knowledge.

Manfred Drozd is advocator of a holistic *Performance by Design* approach: Oracle Database Towers are build from bottom up with a complete calibration of all technology layers focusing on the performance and availability requirements of applications. He used this approach very successfully for the architecture of large OLTP and Data Warehouse systems in the telecommunication and financial industry.