

# **NAS Parallel Benchmark Results 12-95**

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## **Abstract**

The NAS Parallel Benchmarks have been developed at NASA Ames Research Center to study the performance of parallel supercomputers. The eight benchmark problems are specified in a “pencil and paper” fashion. In other words, the complete details of the problem to be solved are given in a technical document, and except for a few restrictions, benchmarkers are free to select the language constructs and implementation techniques best suited for a particular system. This paper presents performance results of various systems using the NAS Parallel Benchmarks. These results represent the best results that have been reported to us for the specific systems listed.

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Table 1: Standard operation counts for the NPB.

Benchmark Name	Abb.	Class A			Class B		
		Nominal Size	Operation Count (x 10 <sup>9</sup> )	Mflop/s CRAY Y-MP/1	Nominal Size	Operation Count (x10 <sup>9</sup> )	Mflop/s CRAY C90/1
Embarrassingly Parallel	EP	2 <sup>28</sup>	26.68	211	2 <sup>30</sup>	100.9	689
Multigrid	MG	256 <sup>3</sup>	3.905	176	256 <sup>3</sup>	18.81	557
Conjugate Gradient	CG	14x10 <sup>3</sup>	1.508	127	75x10 <sup>3</sup>	54.89	447
3-D FFT PDE	FT	256 <sup>2</sup> x128	5.631	196	512x256 <sup>2</sup>	71.37	645
Integer Sort	IS	2 <sup>23</sup> x2 <sup>19</sup>	0.7812	68	2 <sup>25</sup> x2 <sup>21</sup>	3.150	244
LU Simulated CFD Appl.	LU	64 <sup>3</sup>	64.57	194	102 <sup>3</sup>	319.6	711
SP Simulated CFD Appl.	SP	64 <sup>3</sup>	102.0	216	102 <sup>3</sup>	447.1	648
BT Simulated CFD Appl.	BT	64 <sup>3</sup>	181.3	229	102 <sup>3</sup>	721.5	705

Table 2: Results of the Embarrassingly Parallel (EP) benchmark.

Computer System	Date Received	Number Processor	Class A		Class B	
			Time in seconds	Ratio to CRAY Y-MP/1	Time in seconds	Ratio to CRAY C90/1
BBN TC2000	Dec 91	64	284.0	0.44	NA	NA
Convex Exemplar SPP1000	Mar 95	1	376.8	0.33	NA	NA
		8	48.1	2.62	191.0	0.77
		16	24.3	5.19	96.0	1.53
		32	11.8	10.69	48.0	3.05
		64	6.1	20.68	24.5	5.98
CRAY C90	Feb 95	1	36.62	3.45	146.41	1.0
		2	18.42	6.85	73.66	1.99
		4	9.15	13.79	36.78	3.98
		8	4.61	27.37	18.37	7.97
		16	2.36	53.46	9.35	15.66
CRAY J916	Feb 95	1	169.44	0.74	675.71	0.22
		2	86.70	1.46	340.13	0.43
		4	43.09	2.93	170.15	0.86
		8	21.54	5.86	85.49	1.71
		16	10.78	11.70	43.16	3.39
CRAY T3D	Feb 95	16	22.74	5.55	91.83	1.59
		32	11.37	11.10	45.92	3.19
		64	5.68	22.21	22.95	6.38
		128	2.87	43.96	11.47	12.76
		256	1.44	87.62	5.74	25.51
		512	0.72	175.24	2.87	51.01
		1024	0.55	229.40	2.19	66.85
CRAY T916	July 95	1	18.56	6.80	76.13	1.92
		2	9.54	13.23	38.11	3.84
		4	4.77	26.45	19.12	7.66
		8	2.42	52.14	9.65	15.17
CRAY Y-MP	Aug 92	1	126.17	1.0	NA	NA
		8	15.87	7.95	NA	NA
DEC Alpha Server 8400 5/300	Oct 95	1	155.6	0.81	622.22	0.24
		2	77.97	1.61	311.9	0.47
		4	39.1	3.23	156.69	0.93
		8	19.71	6.40	78.43	1.87

Table 2: Results of the Embarrassingly Parallel (EP) benchmark.

Fujitsu VPP500	Aug 94	1	44.25	2.85	176.64	0.83
		2	22.3411	5.65	88.7866	1.65
		4	11.24	11.23	44.52	3.29
		8	5.67	22.26	22.36	6.5
		16	2.87	43.96	11.26	13.00
		32	1.46	86.42	5.68	25.78
		64	0.75	168.23	2.88	50.84
IBM RS/6000 SP Wide-node1 (67 MHz)	Mar 95	8	19.91	6.34	79.75	1.84
		16	9.95	12.69	39.89	3.67
		32	4.98	25.34	19.9	7.36
		64	2.49	50.67	9.95	14.71
		128	1.25	100.94	4.99	29.34
IBM RS/6000 SP Thin-node2 (67 MHz)	Mar 95	8	20.82	6.06	82.94	1.77
		16	10.42	12.11	41.47	3.53
		32	5.23	24.12	20.75	7.06
		64	2.62	48.16	10.37	14.12
		128	1.31	96.31	5.19	28.21
Intel iPSC/860	May 92	32	102.7	1.23	NA	NA
		64	51.4	2.46	NA	NA
		128	25.7	4.91	NA	NA
Intel Paragon OSF R 1.2	Jan 95	64	15.29	8.25	61.04	2.40
		128	7.67	16.45	30.57	4.79
		256	3.87	32.60	15.37	9.53
		512	2.23	56.58	8.93	16.40
		1024	1.15	109.71	4.45	32.90
Intel Paragon (SunMos turbo)	Jan 95	64	7.80	16.18	31.15	4.70
		128	3.93	32.10	15.60	9.39
		256	2.00	63.09	7.82	18.62
		512	1.12	112.65	3.98	36.79
		1024	.59	213.85	2.05	71.42
Intel Paragon MP OSF R1.3	Jan 95	64	8.02	15.73	31.42	4.66
		128	4.17	30.26	15.88	9.22
		256	2.26	55.83	8.11	18.05
		512	1.28	95.57	4.23	34.61
Intel Paragon MP (SunMos turbo)	Nov 95	64	5.75	21.94	22.70	6.45
		128	2.94	42.92	11.40	12.84
		256	1.54	81.93	5.78	25.34
		512	0.87	145.02	2.98	49.13

Table 2: Results of the Embarrassingly Parallel (EP) benchmark.

Kendall Square KSR1	Oct 93	16	101.9	1.23	NA	NA
		32	51.4	2.45	NA	NA
		64	26.0	4.85	NA	NA
		128	12.8	9.86	NA	NA
Kendall Square KSR2	Feb 94	32	24.8	5.09	NA	NA
	May 94	64	13.0	9.71	46.6	3.14
Kyoto/Matsushita ADENART	Feb 94	256	32.9	3.83	NA	NA
MasPar MP-1	Aug 92	4K	248.0	0.51	NA	NA
		16K	69.3	1.82	NA	NA
MasPar MP-2	Nov 92	16K	22.4	5.63	NA	NA
Meiko CS-1	Aug 92	16	116.8	1.08	NA	NA
Meiko CS-2	Oct 94	16	39.39	3.20	152.81	0.96
		32	20.45	6.16	77.20	1.90
		64	11.00	11.46	39.48	3.71
		96	7.84	16.07	26.84	5.45
		128	6.29	20.06	21.16	6.92
nCUBE-2S	Mar 94	64	83.8	1.51	336.3	0.44
		128	41.93	3.01	168.2	0.87
		256	20.97	6.02	84.1	1.74
		512	10.50	12.02	42.1	3.48
		1024	5.25	24.03	21.0	6.97
NEC SX-3	Oct 94	1	21.27	5.93	NA	NA
NEC SX-4/32	Oct. 95	1	NA	NA	102.21	1.43
		2	NA	NA	51.23	2.86
		4	NA	NA	25.66	5.71
		8	NA	NA	12.85	11.39
		16	NA	NA	6.48	22.59
		32	NA	NA	3.31	44.23
Silicon Graphics Power Challenge XL (75 MHz)	Oct 94	1	242.95	0.52	973.62	0.15
		4	61.44	2.05	245.74	0.60
		8	30.77	4.10	122.98	1.19
		16	15.48	8.15	61.79	2.37
SGI Power Challenge XL (90 MHz)	May 95	1	169.10	0.75	676.78	0.22
		2	87.46	1.44	352.31	0.42
		4	43.87	2.88	176.52	0.83
		8	21.98	5.74	87.80	1.67
		16	11.05	11.42	44.22	3.31

Table 2: Results of the Embarrassingly Parallel (EP) benchmark.

Thinking Machines CM-2	Oct 91	8K	126.6	1.00	NA	NA
		16K	63.9	1.97	NA	NA
		32K	33.7	3.74	NA	NA
		64K	18.8	6.71	NA	NA
Thinking Machines CM-200	Oct 91	8K	76.9	1.64	NA	NA
		16K	39.2	3.22	NA	NA
		32K	20.7	6.10	NA	NA
		64K	10.9	11.58	NA	NA
Thinking Machines CM-5	Nov 92	16	42.4	2.98	NA	NA
		32	21.5	5.87	NA	NA
		64	10.9	11.58	NA	NA
		128	5.4	23.36	NA	NA
		256	2.7	46.73	NA	NA
		512	1.4	90.12	NA	NA
Thinking Machines CM-5E	Sep 95	16	27.2	4.64	108.5	1.35
		32	13.6	9.28	54.3	2.70
Thinking Machines CM-500	Sept 95	64	6.9	18.29	27.1	5.40
		128	3.6	35.04	13.7	10.69
		256	2.0	63.09	7.0	20.92

Table 3: Results of the Multigrid (MG) benchmark.

Computer System	Date Received	Number Processor	Class A		Class B	
			Time in seconds	Ratio to CRAY Y-MP/1	Time in seconds	Ratio to CRAY C90/1
Convex Exemplar SPP1000	Mar 95	1	208.0	0.11	NA	NA
		8	29.9	0.74	150.4	0.22
		16	17.3	1.28	85.1	0.40
		32	11.0	2.02	52.7	0.64
		64	NA	NA	39.6	0.85
CRAY C90	Feb 95	1	7.27	3.06	33.78	1.00
		2	3.71	5.99	17.24	1.96
		4	1.92	11.58	8.89	3.80
		8	1.10	20.20	4.59	7.36
		16	0.71	31.30	3.43	9.85
CRAY EL	Aug 92	1	89.19	0.25	NA	NA
		4	27.94	0.80	NA	NA
		8	22.30	0.95	NA	NA
CRAY J916	Feb 95	1	39.08	0.57	184.88	0.18
		2	20.52	1.09	94.71	0.36
		4	10.75	2.07	48.69	0.69
		8	5.88	3.78	26.60	1.27
		16	3.82	2.06	16.12	2.10
CRAY T3D	Feb 95	16	13.78	1.61	66.58	0.51
		32	6.40	3.47	30.10	1.11
		64	2.61	8.51	12.56	2.69
		128	1.36	16.34	6.57	5.14
		256	0.74	30.03	3.37	10.02
		512	0.39	56.97	1.74	19.41
		1024	0.25	88.88	1.15	29.38
CRAY T916	July 95	1	4.43	5.02	20.30	1.66
		2	2.28	9.75	10.50	3.22
		4	1.27	17.50	5.54	6.10
		8	0.99	22.44	4.06	8.32
CRAY Y-MP	Aug 92	1	22.22	1.00	NA	NA
		8	2.96	7.51	NA	NA

Table 3: Results of the Multigrid (MG) benchmark.

Fujitsu VPP500	Mar 95	4	1.44	15.43	6.81	4.96
		8	0.75	29.63	3.59	9.41
		16	0.42	52.90	2.01	16.81
		32	0.26	85.46	1.26	26.81
IBM SP-1	Mar 94	8	17.50	1.27	82.03	0.41
		16	9.49	2.34	44.57	0.76
		32	5.10	4.36	24.37	1.39
		64	2.89	7.69	13.86	2.44
IBM RS/6000 SP Wide-node1 (67 MHz)	Oct 94	8	6.04	3.68	27.92	1.21
		16	3.17	7.01	14.58	2.32
		32	1.69	13.15	7.72	4.38
		64	0.95	23.39	4.36	7.75
		128	0.53	41.92	2.46	13.73
IBM RS/6000 SP Thin-node2 (67 MHz)	Feb 95	8	7.18	3.09	32.73	1.04
		16	3.74	5.94	17.13	1.97
		32	1.99	11.17	9.14	3.96
		64	1.12	19.84	5.20	6.50
		128	0.63	35.27	2.95	11.45
Intel iPSC/860	Aug 92	128	8.6	2.58	NA	NA
Intel Paragon MP (OSF1.3)	Jan 95	64	6.1	3.64	28.7	1.18
		128	3.53	6.29	15.9	2.12
		256	2.48	8.96	10.4	3.24
Intel Paragon ( SunMos )	Jan 95	64	7.72	2.88	36.9	0.92
		128	4.05	5.49	19.5	1.73
		256	2.35	9.46	11.4	2.96
		512	1.75	12.70	8.51	3.97
Intel Paragon (SunMos Turbo)	Nov 95	64	5.85	3.8	27.9	1.21
		128	3.17	7.01	15.2	2.22
		256	1.87	11.88	9.05	3.73
		512	1.46	15.22	7.01	4.82
Intel Paragon MP SunMos Turbo	Jan 95	64	4.83	4.60	23.3	1.45
		128	2.78	7.99	13.4	2.52
		256	1.67	13.31	8.12	4.16
		512	1.37	16.22	6.72	5.03
Kendall Square KSR1	Feb 94	32	19.7	1.13	NA	NA
		64	10.3	2.16	NA	NA
		128	5.6	3.97	NA	NA

Table 3: Results of the Multigrid (MG) benchmark.

Kendall Square KSR2	Feb 94	32	10.3	2.20	NA	NA
	May 94	64	5.7	3.90	26.1	1.29
MasPar MP-1	Aug 92	16K	12.0	1.86	NA	NA
MasPar MP-2	Nov 92	16K	4.36	5.09	NA	NA
Meiko CS-1	Aug 92	16	42.8	0.52	NA	NA
Meiko CS-2	Oct 94	16	7.60	2.93	35.46	0.95
		64	2.35	9.83	10.76	3.14
		128	1.43	15.54	6.55	5.16
NEC SX-3	Oct 94	1	2.80	7.94	13.16	2.57
NEC SX-4/32	NA	NA	NA	NA	NA	NA
nCUBE-2S	Mar 94	64	37.6	0.59	NA	NA
		128	19.2	1.16	NA	NA
		512	5.3	4.19	NA	NA
		1024	2.8	7.94	NA	NA
SGI Power Challenge 90 MHz	Oct 95	1	37.97	0.59	176.22	0.19
		2	20.03	1.11	93.30	0.36
		4	10.63	2.09	49.45	0.68
		8	6.55	3.39	30.43	1.11
		16	5.71	3.89	26.30	1.28
Thinking Machines CM-2	Dec 91	16K	45.8	0.49	NA	NA
		32K	26.0	0.85	NA	NA
		64K	14.1	1.58	NA	NA
Thinking Machines CM-200	Dec 91	16K	30.2	0.74	NA	NA
		32K	17.2	1.29	NA	NA
Thinking Machines CM-5	Aug 93	32	19.5	1.14	NA	NA
		64	10.9	2.03	NA	NA
		128	6.1	3.64	NA	NA
Thinking Machines CM-5E	Sep 95	16	7.7	2.89	36.1	0.94
		32	3.8	5.85	18.7	1.81
Thinking Machines CM-500	Sep 95	64	2.2	10.1	10.6	3.19
		128	1.41	15.76	6.2	5.49
		256	0.91	24.42	3.9	8.67

Table 4: Results of the Conjugate Gradient (CG) benchmark.

Computer System	Date Received	Number Processor	Class A		Class B	
			Time in seconds	Ratio to CRAY Y-MP/1	Time in seconds	Ratio to CRAY C90/1
BBN TC2000	Dec 91	40	51.4	0.23	NA	NA
Convex Exemplar SPP1000	Mar 95	1	202.9	0.06	NA	NA
		8	22.2	0.54	NA	NA
		16	8.94	1.33	837.0	0.15
		32	4.30	2.77	485.4	0.25
		64	NA	NA	292.1	0.42
CRAY C90	Feb 95	1	3.43	3.48	122.90	1.00
		2	1.79	6.66	63.11	1.95
		4	0.95	12.55	33.25	3.70
		8	0.53	22.49	18.11	6.79
		16	0.34	35.06	10.61	11.58
CRAY EL	Sep 93	1	45.24	0.26	NA	NA
		4	14.29	0.83	NA	NA
		8	10.14	1.18	NA	NA
CRAY J916	July 95	1	15.93	0.75	532.03	0.23
		2	8.42	1.42	293.24	0.42
		4	4.42	2.70	150.92	0.81
		8	2.61	4.57	80.67	1.52
		16	1.68	7.10	42.86	2.87
CRAY T3D	Feb 95	16	14.37	0.83	570.11	0.22
		32	7.44	1.60	291.30	0.42
		64	3.93	3.03	158.81	0.77
		128	2.11	5.65	82.07	1.50
		256	1.21	9.85	47.15	2.61
		512	0.72	16.56	27.34	4.50
		1024	0.58	20.6	16.58	7.41
CRAY T916	July 95	1	1.95	6.11	73.98	1.66
		2	1.10	10.84	37.79	3.25
		4	0.58	20.55	19.65	6.25
		8	0.38	31.37	11.43	10.75
CRAY Y-MP	Aug 92	1	11.92	1.00	NA	NA
		8	2.38	5.01	NA	NA

Table 4: Results of the Conjugate Gradient (CG) benchmark.

Fujitsu VPP500	Aug 94	1	5.68	2.10	NA	NA
		2	3.06	3.90	104.51	1.18
		4	1.72	6.93	55.40	2.22
		8	1.04	11.46	31.80	3.86
		15	NA	NA	20.85	5.89
		16	0.80	14.90	NA	NA
		30	NA	NA	15.21	8.08
IBM SP-1	Feb 94	8	21.37	0.56	NA	NA
		16	12.82	0.93	638.2	0.19
		32	7.98	1.49	362.9	0.34
		64	4.72	2.53	193.4	0.64
IBM RS/6000 SP Wide-node1 (67 MHz)	Mar 94	8	4.91	2.43	156.21	0.79
		16	3.09	3.86	88.4	1.39
		32	2.09	5.70	52.53	2.34
		64	1.6	7.45	33.79	3.64
		128	1.38	8.64	25.44	4.83
IBM RS/6000 SP Thin-node2 (67 MHz)	Mar 95	8	5.60	2.13	234.46	0.52
		16	3.48	3.43	120.23	1.02
		32	2.34	5.09	67.16	1.83
		64	1.72	6.93	38.52	3.19
		128	1.48	8.05	28.50	4.31
Intel iPSC/860	Sep 93	128	7.0	1.70	NA	NA
Intel Paragon (OSF1.2)	Mar 94	64	4.10	2.91	NA	NA
		128	3.30	3.61	132.5	0.93
		256	2.83	4.21	70.0	1.76
		512	NA	NA	47.6	2.58
Intel Paragon (SunMos)	Nov 95	64	3.59	3.32	NA	NA
		128	2.76	4.31	125.4	0.98
		256	2.44	4.89	63.6	1.93
		512	NA	NA	40.5	3.03
Kendall Square KSR1	Feb 94	32	19.0	0.63	NA	NA
		64	13.4	0.89	NA	NA
Kendall Square KSR2	Feb 94	32	9.8	1.22	NA	NA
		64	6.1	1.95	182.0	0.67
MasPar MP-1	Aug 92	4K	64.5	0.18	NA	NA
		16K	14.6	0.82	NA	NA
MasPar MP-2	Nov 92	16K	11.0	1.08	NA	NA
Meiko CS-1	Aug 92	16	67.5	0.18	NA	NA

Table 4: Results of the Conjugate Gradient (CG) benchmark.

Meiko CS-2	Oct 94	16	7.18	1.66	248.30	0.49
		32	5.60	2.13	156.50	0.79
nCUBE-2S	Mar 94	64	29.6	0.40	NA	NA
		128	16.9	0.71	NA	NA
		256	9.6	1.24	NA	NA
		512	6.2	1.92	NA	NA
		1024	4.1	2.91	NA	NA
NEC SX-4/32	NA	NA	NA	NA	NA	NA
Silicon Graphics Power Challenge XL (75 MHz)	Oct. 94	1	39.0	0.31	NA	NA
		2	16.9	0.71	NA	NA
		4	7.2	1.66	NA	NA
		8	4.5	2.65	NA	NA
		16	3.5	3.41	NA	NA
SGI Power Challenge (90 MHz)	May 95	1	35.14	0.34	NA	NA
		2	19.58	0.61	NA	NA
	Oct 95	4	8.79	1.35	NA	NA
		8	4.03	2.96	NA	NA
		16	2.54	4.69	NA	NA
Thinking Machines CM-2	Mar 92	8K	25.6	0.47	NA	NA
		16K	14.1	0.85	NA	NA
		32K	8.8	1.35	NA	NA
Thinking Machines CM-5	Aug 93	32	20.7	0.58	NA	NA
		64	10.6	1.12	NA	NA
		128	6.2	1.92	NA	NA
Thinking Machines CM-5E	Sep 95	16	13.5	0.88	454	0.27
		32	8.0	1.49	251	0.49
Thinking Machines CM-500	Sep 95	64	5.4	2.21	149	0.82
		128	3.9	3.06	91	1.35
		256	3.4	3.51	62	1.98

Table 5: Results of the 3-D FFT PDE (FT) benchmark.

Computer System	Date Received	Number Processor	Class A		Class B	
			Time in seconds	Ratio to CRAY Y-MP/1	Time in seconds	Ratio to CRAY C90/1
Convex Exemplar SPP1000	Mar 95	1	178.6	0.16	NA	NA
		8	25.5	1.13	375.4	0.29
		16	20.5	1.40	NA	NA
		32	13.9	2.07	NA	NA
CRAY C90	Feb 95	1	8.95	3.21	110.60	1.00
		2	4.53	6.35	55.75	1.98
		4	2.29	12.56	27.95	3.96
		8	1.29	22.30	14.12	7.83
		16	0.80	35.96	7.65	14.46
CRAY EL	May 93	1	105.1	0.27	NA	NA
		4	27.9	1.03	NA	NA
		8	18.5	1.56	NA	NA
CRAY J916	July 95	1	42.84	0.67	530.06	0.21
		2	22.08	1.30	267.92	0.41
		4	11.21	2.57	134.92	0.82
		8	5.80	4.97	70.51	1.57
		16	3.41	8.44	38.06	2.91
CRAY T3D	Feb 95	16	11.80	2.44	NA	NA
		32	5.90	4.87	NA	NA
		64	2.99	9.62	40.57	2.73
		128	1.52	18.93	20.68	5.35
		256	0.77	37.36	10.77	10.27
		512	0.51	56.41	6.44	17.17
		1024	0.32	89.91	3.76	29.41
CRAY T916	July 95	1	5.23	5.50	64.81	1.71
		2	2.67	10.78	32.39	3.41
		4	1.40	20.55	16.65	6.64
		8	0.98	29.36	9.48	11.67
CRAY Y-MP	Aug 92	1	28.77	1.0	NA	NA
		8	4.19	6.87	NA	NA

Table 5: Results of the 3-D FFT PDE (FT) benchmark.

Fujitsu VPP500	Sept. 95	1	11.25	2.56	NA	NA
		2	5.67	5.07	NA	NA
		4	2.88	9.99	31.21	3.54
		8	1.44	19.98	15.92	6.95
		16	0.75	38.36	7.94	13.91
		32	0.40	71.93	4.07	27.17
		64	0.24	119.88	2.18	50.73
IBM SP-1	Feb 94	8	43.68	0.66	NA	NA
		16	22.86	1.26	286.5	0.39
		32	12.08	2.38	143.2	0.77
		64	6.46	4.45	74.5	1.49
IBM RS/6000 SP Wide-node1 (67 MHz)	Oct 94	8	13.31	2.16	NA	NA
		16	7.17	4.01	91.8	1.20
		32	3.96	7.27	47.23	2.34
		64	2.19	13.4	26.05	4.25
		128	1.23	23.39	14.52	7.62
IBM RS/6000 SP Thin-node2 (67 MHz)	Mar 95	8	14.78	1.95	NA	NA
		16	8.09	3.56	101.03	1.09
		32	4.31	6.68	51.38	2.15
		64	2.39	12.04	28.02	3.95
		128	1.30	22.13	15.68	7.05
Intel iPSC/860	Dec 91	64	20.9	1.38	NA	NA
	Apr 92	128	9.7	2.97	NA	NA
Intel Paragon OSF R 1.2	Nov 95	16	24.7	1.16	NA	NA
		32	12.99	2.21	NA	NA
		64	6.83	4.21	83.6	1.32
		128	3.85	7.47	42.07	2.63
		256	3.46	8.32	25.93	4.27
Intel Paragon SunMos	Nov 95	16	20.46	1.41	NA	NA
		32	10.54	2.73	NA	NA
		64	5.47	5.26	60.9	1.82
		128	3.13	9.19	32.15	3.44
		256	2.82	10.20	18.66	5.93
		512	NA	NA	16.17	6.84
Intel Paragon MP R1.3	Nov 95	16	17.6	1.63	NA	NA
		32	9.52	3.02	NA	NA
		64	5.16	5.58	60.9	1.82
		128	2.93	9.82	31.0	3.57
		256	2.73	10.54	19.87	5.57

Table 5: Results of the 3-D FFT PDE (FT) benchmark.

Intel Paragon MP SunMos Turbo	Nov 95	64	3.87	7.43	41.8	2.65
		128	2.38	12.09	22.76	4.86
		256	2.20	13.08	14.2	7.79
		512	1.92	14.98	12.4	8.92
Kendall Square KSR1	Feb 94	32	16.2	1.78	NA	NA
		64	9.2	3.13	NA	NA
Kendall Square KSR2	Feb 94	32	9.0	3.20	NA	NA
	May 94	64	6.5	4.43	124.0	0.89
Kyoto/Matsushita ADENART	Feb 94	256	72.7	0.4	NA	NA
MasPar MP-1	Aug 92	16K	18.3	1.57	NA	NA
MasPar MP-2	Nov 92	16K	8.0	3.60	NA	NA
Meiko CS-1	Aug 92	16	170.0	0.17	NA	NA
Meiko CS-2	Oct 94	16	12.67	2.27	NA	NA
		32	7.17	4.01	82.71	1.34
		64	4.53	6.35	48.04	2.30
nCUBE-2S	Mar 94	64	62.8	0.46	NA	NA
		128	32.9	0.87	NA	NA
		256	16.0	1.8	NA	NA
		512	8.4	3.43	NA	NA
		1024	4.1	7.02	NA	NA
NEC SX-3	Oct 94	1	2.79	10.31	37.52	2.95
NEC SX-4/32	Oct. 95	1	NA	NA	56.57	1.96
		2	NA	NA	28.14	3.93
		4	NA	NA	14.79	7.48
		8	NA	NA	8.03	13.77
		16	NA	NA	4.74	23.33
		32	NA	NA	3.14	35.22
Silicon Graphics Power Challenge XL (75 MHz)	Oct 94	1	61.17	0.47	761.67	0.15
		2	35.53	0.81	414.52	0.27
		4	19.98	1.44	223.97	0.49
		8	12.57	2.29	130.15	0.85
		16	11.18	2.57	110.37	1.00

Table 5: Results of the 3-D FFT PDE (FT) benchmark.

SGI Power Challenge (90 MHz)	May 95	1	51.89	0.55	642.3	0.17
		2	27.49	1.05	331.5	0.33
		4	16.64	1.73	181.4	0.61
		8	10.47	2.75	110.6	1.00
		16	9.23	3.11	93.9	1.18
Thinking Machines CM-2	Dec 91	16K	37.0	0.78	NA	NA
		32K	18.2	1.58	NA	NA
		64K	11.4	2.52	NA	NA
Thinking Machines CM-200	Dec 91	8K	45.6	0.63	NA	NA
Thinking Machines CM-5	Aug 93	32	14.9	1.93	NA	NA
		64	7.9	3.64	NA	NA
		128	6.6	4.36	NA	NA
Thinking Machines CM-5E	Sep 95	16	12.8	2.25	160	0.69
		32	6.7	4.29	82.0	1.35
	Feb 94	64	3.9	7.38	46.0	2.40
		128	2.9	9.92	34.0	3.25
Thinking Machines CM-500	Sep 95	64	3.5	8.22	41.9	2.64
		128	1.96	14.67	22.5	4.92
		256	1.33	21.63	13.2	8.38

Table 6: Results of the Integer Sort (IS) benchmark.

Computer System	Date Received	Number Processor	Class A		Class B	
			Time in seconds	Ratio to Cray Y-MP/1	Time in seconds	Ratio to Cray C90/1
Convex Exemplar SPP1000	Mar 95	1	83.2	0.14	NA	NA
		8	10.1	1.13	43.5	0.30
CRAY C90	Feb 95	1	3.33	3.44	12.92	1.0
		2	1.64	6.99	6.50	1.99
		4	0.85	13.48	3.30	3.92
		8	0.46	24.91	1.73	7.47
		16	0.27	42.44	0.98	13.18
CRAY EL	Sep 93	1	43.76	0.26	NA	NA
		4	12.99	0.88	NA	NA
		8	8.45	1.35	NA	NA
CRAY J916	July 95	1	13.75	0.83	54.41	0.24
		2	7.02	1.63	27.96	0.46
		4	3.81	3.00	13.93	0.93
		8	2.21	5.19	7.60	1.70
		16	1.63	7.03	4.91	2.63
CRAY T3D	Feb 95	16	7.07	1.62	NA	NA
		32	3.89	2.95	16.57	0.78
		64	2.09	5.48	8.74	1.48
		128	1.05	10.91	4.56	2.83
		256	0.55	20.84	2.36	5.47
		512	0.31	36.97	1.33	9.71
		1024	0.44	26.05	1.22	10.59
CRAY T916	July 95	1	2.02	5.67	7.44	1.74
		2	1.02	11.24	3.74	3.45
		4	0.52	22.04	1.92	6.73
		8	0.38	30.16	1.41	9.16
CRAY Y-MP	Aug 92	1	11.46	1.00	NA	NA
		8	1.85	6.19	NA	NA

Table 6: Results of the Integer Sort (IS) benchmark.

Fujitsu VPP500	Apr 94	1	2.189	5.24	NA	NA
		2	1.574	7.28	NA	NA
		4	1.098	10.44	3.70	3.49
		8	0.917	12.50	3.03	4.26
IBM SP-1	Feb 94	8	16.81	0.68	NA	NA
		16	8.85	1.29	37.3	0.35
		32	5.04	2.27	20.1	0.64
		64	3.06	3.75	11.2	1.15
IBM RS/6000 SP Wide-node1 (67 MHz)	Mar 95	8	4.93	2.32	19.75	0.65
		16	2.65	4.32	10.60	1.22
		32	1.54	7.44	5.92	2.18
		64	0.89	12.88	3.41	3.79
		128	0.59	19.42	1.98	6.53
IBM RS/6000 SP Thin-node2 (67 MHz)	Feb 95	8	5.16	2.22	20.79	0.62
		16	2.89	3.97	11.46	1.13
		32	1.66	6.90	6.37	2.03
		64	0.91	12.59	3.58	3.61
		128	0.61	18.79	2.05	6.30
Intel iPSC/860	May 92	32	25.7	0.45	NA	NA
		64	17.3	0.66	NA	NA
		128	13.6	0.84	NA	NA
Intel Paragon (OSF1.2)	Mar 94	32	7.81	1.47	NA	NA
		64	4.34	2.64	17.33	0.75
		128	2.41	4.76	9.52	1.36
		256	NA	NA	5.94	2.18
		512	NA	NA	4.69	2.75
Intel Paragon (SunMos)	Mar 94	32	5.48	2.09	NA	NA
		64	3.77	3.04	11.98	1.08
		128	2.29	5.00	7.22	1.79
Kendall Square KSR1	Feb 94	32	10.8	1.06	NA	NA
		64	6.6	1.74	NA	NA
Kendall Square KSR2	Feb 94	32	7.0	1.64	NA	NA
	May 94	64	3.9	2.94	20.3	0.64
Kyoto/Matsushita ADENART	Feb 94	256	46.6	0.25	NA	NA

Table 6: Results of the Integer Sort (IS) benchmark.

MasPar MP-1	Jan 93	16K	11.5	1.00	NA	NA
MasPar MP-2	Jan 93	16K	7.7	1.49	NA	NA
Meiko CS-1	Aug 92	16	62.7	0.18	NA	NA
nCUBE-2S	Mar 94	64	23.2	0.49	NA	NA
		128	12.0	0.96	47.5	0.27
		256	6.1	1.88	NA	NA
		512	3.2	3.58	12.5	1.03
		1024	1.7	6.74	6.5	1.99
SGI Power Challenge (90 MHz)	Oct 95	1	20.0	0.57	NA	NA
		2	11.9	0.96	NA	NA
		4	7.1	1.61	NA	NA
		8	5.0	2.29	NA	NA
Thinking Machines CM-200	Dec 91	64K	5.7	2.01	NA	NA
Thinking Machines CM-5	Aug 93	32	43.1	0.27	NA	NA
		64	24.2	0.47	NA	NA
		128	12.0	0.96		NA
Thinking Machines CM-5E	Sep 95	16	11.9	0.96	NA	NA
	Feb 94	32	6.1	1.88	31.4	0.41
		64	3.1	3.70	16.4	0.79
		128	1.66	6.90	8.4	1.54
Thinking Machines CM-500	Sep 95	64	3.16	3.63	16.1	0.80
		128	1.67	6.86	8.2	1.58
		256	1.16	9.88	4.3	3.0

Table 7: Results of the LU CFD Application (LU)benchmark.

Computer System	Date Received	No. Proc.	Class A		Class B	
			Time in seconds	Ratio to Cray YMP/1	Time in seconds	Ratio to Cray C90/1
BBN TC2000	Dec 91	62	3032.0	0.11	NA	NA
Convex Exemplar SPP1000	Mar 95	1	2668	0.13	NA	NA
		8	331	1.00	1492	0.30
		16	196	1.70	827	0.54
		32	126	2.65	465.9	0.9
CRAY C90	Feb 95	1	119.78	2.78	449.54	1.00
		2	62.29	5.35	231.98	1.94
		4	32.20	10.36	121.26	3.71
		8	17.15	19.45	63.03	7.13
		16	10.17	32.79	37.93	11.85
CRAY EL	Aug 92	1	1449.0	0.23	NA	NA
		4	522.3	0.64	NA	NA
		8	351.6	0.95	NA	NA
CRAY J916	July 95	1	492.83	0.68	1994.05	0.23
		2	254.94	1.31	1024.74	0.44
		4	135.07	2.47	526.29	0.85
		8	72.73	4.51	286.17	1.57
		16	47.59	7.01	170.26	2.64
CRAY T3D	Feb 95	16	205.69	1.62	844.53	0.53
		32	106.89	3.12	451.18	1.00
		64	55.32	6.03	233.45	1.93
		128	28.71	11.62	120.53	3.73
		256	15.94	20.92	65.06	6.9
		512	9.02	36.97	36.39	12.35
		1024	7.09	47.4	20.77	21.64
CRAY T916	July 95	1	82.67	4.03	293.38	1.53
		2	46.91	7.11	149.33	3.01
		4	23.68	14.08	77.95	5.77
		8	15.74	21.19	43.13	10.42
		16	NA	NA	28.26	15.91

CRAY Y-MP	Aug 92	1	333.5	1.00	NA	NA
		8	49.5	6.74	NA	NA
DEC Alpha Server 8400 5/300	Oct 95	1	528.6	0.63	2304.9	0.20
		2	301.77	1.11	1350.0	0.33
		4	158.78	2.10	691.8	0.65
		8	91.72	3.64	376.23	1.19
		12	79.13	4.21	296.19	1.51
Fujitsu VPP500	Oct 95	1	101.960	3.27	414.82	1.08
		2	61.409	5.43	242.23	1.86
		3	NA	NA	175.20	2.57
		4	35.789	9.31	NA	NA
		6	NA	NA	97.851	4.59
		8	21.041	15.85	NA	NA
		16	13.944	23.92	NA	NA
		17	NA	NA	43.644	10.30
		34	NA	NA	28.095	16.00
IBM SP-1	Feb 94	8	291.4	1.14	NA	NA
		16	172.9	1.93	604.8	0.74
		32	101.8	3.28	348.1	1.29
		64	63.2	5.28	207.5	2.17
IBM RS/6000 SP Wide-node1 (67 MHz)	Mar 95	8	112.5	2.96	429.8	1.05
		16	64.6	5.16	234.4	1.92
		32	36.5	9.14	129.7	3.47
		64	22.7	14.69	76.8	5.85
		128	15.2	21.94	47.8	9.4
IBM RS/6000 SP Wide-node2 (77 MHz)	Oct 95	1	501.5	0.67	2066.6	0.22
		8	80.81	4.13	311.53	1.44
		16	48.36	6.90	171.79	2.62
		32	29.41	11.34	98.04	4.59
		64	19.20	17.37	59.45	7.56
IBM RS/6000 SP Thin-node1 (67 MHz)	Mar 95	8	120.8	2.76	477.3	0.94
		16	70.9	4.70	255.4	1.76
		32	40.1	8.32	141.3	3.18
		64	24.5	13.61	82.9	5.42
		128	15.9	20.97	51.2	8.78
Intel iPSC/860	Mar 91	64	690.8	0.48	NA	NA
		128	442.5	0.75	NA	NA

Intel Paragon (OSF1.2)	Jul 94	64	190.0	1.76	675.0	0.67
		128	118.0	2.83	406.0	1.11
		256	75.0	4.45	254.0	1.77
		512	NA	NA	175.0	2.57
Kendall Square KSR1	Feb 94	32	341.0	0.98	NA	NA
		64	199.0	1.68	NA	NA
		128	155.0	2.15	NA	NA
Kendall Square KSR2	Feb 94	32	172.0	1.93	NA	NA
	May 94	64	102.0	3.27	424.0	1.06
MasPar MP-1	Aug 92	4K	1580.0	0.21	NA	NA
MasPar MP-2	Nov 92	4K	463.5	0.72	NA	NA
Meiko CS-1	Aug 92	16	2937.0	0.11	NA	NA
nCUBE-2S	Mar 94	64	1322.0	0.25	NA	NA
		128	712.5	0.47	NA	NA
		256	389.1	0.86	NA	NA
		512	226.1	1.48	NA	NA
		1024	134.1	2.49	NA	NA
NEC SX-4/16	Oct 95	16	NA	NA	35.26	12.75
Silicon Graphics Power Challenge XL (75 MHz)	Oct 94	1	604.0	0.55	2617.9	0.17
		4	231.8	1.44	1010.5	0.44
		8	111.7	2.99	550.2	0.82
		16	65.3	5.11	308.1	1.46
SGI Power Challeng - XL (90 MHz)	Oct 94	1	549.02	0.61	2439.90	0.18
		2	356.73	0.93	1500.30	0.30
		4	188.33	1.77	774.93	0.58
		8	101.00	3.30	419.90	1.07
		16	65.90	5.06	292.02	1.54
Thinking Machines CM-2	Mar 91	8K	1307.0	0.26	NA	NA
		16K	850.0	0.39	NA	NA
		32K	546.0	0.61	NA	NA
Thinking Machines CM-5	Aug 93	32	418.0	0.80	NA	NA
		64	272.0	1.23	NA	NA
		128	171.0	1.95	NA	NA

Thinking Machines CM-5E	Sep 95	16	256	1.30	957	0.47
		32	143	2.33	533	0.84
	Feb 94	64	97.0	3.44	367.0	1.22
		128	65.0	5.13	318.0	1.41
Thinking Machines CM-500	Sep 95	64	90	3.71	336	1.34
		128	61	5.47	247	1.82
		256	43	7.76	149	3.02

Table 8: Results of the SP simulated CFD application (SP) benchmark.

Computer System	Date Received	Number Processor	Class A		Class B	
			Time in seconds	Ratio to Cray YMP/1	Time in seconds	Ratio to Cray C90/1
BBN TC2000	Dec 91	112	880.0	0.54	NA	NA
Convex Exemplar SPP1000	Mar 95	1	2533	0.19	NA	NA
		8	345	1.37	1584	0.44
		16	228	2.07	1068	0.65
		32	144	3.27	697.4	0.99
		64	102	4.62	449.5	1.5
CRAY C90	Feb 95	1	174.50	2.70	689.60	1.00
		2	87.32	5.40	345.57	2.00
		4	44.75	10.54	175.85	3.92
		8	22.74	20.73	90.80	7.59
		16	12.82	36.78	52.22	13.21
CRAY EL	Aug 92	1	2025.7	0.23	NA	NA
		4	601.9	0.78	NA	NA
		8	488.4	0.97	NA	NA
CRAY J916	July 95	1	870.47	0.54	3728.69	0.18
		2	436.91	1.08	1927.50	0.36
		4	226.66	2.08	941.08	0.73
		8	118.30	3.99	521.73	1.32
		16	77.54	6.08	316.58	2.18

Table 8: Results of the SP simulated CFD application (SP) benchmark.

CRAY T3D	Feb 95	16	202.11	2.33	818.07	0.84
		32	104.10	4.53	463.62	1.49
		64	53.26	8.85	233.52	2.95
		128	27.54	17.12	130.45	5.29
		256	14.71	32.05	74.89	9.21
		512	8.91	52.92	42.63	16.18
		1024	5.41	87.15	25.23	27.33
CRAY T916	July95	1	112.37	4.20	427.56	1.61
		2	56.46	8.35	214.63	3.21
		4	30.42	15.50	113.02	6.10
		8	18.69	25.23	60.61	11.38
		16	NA	NA	40.59	16.99
CRAY Y-MP	Aug 92	1	471.5	1.01	NA	NA
		8	64.6	7.30	NA	NA
DEC Alpha Server 8400 5/300	Mar 95	1	749.61	0.63	3448.10	0.20
		4	199.17	2.37	904.45	0.76
		8	118.04	3.99	452.13	1.53
		12	102.75	4.59	364.54	1.89
Fujitsu VPP500	Mar 95	1	99.309	4.75	404.08	1.71
		2	61.588	7.66	241.23	2.86
		4	32.114	14.68	127.48	5.41
		6	NA	NA	83.710	8.24
		8	16.399	28.75	64.930	10.62
		16	8.5761	54.98	NA	NA
		17	NA	NA	30.474	22.63
		32	4.5355	103.96	NA	NA
		34	NA	NA	15.674	44.0
		51	NA	NA	10.654	64.73
		64	2.5483	185.0	NA	NA
IBM SP-1	Feb 94	8	441.6	1.07	NA	NA
		16	268.7	1.75	941.2	0.73
		32	165.0	2.86	522.4	1.32
		64	100.4	4.69	302.3	2.28
IBM RS/6000 SP Wide-node1 (67 MHz)	Mar 95	8	143.8	3.28	589.3	1.17
		16	83.2	5.67	300.6	2.29
		32	48.7	9.68	163.8	4.21
		64	30.1	15.66	91.7	7.52
		128	18.7	25.21	54.8	12.58

Table 8: Results of the SP simulated CFD application (SP) benchmark.

IBM RS/6000 SP Wide-node2 (77 MHz)	Oct 95	1	711.8	0.66	3087.0	0.22
		8	114.15	4.13	453.66	1.52
		16	69.32	6.80	248.51	2.77
		32	43.20	10.91	142.88	4.83
		64	26.46	17.82	80.17	8.60
IBM RS/6000 SP Thin-node2 (67 MHz)	Mar 95	8	161.1	2.93	640.9	1.08
		16	93.3	5.05	342.3	2.01
		32	53.6	8.80	184.4	3.74
		64	32.7	14.42	101.6	6.79
		128	20.6	22.89	59.9	11.51
Intel iPSC/860	Jul 94	64	640.0	0.74	NA	NA
	Aug 92	128	449.5	1.05	NA	NA
Intel Paragon (OSF1.2)	Jul 94	64	226.0	2.09	960.0	0.72
		102	NA	NA	610.0	1.13
		128	143.0	3.30	NA	NA
		204	NA	NA	387.0	1.78
		256	97.0	4.86	301.0	2.29
		324	89.0	5.30	262.0	2.63
		400	NA	NA	246.0	2.80
		484	NA	NA	209.0	3.30
Kendall Square KSR1	Feb 94	32	418.0	1.13	NA	NA
		64	257.0	1.83	NA	NA
		128	160.0	2.95	NA	NA
Kendall Square KSR2	Feb 94	32	221.0	2.13	NA	NA
	May 94	64	131.0	3.59	495.0	1.39
Kyoto/Matsushita ADENART	Feb 94	256	209.9	2.24	NA	NA
MasPar MP-1	Aug 92	4K	1772	0.27	NA	NA
MasPar MP-2	Nov 92	4K	615	0.77	NA	NA
Meiko CS-1	Aug 92	16	2975	0.16	NA	NA
nCUBE-2S	Mar 94	64	1243.2	0.38	NA	NA
		128	717.4	0.66	NA	NA
		256	387.3	1.22	NA	NA
		512	208.6	2.26	NA	NA
		1024	120.9	3.90	NA	NA

Table 8: Results of the SP simulated CFD application (SP) benchmark.

NEC SX-3	Oct 94	1	75.72	6.23	495.0	1.39
NEC SX-4/32	Oct 95	1	NA	NA	416.34	1.66
		2	NA	NA	213.34	3.23
		4	NA	NA	108.66	6.35
		8	NA	NA	56.91	12.11
		16	NA	NA	31.75	21.72
		32	NA	NA	17.76	38.82
Silicon Graphics Power Challenge XL (75 MHz)	Oct 94	1	858.3	0.55	3719.5	0.19
		4	225.8	2.09	947.6	0.73
		8	119.5	3.95	491.4	1.40
		16	67.2	7.02	313.1	2.20
SGI Power Challenge - XL (90 MHz)	May 95	1	757.00	0.62	3343.90	0.21
		2	387.90	1.22	1685.30	0.41
		4	200.44	2.35	853.35	0.81
		8	106.43	4.43	445.38	1.55
		16	63.18	7.46	294.22	2.34
Thinking Machines CM-2	Dec 91	16K	1444.0	0.33	NA	NA
		32K	917.0	0.51	NA	NA
		64K	640.0	0.74	NA	NA
Thinking Machines CM-5		32	289.0	1.63	NA	NA
		64	170.0	2.77	NA	NA
		128	119.0	3.96	NA	NA
Thinking Machines CM-5E	Sep 95	16	268	1.76	1580	0.44
		32	144	3.27	771	0.89
	Feb 94	64	104.0	4.53	595.0	1.16
		128	61.0	7.73	320.0	2.16
Thinking Machines CM-500	Sep 95	64	85	5.55	405	1.70
		128	51	9.25	236	2.92
		256	34	13.87	140	4.93

Table 9: Results of the BT simulated CFD application (BT) benchmark.

Computer System	Date Received	Number Processor	Class A		Class B	
			Time in seconds	Ratio to CRAY Y-MP/1	Time in seconds	Ratio CRAY C90/1
BBN TC2000	Dec 91	112	1378.0	0.58	NA	NA
Convex Exemplar SPP1000	Mar 95	1	2825	0.28	NA	NA
		8	366	2.17	1675	0.61
		16	211	3.76	984	1.04
		32	125	6.34	559.8	1.82
		64	78	10.16	338.2	3.03
CRAY C90	Feb 95	1	276.80	2.86	1023.4	1.00
		2	139.44	5.68	519.46	1.97
		4	72.11	10.99	265.20	3.86
		8	36.99	21.42	138.16	7.41
		16	20.30	39.03	78.80	12.99
CRAY EL	May 93	1	3832.8	0.21	NA	NA
		4	1090.2	0.73	NA	NA
		8	764.1	1.04	NA	NA
CRAY J916	July 95	1	1202.53	0.66	5356.59	0.19
		2	608.83	1.30	2789.74	0.37
		4	317.62	2.49	1414.43	0.72
		8	168.46	4.70	765.60	1.34
		16	98.80	8.02	426.91	2.40

Table 9: Results of the BT simulated CFD application (BT) benchmark.

CRAY T3D	Feb 95	16	230.41	3.44	918.04	1.11
		32	115.53	6.85	476.97	2.15
		64	59.01	13.43	252.86	4.04
		128	29.96	26.44	128.21	7.98
		256	15.89	49.87	68.38	15.0
		512	8.39	94.45	38.01	26.92
		1024	4.56	173.77	20.45	50.04
CRAY T916	July 95	1	193.19	4.10	649.10	1.58
		2	100.10	7.92	332.38	3.08
		4	53.23	14.89	169.27	6.05
		8	30.66	25.84	92.43	11.07
		16			64.06	15.98
CRAY Y-MP	Aug 92	1	792.4	1.00	NA	NA
		8	114.0	6.95	NA	NA
DEC Alpha Server 8400 5/300	Oct 95	1	1048.7	0.76	4076.50	0.25
		2	527.04	1.50	2525.00	0.41
		4	271.13	2.92	1278.60	0.80
		8	146.91	5.39	649.53	1.58
		12	103.47	7.66	458.21	2.23
Fujitsu VPP500	Mar 95	1	142.42	5.56	NA	NA
		2	75.17	10.54	NA	NA
		4	39.14	20.25	NA	NA
		8	19.82	39.98	NA	NA
		16	9.99	79.32	NA	NA
		17	NA	NA	37.26	27.47
		32	5.09	155.68	NA	NA
		34	NA	NA	18.82	54.38
		51	NA	NA	12.61	81.16
		64	2.66	297.90	NA	NA
IBM SP-1	Aug 94	8	443.9	1.79	NA	NA
		16	249.2	3.18	987.4	1.04
		32	143.0	5.54	511.2	2.00
		64	83.1	9.54	274.6	3.73
IBM RS/6000 SP Wide-node1 (67 MHz)	Mar 95	8	206.7	3.83	862.8	1.19
		16	112.9	7.02	440.6	2.32
		32	61.8	12.82	226.8	4.51
		64	34.7	22.84	119.1	8.59
		128	20.1	39.42	67.0	15.27

Table 9: Results of the BT simulated CFD application (BT) benchmark.

IBM RS/6000 SP Wide-node2 (77 MHz)	Oct 95	1	1130.7	0.70	4775.7	0.21
		8	170.74	4.64	708.47	1.44
		16	95.48	8.30	375.76	2.72
		32	51.34	15.44	197.91	5.17
		64	29.01	27.31	105.19	9.73
IBM RS/6000 SP Thin-node2 (67 MHz)	Feb 95	8	216.6	3.66	889.8	1.15
		16	118.0	6.72	459.2	2.23
		32	64.9	12.21	237.2	4.31
		64	36.3	21.83	124.8	8.20
		128	20.8	38.10	69.6	14.70
Intel iPSC/860	Aug 92	64	714.7	1.11	NA	NA
		128	414.3	1.91	NA	NA
Intel Paragon (OSF1.2)	Mar 94	64	235.0	3.37	NA	NA
		102	NA	NA	633.0	1.62
		128	129.0	6.14	NA	NA
		204	NA	NA	359.0	2.86
		256	83.0	9.55	NA	NA
		306	NA	NA	257.0	3.98
		408	NA	NA	226.0	4.53
		510	NA	NA	196.0	5.22
512	63.0	12.58	NA	NA		
Intel Paragon (SunMos)	Nov 93	64	224.0	3.54	NA	NA
	Mar 94	102	NA	NA	598.0	1.71
		128	113.0	7.01	NA	NA
		204	NA	NA	324.0	3.16
		306	NA	NA	215.0	4.76
Kendall Square KSR1	Feb 94	32	457	1.74	NA	NA
		64	256	3.1	NA	NA
		128	145	5.46	NA	NA
Kendall Square KSR2	Feb 94	32	225	3.52	NA	NA
	May 94	64	130	6.10	542.0	1.89
Kyoto/Matsushita ADENART	Feb 94	256	314.1	2.52	NA	NA
MasPar MP-1	Aug 92	4K	2396.0	0.33	NA	NA
MasPar MP-2	Nov 92	4K	789.0	1.00	NA	NA
Meiko CS-1	Aug 92	16	2984.0	0.27	NA	NA

Table 9: Results of the BT simulated CFD application (BT) benchmark.

Meiko CS-2	Oct 94	8	570.4	1.39	NA	NA
		16	286.6	2.77	NA	NA
		32	149.3	5.31	NA	NA
nCUBE-2S	Mar 94	64	1243.2	0.64	NA	NA
		128	644.7	1.22	NA	NA
	Jul 94	256	336.7	2.35	NA	NA
		512	179.1	4.42	NA	NA
		1024	100.9	7.85	NA	NA
NEC SX-3	Oct 94	1	100.31	7.90	NA	NA
NEC SX-4/32	Oct. 95	1	NA	NA	620.36	1.65
		2	NA	NA	316.72	3.23
		4	NA	NA	160.77	6.37
		8	NA	NA	83.52	12.25
		16	NA	NA	46.25	22.13
		32	NA	NA	25.15	40.69
Silicon Graphics Power Challenge XL (75 MHz)	Oct 94	1	1330.3	0.60	5698.7	0.18
		4	355.9	2.23	1450.0	0.71
		8	177.0	4.48	775.0	1.32
		16	91.8	8.63	426.0	2.40
SGI Power Challeng XL (90 MHz)	May 95	1	1145.20	0.69	5089.60	0.20
		2	574.37	1.38	2537.70	0.40
		4	298.74	2.65	1278.60	0.80
		8	152.65	5.19	672.56	1.52
		16	80.20	9.88	391.88	2.61
Thinking Machines CM-2	Dec 91	16K	1118.0	0.71	NA	NA
		32K	634.0	1.25	NA	NA
		64K	370.0	2.14	NA	NA
Thinking Machines CM-200	Dec 91	16K	832.0	0.95	NA	NA
		32K	601.0	1.32	NA	NA
Thinking Machines CM-5	May 93	32	284.0	2.79	NA	NA
		64	175.0	4.50	NA	NA
		128	119.0	6.66	NA	NA
Thinking Machines CM-5E	Sep 95	16	259	3.06	1480	0.69
		32	135	5.87	712	1.44
	Feb 94	64	84.0	9.43	464.0	2.21
		128	48.0	16.50	253.0	4.05

Table 9: Results of the BT simulated CFD application (BT) benchmark.

Thinking Machines CM-500	Sep 95	64	75	10.56	370	2.77
		128	43	18.43	209	4.90
		256	27	29.34	114	8.98

Table 10: Approximate sustained performance per dollar for Class B LU benchmark

Computer System	# Proc.	Memory	Ratio to C90/1	List Price Million Dollars	Performance per Million Dollars	Date
Convex SPP1000	32	4 GB	0.96	1.25	0.77	Mar 95
CRAY C916	16	2 GB	11.85	30.50	0.39	Mar 95
CRAY J916	16	2 GB	2.64	1.05	2.51	Jul 95
CRAY T3D	128	64 MB/PE	3.73	3.6	1.04	Mar 95
CRAY T916	16	2 GB	15.91	15.0	1.06	Oct 95
DEC Alpha Server 8400 5/300	12	2 GB	1.51	0.718	2.10	Oct 95
IBM RS/6000 SP Wide-node1 (67 MHz)	64	128 MB/PE	5.85	5.08	1.15	Mar 95
IBM RS/6000 SP Wide-node2 (77 MHz)	64	128 MB/PE	7.56	5.74	1.32	Oct 95
IBM RS/6000 SP Thin-node2 (67 MHz)	64	64 MB/PE	5.42	3.48	1.56	Mar 95
NEC SX-4/16	16	4 GB	12.75	8.1	1.57	Oct 95

SGI PC XL (75 MHz)	16	2 GB	1.46	0.895	1.63	Jun 94
SGI PC XL (90 MHz)	16	2 GB	1.54	1.02	1.51	May 95

Table 11: Approximate sustained performance per dollar for Class B SP benchmark

<b>Computer System</b>	<b># Proc</b>	<b>Memory</b>	<b>Ratio to C90/1</b>	<b>List Price Million Dollars</b>	<b>Performance per Million Dollars</b>	<b>Date</b>
Convex SPP1000	64	8 GB	1.5	2.50	0.60	Mar 95
CRAY C916	16	2 GB	13.21	30.50	0.43	Mar 95
CRAY J916	16	2 GB	2.18	1.05	2.07	July 95
CRAY T3D	128	64 MB/PE	5.29	3.6	1.47	Mar 95
CRAY T916	16	2 GB	16.99	15.0	1.13	Oct 95
DEC Alpha Server 8400 5/300	12	2 GB	1.89	0.718	2.63	Oct 95
Fujitsu VPP500	51	256 MB/PE	64.73	31.00	2.09	Mar 95
IBM RS/6000 SP Wide-node1 (67 MHz)	64	128 MB/PE	7.52	5.08	1.48	Mar 95
IBM RS/6000 SP Wide-node2 (77 MHz)	64	128 MB/PE	8.60	5.74	1.50	Oct 95
IBM RS/6000 SP Thin-node2 (67 MHz)	64	64 MB/PE	6.79	3.48	1.95	Mar 95

NEC SX-4/32	32	4 GB	38.82	12.5	3.11	Oct 95
SGI PC XL (75 MHz)	16	2 GB	2.20	0.895	2.45	Jun 94
SGI PC XL (90 MHz)	16	2 GB	2.34	1.02	2.29	May 95

Table 12: Approximate sustained performance per dollar for Class B BT benchmark

<b>Computer System</b>	<b># Proc</b>	<b>Memory</b>	<b>Ratio to C90/1</b>	<b>List Price Million Dollars</b>	<b>Performance per Million Dollars</b>	<b>Date</b>
Convex SPP1000	64	8 GB	3.03	2.50	1.21	Mar 95
CRAY C916	16	2 GB	12.99	30.50	0.43	Mar 95
CRAY J916	16	2 GB	2.40	1.05	2.29	July 95
CRAY T3D	128	64 MB/PE	7.98	3.6	2.22	Mar 95
CRAY T916	16	2 GB	15.98	15.0	1.07	Oct 95
DEC Alpha Server 8400 5/300	12	2 GB	2.23	0.718	3.11	Oct 95
Fujitsu VPP500	51	256 MB/PE	81.16	31.00	2.62	Mar 95
IBM RS/6000 SP Wide-node1 (67 MHz)	64	128 MB/PE	8.59	5.08	1.69	Mar 95
IBM RS/6000 SP Wide-node2 (77 MHz)	64	128 MB/PE	9.73	5.74	1.70	Oct 95
IBM RS/6000 SP Thin-node2 (67 MHz)	64	64 MB/PE	8.20	3.48	2.36	Mar 95

NEC SX-4/32	32	4 GB	40.69	12.5	3.26	Oct 95
SGI PC XL (75 MHz)	16	2 GB	2.40	0.895	2.68	Jun 94
SGI PC XL (90 MHz)	16	2 GB	2.61	1.02	2.56	May 95