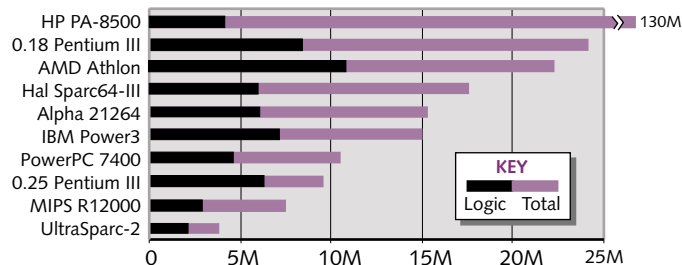


CHART WATCH: WORKSTATION PROCESSORS

	Alpha 21264	AMD Athlon	Intel PIII	MIPS R12000	HP PA-8600	IBM Power3	PowerPC 7400 (G4)	Sun Ultra-2	Sun Ultra-2i	Hal Sparc64-III
Clock rate	700 MHz	1000 MHz	1000 MHz	300 MHz	552 MHz	400 MHz	450 MHz	450 MHz	360 MHz	296 MHz
Cache (I/D)	64K/64K	64K/64K	16/16/256	32K/32K	512K/1M	32K/64K	32K/32K	16K/16K	16K/16K	64K/64K
Issue rate	4 issue	3 x86 instr	3 x86 instr	4 issue	4 issue	4 issue	3 issue	4 issue	4 issue	4 issue
Pipe stages‡	7/9 stages	9/11 stages	12/14	6 stages	7/9 stages	7/8 stages	4/5 stages	6/9 stages	6/9 stages	8/10
Out of order	80 instr	72 ROPs	40 ROPs	48 instr	56 instr	32 instr	5 instr	None	None	63 instr
Rename regs	48/41	36/36	40 total	32/32	56 total	16 int/24 fp	6 int/6 fp	None	None	34/32
BHT entries	4K x 9-bit	4K x 2-bit	≥512	2K x 2-bit	2K x 2-bit	2K x 2-bit	512 x 2-bit	512 x 2-bit	512 x 2-bit	8K x 2-bit
TLB entries	128/128	280/288	32 I/64 D	64 unified	120 unified	128/128	128/128	64 I/64 D	64 I/64 D	32/32/256
Memory B/W	2.66 GB/s	1.6 GB/s	1.06 GB/s	539 MB/s	1.54 GB/s	1.6 GB/s	1.6 GB/s	1.9 GB/s	600 MB/s	1.33 GB/s
Package	CPGA-588	CBGA-576	PGA-370	CPGA-527	LGA-544	SCC-1,088	CBGA-360	CLGA-787	PBGA-587	CLGA-957
IC process	0.25µ 6M	0.18µ 6M	0.18µ 6M	0.25µ 4M	0.25µ 4M	0.22µ 6M	0.22µ 6M	0.29µ 4M	0.29µ 4M	0.25µ 5M
Die size	205 mm²	102 mm²	106 mm²	204 mm²	477 mm²	163 mm²	83 mm²	126 mm²	150 mm²	240 mm²
Transistors	15.2 million	22 million	24 million	7.2 million	130 million	23 million	10.5 million	3.8 million	4.1 million	17.6 million
Est mfg cost*	\$160	\$70§	\$40	\$140	\$330	\$110	\$45	\$70	\$85	\$250
Power (max)	75 W	60 W*	23 W*	20 W	60 W*	36 W	13 W	20 W	38 W	50 W
SPEC95bt	35/55	42/30	47/32	18/30	39/61	24/46	21/20	16/24	12/17	15/28
Availability	3Q99	1Q00	1Q00	2Q99	1Q00	1Q00	3Q99	4Q98	4Q98	4Q98
1K list price	\$2,296\$§	\$1299\$§	\$990	Not public	Not public	Not public	\$345	\$4,249\$§	\$470	Not public

†SPEC95 baseline (int/FP) ‡integer ALU/load §includes 512K L2 cache ¶includes 2M L2 cache (Source: vendors, except *MDR estimates)

The table above gives the vital statistics for the key high-end processors available soon. The table below provides the best reported SPEC95 results for each shipping processor. The graph compares transistor counts for these devices for the logic (noncache) portion and the complete design.



Processor	Intel PIII	Alpha 21264	AMD Athlon	HP PA-8600	IBM Pulsar	MIPS R12000	Sun Ultra-2	Hal Sparc64	PowerPC 604e	IBM Power3
System or Motherboard	Intel VC820	AlphaServ. GS140-6	Gigabyte/ASUS	HP9000 C3600	Bull EPC2400	SGI Origin2000	Ultra 80 Mod. 1450	Fujitsu GP7000F	RS/6000 43P-150	RS/6000 44P-170
Clock rate	1000 MHz	700 MHz	1000 MHz	552 MHz	450 MHz	300 MHz	450 MHz	296 MHz	375 MHz	400 MHz
Ext cache	None	8M	512K	none	8M	8M	4M	8M	1M	4M
099.go	49.1	33.7	44.8	42.8	29.3	16.7	18.2	15.0	16.4	27.8
124.m88Ksim	54.7	43.4	50.4	41.7	16.9	17.7	15.0	11.9	18.9	26.5
126.gcc	43.1	25.9	40.9	34.7	19.9	17.7	18.3	18.0	13.1	23.1
129.compres	26.5	27.9	27.6	34.7	19.8	17.8	18.5	15.3	11.1	22.3
130.li	60.7	35.4	49.3	40.8	17.2	13.6	13.3	12.8	12.7	22.5
132.ijpeg	41.5	41.9	35.6	32.2	13.1	15.8	16.6	15.4	17.1	26.3
134.perl	55.1	33.7	57.8	35.9	18.8	21.0	15.4	14.8	15.9	17.7
147.vortex	52.5	39.7	37.3	43.2	20.3	27.0	15.2	15.3	12.4	23.4
SPECint95b*	46.6	34.7	42.0	38.4	19.0	18.1	16.2	14.7	14.5	23.5
101.tomcatv	44.8(54.4†)	99.7	39.1	102.0	26.9§	36.7	34.4	58.5	10.8	56.7
102.swim	80.1(97.7†)	85.8	63.0	151	24.0§	50.9	45.0	67.9	17.1	76.4
103.su2cor	15.8(17.3†)	21.7	15.6	36.8	11.2§	18.0	16.7	16.0	4.76	31.4
104.hydro2d	16.2(18.0†)	51.8	14.4	29.8	12.4§	24.4	16.7	22.8	4.29	31.7
107.mgrid	33.1(31.3†)	73.2	18.0	49.6	20.2§	34.6	26.6	26.4	7.81	42.8
110.applu	18.0(18.3†)	26.2	16.3	41.4	15.4§	17.8	13.6	14.5	5.60	27.4
125.turb3d	30.7(28.3†)	30.9	20.8	49.4	23.0§	23.0	21.0	18.4	12.6	57.1
141.apsi	26.8(24.4†)	59.0	28.4	50.8	17.7§	28.0	30.7	20.7	11.7	34.3
145.fpppp	57.4(44.2†)	102	117.0	107	36.9§	47.9	26.8	38.9	35.6	67.1
146.wave5	42.6(39.5†)	67.7	42.6	76.7	26.5§	39.7	30.3	32.3	9.07	63.0
SPECfp95b*	31.9(32.1†)	54.5	29.4	61.0	20.2§	30.1	24.6	27.7	9.76	46.0

*SPEC 95 baseline †from 800MHz Dell Precision Workstation 420 §from Northstar-300 in RS/6000 H70 (Source: SPEC)