



# CFP2000 Result

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Hewlett-Packard Company  
hp AlphaServer ES45 68/1250

SPECfp\_rate2000 = 15.8  
SPECfp\_rate\_base2000 = 11.8

SPEC license #: 2 | Tested by: HP | Test date: Nov-2002 | Hardware Avail: Aug-2002 | Software Avail: Dec-2002

Benchmark	Base Copies	Base Runtime	Base Ratio	Copies	Runtime	Ratio
168.wupwise	1	203	9.15	1	91.2	20.4
171.swim	1	190	18.9	1	190	18.9
172.mgrid	1	295	7.08	1	179	11.7
173.applu	1	186	13.1	1	168	14.5
177.mesa	1	141	11.5	1	115	14.1
178.galgel	1	122	27.6	1	119	28.4
179.art	1	115	26.3	1	90.7	33.2
183.quake	1	342	4.41	1	105	14.3
187.facerec	1	131	16.9	1	108	20.5
188.amp	1	253	10.1	1	210	12.1
189.lucas	1	176	13.2	1	144	16.2
191.fma3d	1	253	9.63	1	186	13.1
200.sixtrack	1	211	6.06	1	192	6.65
301.apsi	1	226	13.4	1	211	14.3

**Hardware**

CPU: Alpha 21264C  
CPU MHz: 1250  
FPU: Integrated  
CPU(s) enabled: 1 core, 1 chip, 1 core/chip  
CPU(s) orderable: 1 to 4  
Parallel: No  
Primary Cache: 64KB(I)+64KB(D) on chip  
Secondary Cache: 16MB off chip per CPU  
L3 Cache: None  
Other Cache: None  
Memory: 16GB  
Disk Subsystem: 9 GB SCSI  
Other Hardware: None

**Software**

Operating System: Tru64 UNIX T5.1B  
Compiler: Compaq C V6.5-011-48C5K  
Spike V5.2 (506 48C5K)  
Compaq Fortran V5.5-1877-48BBF  
Compaq Fortran 77 V5.5-1877-48BBF  
KAP Fortran V4.4 k340504 20010517  
KAP Fortran 77 V4.1 k310440 980926  
KAP C V4.2 k010737S 010515

File System: ufs  
System State: Multi-user

## Notes/Tuning Information

Baseline C: cc -arch ev6 -fast -O4 ONESTEP  
Fortran: f90 -arch ev6 -fast -O5 ONESTEP

### Peak:

All use -arch ev6 -non\_shared ONESTEP (except applu and ammp)

Individual benchmark tuning:

168.wupwise: kf77 -call\_shared -inline all -tune ev67  
-unroll 12 -automatic -align commons -arch ev67  
-fkapargs=' -aggressive=c -fuse  
-fuselevel=1 -so=2 -r=1 -o=1 -interleave  
-ur=6 -ur2=060 ' +PFB

171.swim: same as base

172.mgrid: kf90 -call\_shared -arch generic -O5 -inline  
manual -nopipeline -unroll 9 -automatic -transform\_loops  
-fkapargs=' -aggressive=a -fuse -interleave  
-ur=2 -ur3=5 -cachesize=128,16000 ' +PFB



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## Notes/Tuning Information (Continued)

```

173.applu: kf90 -O5 -transform_loops
          -fkapargs=' -o=0 -nointerleave -ur=14
          -ur2=260 -ur3=18' +PFB
177.mesa: kcc -fast -O4 +CFB +IFB
178.galgel: f90 -O5 -fast -unroll 5 -automatic
179.art: kcc -assume whole_program -ldensemalloc
          -call_shared -assume restricted_pointers
          -unroll 16 -inline none -ckapargs='
          -fuse -fuselevel=1 -ur=3' +PFB
183.quake: cc -call_shared -arch generic -fast -O4
          -ldensemalloc -assume restricted_pointers
          -inline speed -unroll 13 -xtaso_short +PFB
187.facerec: f90 -O4 -nopipeline -inline all
          -non_shared -speculate all -unroll 7
          -automatic -assume accuracy_sensitive
          -math_library fast +IFB
188.ammp: cc -arch host -O4 -ifo -assume nomath_errno
          -assume trusted_short_alignment -fp_reorder
          -readonly_strings -ldensemalloc -xtaso_short
          -assume restricted_pointers -unroll 9
          -inline speed +CFB +IFB +PFB
189.lucas: kf90 -O5 -fkapargs='-ur=1' +PFB
191.fma3d: kf90 -O4 -transform_loops -fkapargs='-cachesize=128,16000' +PFB
200.sixtrack: f90 -fast -O5 -assume accuracy_sensitive
          -notransform_loops +PFB
301.apsi: kf90 -O5 -inline none -call_shared -speculate all
          -align commons -fkapargs=' -aggressive=ab
          -tune=ev5 -fuse -ur=1 -ur2=60 -ur3=20
          -cachesize=128,16000'

```

Most benchmarks are built using one or more types of profile-driven feedback. The types used are designated by abbreviations in the notes:

+CFB: Code generation is optimized by the compiler, using feedback from a training run. These commands are done before the first compile (in phase "fdo\_pre0"):

```

mkdir /tmp/pp
rm -f /tmp/pp/${baseexe}*

```

and these flags are added to the first and second compiles:

```

PASS1_CFLAGS = -prof_gen_noopt -prof_dir /tmp/pp
PASS2_CFLAGS = -prof_use -prof_dir /tmp/pp

```

(Peak builds use /tmp/pp above; base builds use /tmp/pb.)

+IFB: Icache usage is improved by the post-link-time optimizer Spike, using feedback from a training run. These commands are used (in phase "fdo\_postN"):

```

mv ${baseexe} oldexe
spike oldexe -feedback oldexe -o ${baseexe}

```

+PFB: Prefetches are improved by the post-link-time optimizer



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Spike, using feedback from a training run. These commands are used (in phase "fdo\_post\_makeN"):

```
rm -f *Counts*
mv ${baseexe} oldexe
pixie -stats dstride oldexe 1>pixie.out 2>pixie.err
mv oldexe.pixie ${baseexe}
```

A training run is carried out (in phase "fdo\_runN"), and then this command (in phase "fdo\_postN"):

```
spike oldexe -fb oldexe -stride_prefetch -o ${baseexe}
```

When Spike is used for both Icache and Prefetch improvements, only one spike command is actually issued, with the Icache options followed by the Prefetch options.

vm:

```
vm_bigpg_enabled = 1
vm_bigpg_thresh=16
vm_swap_eager = 0
```

proc:

```
max_per_proc_address_space = 0x4000000000
max_per_proc_data_size = 0x4000000000
max_per_proc_stack_size = 0x4000000000
max_proc_per_user = 2048
max_threads_per_user = 0
maxusers = 16384
per_proc_address_space = 0x4000000000
per_proc_data_size = 0x4000000000
per_proc_stack_size = 0x4000000000
```

Portability: galgel: -fixed