# CFP2000 Result

**Hewlett-Packard Company**  
**AlphaServer ES80 7/1150**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base Copies</th>
<th>Base Runtime</th>
<th>Base Ratio</th>
<th>Copies</th>
<th>Runtime</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>168.wupwise</td>
<td>2</td>
<td>184</td>
<td>20.2</td>
<td>2</td>
<td>76.0</td>
<td>48.8</td>
</tr>
<tr>
<td>171.swim</td>
<td>2</td>
<td>87.1</td>
<td>82.6</td>
<td>2</td>
<td>87.1</td>
<td>82.6</td>
</tr>
<tr>
<td>172.mgrid</td>
<td>2</td>
<td>254</td>
<td>16.4</td>
<td>2</td>
<td>169</td>
<td>24.7</td>
</tr>
<tr>
<td>173.applu</td>
<td>2</td>
<td>140</td>
<td>34.8</td>
<td>2</td>
<td>130</td>
<td>37.6</td>
</tr>
<tr>
<td>177.mesa</td>
<td>2</td>
<td>153</td>
<td>21.2</td>
<td>2</td>
<td>134</td>
<td>24.2</td>
</tr>
<tr>
<td>178.galgel</td>
<td>2</td>
<td>139</td>
<td>48.5</td>
<td>2</td>
<td>137</td>
<td>49.0</td>
</tr>
<tr>
<td>179.art</td>
<td>2</td>
<td>130</td>
<td>46.3</td>
<td>2</td>
<td>81.7</td>
<td>73.8</td>
</tr>
<tr>
<td>183.equake</td>
<td>2</td>
<td>248</td>
<td>12.2</td>
<td>2</td>
<td>82.7</td>
<td>36.5</td>
</tr>
<tr>
<td>187.facerec</td>
<td>2</td>
<td>173</td>
<td>25.5</td>
<td>2</td>
<td>154</td>
<td>28.6</td>
</tr>
<tr>
<td>188.ammp</td>
<td>2</td>
<td>300</td>
<td>17.0</td>
<td>2</td>
<td>261</td>
<td>19.6</td>
</tr>
<tr>
<td>189.lucas</td>
<td>2</td>
<td>131</td>
<td>35.5</td>
<td>2</td>
<td>120</td>
<td>38.6</td>
</tr>
<tr>
<td>191.fma3d</td>
<td>2</td>
<td>206</td>
<td>23.6</td>
<td>2</td>
<td>156</td>
<td>31.3</td>
</tr>
<tr>
<td>200.sixtrack</td>
<td>2</td>
<td>228</td>
<td>11.2</td>
<td>2</td>
<td>210</td>
<td>12.1</td>
</tr>
<tr>
<td>301.apsi</td>
<td>2</td>
<td>209</td>
<td>28.8</td>
<td>2</td>
<td>197</td>
<td>30.6</td>
</tr>
</tbody>
</table>

**Hardware**
- CPU: Alpha 21364
- CPU MHz: 1150
- FPU: Integrated
- CPU(s) enabled: 2 cores, 2 chips, 1 core/chip
- CPU(s) orderable: 2 to 8
- Parallel: No
- Primary Cache: 64KB(I)+64KB(D) on chip
- Secondary Cache: 1.75MB on chip per CPU
- L3 Cache: None
- Other Cache: None
- Memory: 4GB per CPU; 512MB RIMMs
- Disk Subsystem: AdvFS
- Other Hardware: None

**Software**
- Operating System: Tru64 UNIX V5.1B + IPK
- Compiler: Compaq C V6.5-011-48C5K  
  Program Analysis Tools V2.0
  Spike V5.2 (510 USG)
  HP Fortran V5.5A-3548-48D88
  HP Fortran 77 V5.5A-3548-48D88
  KAP Fortran V4.3 000607
  KAP Fortran 77 V4.1 980926
  KAP C V4.1 000607
- File System: MFS, 8GB
- System State: Multi-user

**Notes/Tuning Information**
- Baseline: C: cc -arch ev7 -fast -O4 ONESTEP  
  Fortran: f90 -arch ev7 -fast -O5 ONESTEP
- Peak:  
  All use -g3 -arch ev7 -non_shared ONESTEP  
  except these (which use only the tunings shown below):  
  173.applu 188.ammp 191.fma3d
  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 -transform_loops -unroll 9 -automatic
**Notes/Tuning Information (Continued)**

```
-fkapargs='--aggressive=a -fuse -interleave
    -ur=2 -ur3=5 -cachesize=128,16000' +PFB
```

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
   kcc -assume whole_program -ldensemalloc
   -call_shared -assume restricted_pointers
   -unroll 16 -inline none -ckapargs=' -fuse -fuselevel=1 -ur=3' +PFB

183.equake: cc -call_shared -arch generic -fast -O0
   -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_feedback -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}
```
Hewlett-Packard Company  
AlphaServer ES80 7/1150

SPECfp_rate2000 = 34.2  
SPECfp_rate_base2000 = 26.0

Notes/Tuning Information (Continued)

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

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 = 6
vm_swap_eager = 0
ubc_maxpercent = 50

proc:
max_per_proc_address_space = 34359738368
max_per_proc_data_size = 34359738368
max_per_proc_stack_size = 34359738368
max_proc_per_user = 2048
max_threads_per_user = 4096
maxusers = 2048
per_proc_address_space = 34359738368
per_proc_data_size = 34359738368
per_proc_stack_size = 34359738368

Portability: galgel: -fixed

Information on UNIX V5.1B Patches can be found at

Processes were bound to CPUs using "runon".

This result was measured on model ES80.
Model ES47 and model ES80 are electronically equivalent.