## Benchmark Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Reference Time</th>
<th>Base Runtime</th>
<th>Base Ratio</th>
<th>Runtime</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>164.gzip</td>
<td>1400</td>
<td>303</td>
<td>462</td>
<td>299</td>
<td>468</td>
</tr>
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<td>175.vpr</td>
<td>1400</td>
<td>262</td>
<td>533</td>
<td>260</td>
<td>538</td>
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<td>176.gcc</td>
<td>1100</td>
<td>157</td>
<td>699</td>
<td>141</td>
<td>778</td>
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<td>181.mcf</td>
<td>1800</td>
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<td>565</td>
<td>242</td>
<td>744</td>
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<td>186.crafty</td>
<td>1000</td>
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<td>815</td>
<td>123</td>
<td>815</td>
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<td>252.eon</td>
<td>1300</td>
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<td>793</td>
<td>159</td>
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<td>253.perlbmk</td>
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<td>255.vortex</td>
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<td>256.bzip2</td>
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<tr>
<td>300.twolf</td>
<td>3000</td>
<td>380</td>
<td>789</td>
<td>372</td>
<td>807</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU:** Alpha 21264C
- **CPU MHz:** 1000
- **FPU:** Integrated
- **CPU(s) enabled:** 1 core, 1 chip, 1 core/chip
- **CPU(s) orderable:** 1 to 2
- **Parallel:** No
- **Primary Cache:** 64KB(I)+64KB(D) on chip
- **Secondary Cache:** 8MB off chip per CPU
- **L3 Cache:** None
- **Memory:** 8GB
- **Disk Subsystem:** 18.2GB SCSI
- **Other Hardware:** None

### Software

- **Operating System:** Tru64 UNIX V5.1A
- **Compiler:** Compaq C V6.4-215-46B7O
  - Program Analysis Tools V2.0
  - Spike V5.2 DTK (1.471.2.2 46B5P)
  - Compaq C++ V6.3-010-46B2F
- **File System:** AdvFS
- **System State:** Multi-user

### Notes/Tuning Information

**Baseline C:**
```
c -arch ev6 -fast +CFB ONESTEP
```

**C++:**
```
cxx -arch ev6 -O2 ONESTEP
```

**Peak:**
```
All but 252.eon: cc -q3 -arch ev6 ONESTEP
164.gzip: -fast -04 -non_shared +CFB
175.vpr: -fast -04 -assume restricted_pointers +CFB
176.gcc: -fast -04 -xtaso_short -all -ldensemalloc -none
  +CFB +IFB
181.mcf: -fast -xtaso_short +CFB +IFB +PFB
186.crafty: same as base
197.parser: -fast -04 -xtaso_short -non_shared +CFB
252.eon: cxx -arch ev6 -O2 -all -ldensemalloc -none
253.perlbmk: -fast -non_shared +CFB +IFB
254.gap: -fast -04 -non_shared +CFB +IFB +PFB
255.vortex: -fast -non_shared +CFB +IFB
256.bzip2: -fast -04 -non_shared +CFB -all
  -ldensemalloc -none +CFB +IFB
300.twolf: -fast -04 -assume restricted_pointers -all
  -ldensemalloc -none +CFB +IFB
```
Hewlett-Packard Company
hp AlphaServer DS25 68/1000

SPECint2000 = 678
SPECint_base2000 = 618

Notes/Tuning Information (Continued)

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 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.


Spike, and the Program Analysis Tools, are part of the Developers' Tool Kit Supplement, http://www.tru64unix.compaq.com/dtk/ . The features used in this SPEC submission will be available at the website as a production release in October, 2001. The C compiler for this SPEC submission has been available at the same location, as a production release, since August, 2001.