### CFP2000 Result

#### Hewlett-Packard Company

**hp AlphaServer DS25 68/1000**

**SPECfp_rate2000** = 21.5

**SPECfp_rate_base2000** = 17.9

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<th>Base Runtime</th>
<th>Base Ratio</th>
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</table>

#### Hardware

- **CPU:** Alpha 21264C
- **CPU MHz:** 1000
- **FPU:** Integrated
- **CPU(s) enabled:** 2 cores, 2 chips, 1 core/chip
- **CPU(s) orderable:** 2 cores, 2 chips, 1 core/chip
- **Parallel:** No
- **Primary Cache:** 64KB(I)+64KB(D) on chip
- **Secondary Cache:** 8MB off chip per CPU
- **L3 Cache:** None
- **Other 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 (1.471.2.46B5P)
  - Compaq Fortran V5.4A-1472-46B2F
  - Compaq Fortran 77 V5.4A-196-46B2F
  - KAP Fortran 4.3 000607
  - KAP Fortran 77 V4.1 980926
  - KAP C V4.1 000607
- **File System:** AdvFS
- **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 -g3 -arch ev6 -non_shared ONESTEP

Individual benchmark tuning:
- 168.wupwise: kf77 -fast -O4 -pipeline -unroll 2 +PFB
- 171.swim: f90 -fast -O5
- 172.mgrid: kf77 -O5 -transform_loops -tune ev6 -unroll 8
- 173.applu: f90 -fast -O5 +PFB
- 177.mesa: cc -fast -O4 +CFB +IFB
- 178.galgel: f90 -fast -O5
- 179.art: kcc -fast -O4 -unroll 10 -ckapargs=':arl=4 -ur=4' +PFB
- 183.equake: cc -fast -xtaso_short -assume restricted_pointers -all -ldensemalloc -none +PFB

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Standard Performance Evaluation Corporation
info@spec.org
http://www.spec.org
Notes/Tuning Information (Continued)

187. facerec: f90 -fast -O4 +PFB
188. ammp: cc -fast -O4 -xtaso_short -assume restricted_pointers
189. lucas: kf90 -O5 -fkapargs='-ur=1' +PFB
191. fma3d: kf90 -O4 -transform_loops +PFB
200. sixtrack: f90 -fast -O5 -assume accuracy_sensitive
          -notransform_loops +PFB
301. apsi: kf90 -O5 -transform_loops -unroll 8
          -fkapargs='-ur=1' +PFB

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.

Portability: galgel: -fixed
Notes/Tuning Information (Continued)

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 web site 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.