## CFP2000 Result

**Compaq Computer Corporation**  
**AlphaServer DS20E Model 68/833**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base Copies</th>
<th>Base Runtime</th>
<th>Base Ratio</th>
<th>Copies</th>
<th>Runtime</th>
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</table>

### Hardware
- **CPU**: Alpha 21264B  
- **CPU MHz**: 833  
- **FPU**: Integrated  
- **CPU(s) enabled**: 2 cores, 2 chips, 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  
- **Other Cache**: None  
- **Memory**: 4GB  
- **Disk Subsystem**: 1x18GB  
- **Other Hardware**: None

### Software
- **Operating System**: Tru64 UNIX V5.1  
- **Compiler**: Compaq C V6.4-214-46B59  
  - Program Analysis Tools V2.0  
  - Spike V5.2 DTK (1.461 46B5P)  
  - Compaq Fortran V5.4A-1472-46B2F  
  - Compaq Fortran 77 V5.4A-196-46B2F  
  - KAP Fortran V4.3 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
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

Information on UNIX V5.1 Patches can be found at
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SPECfp_rate2000 = 15.9
SPECfp_rate_base2000 = 13.5

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 beta kit in August, 2001, and 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 May, 2001.