## CFP2000 Result

### Compaq Computer Corporation
**AlphaServer GS320 Model 32 68/1001**

- **SPECfp_rate2000** = 242
- **SPECfp_rate_base2000** = 191

<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>
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<tbody>
<tr>
<td>168.wupwise</td>
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<td>352</td>
<td>169</td>
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<td>251</td>
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<td>301.apsi</td>
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</tr>
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</table>

### Hardware
- CPU: Alpha 21264C
- CPU MHz: 1001
- FPU: Integrated
- CPU(s) enabled: 32 cores, 32 chips, 1 core/chip
- CPU(s) orderable: 1 to 32
- Parallel: No
- Primary Cache: 64KB(I)+64KB(D) on chip
- Secondary Cache: 8MB off chip per CPU
- L3 Cache: None
- Other Cache: None
- Memory: 256GB
- Disk Subsystem: mfs (Memory File System)
- Other Hardware: None

### Software
- Operating System: Tru64 UNIX V5.1
- Compiler: Compaq C V6.4-214-46B59
- File System: mfs
- System State: Single-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 dstripe 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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Notes/Tuning Information (Continued)


submit = runon <cpu #> $command
sysconfigtab settings:
  max_proc_per_user = 4096
  max_threads_per_user = 4096
  per_proc_data_size = 21474836480
  max_per_proc_data_size = 21474836480
  per_proc_address_space = 21474836480
  max_per_proc_address_space = 21474836480

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.