Hewlett-Packard Company
hp AlphaServer ES45 68/1250

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<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>168.wupwise</td>
<td>1600</td>
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<td>NC</td>
<td>NC</td>
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<tr>
<td>172.mgrid</td>
<td>1800</td>
<td>NC</td>
<td>NC</td>
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<tr>
<td>173.applu</td>
<td>2100</td>
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<td>NC</td>
<td>NC</td>
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<tr>
<td>177.mesa</td>
<td>1400</td>
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<tr>
<td>178.galgel</td>
<td>2900</td>
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<td>NC</td>
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<tr>
<td>179.art</td>
<td>2600</td>
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<td>NC</td>
<td>NC</td>
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<td>187.facerec</td>
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<td>2200</td>
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<td>2000</td>
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<td>NC</td>
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<tr>
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<td>1100</td>
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<td>NC</td>
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<tr>
<td>301.apsi</td>
<td>2600</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
</tr>
</tbody>
</table>

**Hardware**
- CPU: Alpha 21264C
- CPU MHz: 1250
- FPU: Integrated
- CPU(s) enabled: 1 core, 1 chip, 1 core/chip
- CPU(s) orderable: 1 to 4
- Parallel: No
- Primary Cache: 64KB(I)+64KB(D) on chip
- Secondary Cache: 16MB off chip per CPU
- L3 Cache: None
- Other Cache: None
- Memory: 16GB
- Disk Subsystem: 9 GB SCSI
- Other Hardware: None

**Software**
- Operating System: Tru64 UNIX T5.1B
- Compiler:
  - Compaq C V6.5-011-48C5K
  - Spike V5.2 (506 48C5K)
  - Compaq Fortran V5.5-1877-48BBF
  - Compaq Fortran 77 V5.5-1877-48BBF
  - KAP Fortran V4.4 k340504 20010517
  - KAP Fortran 77 V4.1 k310440 980926
  - KAP C V4.2 k010737S 010515
- File System: ufs
- 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 -arch ev6 -non_shared ONESTEP (except applu and ammp)

Standard Performance Evaluation Corporation
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Hewlett-Packard Company
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SPECfp2000 = NC
SPECfp_base2000 = NC

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Notes/Tuning Information (Continued)

Individual benchmark tuning:
168.wupwise: kf77 -call_shared -inline all -tune ev67
-ur=12 -automatic -align commons -arch ev67
-fkapargs=' -aggressive=a -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 -urroll 9 -automatic -transform_loops
-fkapargs=' -aggressive=a -fuse -interleave
-ur=2 -ur3=5 -cachsize=128,16000 '+PFB
173.aplul: kf90 -O5 -transform_loops
-fkapargs=' -o=0 -pointerleave -ur=14
-ur2=260 -ur3=18 '+PFB
177.mesa: gcc -fast -O4 +CFB +IFB
178.galgel: f90 -O5 -fast -urroll 5 -automatic
179.art: gcc -assume whole_program -ldensmallocl
-call_shared -assume restricted_pointers
-urroll 16 -inline none -fkapargs=' -fuse -fuselevel=1 -ur=3 '+PFB
183.equake: cc -call_shared -arch generic -fast -O4
-ldensmallocl -assume restricted_pointers
-inline speed -urroll 13 -xtaso_short +PFB
187.facelec: f90 -O4 -nopipeline -inline all
-non_shared -speculate all -urroll 7
-automatic -assume accuracy_sensitive
-math_library fast +IFB
188.ammp: cc -arch host -O4 -ifo -assume nominal_errno
-assume trusted_short_alignment -fp_reorder
-readonly_strings -ldensmallocl -xtaso_short
-assume restricted_pointers -urroll 9
-inline speed +CFB +IFB +PFB
189.lucas: kf90 -O5 -fkapargs=' -ur=1 '+PFB
191.fma3d: kf90 -O4 -transform_loops -fkapargs=' -cachsize=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
-cachsize=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:
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Notes/Tuning Information (Continued)

+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.

vm:

vm_bigpg_enabled = 1
vm_bigpg_thresh=16
vm_swap_eager = 0
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Notes/Tuning Information (Continued)

proc:
max_per_proc_address_space = 0x400000000000
max_per_proc_data_size = 0x400000000000
max_per_proc_stack_size = 0x400000000000
max_proc_per_user = 2048
max_threads_per_user = 0
maxusers = 16384
per_proc_address_space = 0x400000000000
per_proc_data_size = 0x400000000000
per_proc_stack_size = 0x400000000000

Portability: galgel: -fixed

Submitted_by: "Craig, Steve" <Steve.Craig@hp.com>
Submitted: Mon Sep 9 13:54:05 2002
Submission: cpu2000-20020909-01610.sub