### SPEC CPU®2017 Floating Point Speed Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
Superdome Flex 280  
(2.80 GHz, Intel Xeon Gold 6328HL)

**SPECspeed®2017_fp_base = 186**  
**SPECspeed®2017_fp_peak = 187**

- **CPU2017 License:** 3  
- **Test Sponsor:** HPE  
- **Tested by:** HPE  
- **Test Date:** Nov-2020  
- **Hardware Availability:** Nov-2020  
- **Test Sponsor:** HPE  
- **Hardware Availability:** Nov-2020  
- **Vendor:** HPE  
- **Software Availability:** Apr-2020

<table>
<thead>
<tr>
<th>Thread</th>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s 64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>607.cactuBSSN_s 64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>619.lbm_s 64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>621.wrf_s 64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>627.cam4_s 64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>628.pop2_s 64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>638.imagick_s 64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>644.nab_s 64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>649.fotonik3d_s 64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>654.roms_s 64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Hardware

- **CPU Name:** Intel Xeon Gold 6328HL  
- **Max MHz:** 4300  
- **Nominal:** 2800  
- **Enabled:** 64 cores, 4 chips  
- **Orderable:** 2, 4, 8 chip(s)  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **L2:** 1 MB I+D on chip per core  
- **L3:** 22 MB I+D on chip per chip  
- **Memory:** 3 TB (24 x 128 GB 4Rx4 PC4-3200AA-L, running at 2933)  
- **Storage:** 1 x 1 TB SATA HDD, 7.2K RPM  
- **Other:** None

#### Software

- **OS:** Red Hat Enterprise Linux 8.2 (Ootpa)  
- **Compiler:** C/C++: Version 19.1.1.217 of Intel C/C++ Compiler Build 20200306 for Linux; Fortran: Version 19.1.1.217 of Intel Fortran Compiler Build 20200306 for Linux;  
- **Firmware:** HPE Firmware Bundle Version 1.0.142 released Oct-2020  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 64-bit  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage

---

**Notes:**  
- The benchmark results are based on the SPEC CPU®2017 benchmark suite, which evaluates the performance of a system in various scientific and engineering applications.  
- The results are compared against other systems and platforms to provide a clear understanding of the system's performance capabilities.  
- The SPEC CPU®2017 benchmark suite is developed and maintained by the Standard Performance Evaluation Corporation (SPEC).  
- The SPEC CPU®2017 benchmark suite is widely used in the industry to benchmark and compare the performance of various systems and platforms.
SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
Superdome Flex 280
(2.80 GHz, Intel Xeon Gold 6328HL)

Copyright 2017-2020 Standard Performance Evaluation Corporation

HPE Foundation Software (HFS) is a collection of software packages designed to make the HPE Superdome Flex family of servers easier to use for customers. This software is compatible with RHEL, SLES, and Oracle Linux only. It is highly recommended all users install HFS for the Superdome Flex system. More details, and a revision history list, can be found at: https://support.hpe.com/hpsc/swd/public/detail?swItemId=MTX_b48de5f6a8a041f0ae985825a5#tab-history

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOCS_CONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes
Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

(Continued on next page)
**SPEC CPU®2017 Floating Point Speed Result**

Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
Superdome Flex 280  
(2.80 GHz, Intel Xeon Gold 6328HL)  

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>186</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>187</td>
</tr>
</tbody>
</table>

CPU2017 License: 3  
Test Sponsor: HPE  
Tested by: HPE  

**General Notes (Continued)**

Yes: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1) is mitigated in the system as tested and documented.  
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2) is mitigated in the system as tested and documented.  
jemalloc, a general purpose malloc implementation  
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5  

**Platform Notes**

BIOS Configuration:  
Workload Profile set to HPC  
Intel Hyper-Threading set to Disabled  
Workload Profile set to Custom  
Minimum Processor Idle Power Core C-State set to C6 State  
Minimum Processor Idle Power Package C-State set to Package C6 (non-retention) State  
LLC Prefetch set to Enabled

Sysinfo program /home/cpu2017/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f88a3d7edbe6e46a485a0011  
running on ch-620.fchst.rdlabs.hpecorp.net Wed Dec 2 21:36:16 2020

SUT (System Under Test) info as seen by some common utilities.  
For more information on this section, see  
https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo
  model name : Intel(R) Xeon(R) Gold 6328HL CPU @ 2.80GHz  
  4 "physical id"s (chips)  
  64 "processors"  
cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)  
cpu cores : 16  
siblings : 16  
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
physical 2: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
physical 3: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From lscpu:
  Architecture: x86_64  
  CPU op-mode(s): 32-bit, 64-bit  
  Byte Order: Little Endian  
  CPU(s): 64  
  On-line CPU(s) list: 0-63  
  Thread(s) per core: 1

(Continued on next page)
Platform Notes (Continued)

Core(s) per socket: 16
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6328HL CPU @ 2.80GHz
Stepping: 11
CPU MHz: 3242.222
CPU max MHz: 4300.0000
CPU min MHz: 1000.0000
BogoMIPS: 5600.13
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 22528K
NUMA node0 CPU(s): 0-15
NUMA node1 CPU(s): 16-31
NUMA node2 CPU(s): 32-47
NUMA node3 CPU(s): 48-63
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmprefetch pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3
invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnum
flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
cmq mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsavec cqm_llc cqm_occu lowercase
l mb_total cqm mb_local avx512_bf16 dtherm ida arat pln pts pku ospke avx512_vni md_clear
flush_lld arch_capabilities

/proc/cpuinfo cache data
cache size: 22528 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
node 0 size: 772622 MB
node 0 free: 765888 MB
node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
node 1 size: 774139 MB
node 1 free: 769175 MB
node 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47

(Continued on next page)
# SPEC CPU®2017 Floating Point Speed Result

**Hewlett Packard Enterprise**  
*Test Sponsor: HPE*  
Superdome Flex 280  
*(2.80 GHz, Intel Xeon Gold 6328HL)*

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base = 186</th>
<th>SPECspeed®2017_fp_peak = 187</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CPU2017 License: 3</th>
<th>Test Date: Nov-2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor: HPE</td>
<td>Hardware Availability: Nov-2020</td>
</tr>
<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Apr-2020</td>
</tr>
</tbody>
</table>

## Platform Notes (Continued)

```
node 2 size: 774112 MB
node 2 free: 770953 MB
node 3 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
node 3 size: 773619 MB
node 3 free: 772514 MB
node distances:
node 0 1 2 3
  0: 10 16 16 24
  1: 16 10 24 16
  2: 16 24 10 16
  3: 24 16 16 10

From /proc/meminfo
- MemTotal:       3168761828 kB
- HugePages_Total:       0
- Hugepagesize:       2048 kB

```

```
/usr/bin/lsb_release -d
Red Hat Enterprise Linux release 8.2 (Ootpa)

```

```
From /etc/*release* /etc/*version*
- hpe-foundation-release: HPE Foundation Software 2.4, Build 734.0820.200723T0100.a.rhel82hpe-200723T0100
- os-release:
  - NAME="Red Hat Enterprise Linux"
  - VERSION="8.2 (Ootpa)"
  - ID="rhel"
  - ID_LIKE="fedora"
  - VERSION_ID="8.2"
  - PLATFORM_ID="platform:el8"
  - PRETTY_NAME="Red Hat Enterprise Linux 8.2 (Ootpa)"
  - ANSI_COLOR="0;31"
- redhat-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
- system-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
- system-release-cpe: cpe:/o:redhat:enterprise_linux:8.2:ga

```

```
uname -a:
Linux ch-620.fchst.rdlabs.hpecorp.net 4.18.0-193.el8.x86_64 #1 SMP Fri Mar 27 14:35:58 UTC 2020 x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

- itlb_multihit: Not affected
- CVE-2018-3620 (L1 Terminal Fault): Not affected
- Microarchitectural Data Sampling: Not affected
- CVE-2017-5754 (Meltdown): Not affected
- CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled
```

(Continued on next page)
Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
Superdome Flex 280  
(2.80 GHz, Intel Xeon Gold 6328HL)  

SPECspeed®2017_fp_base = 186  
SPECspeed®2017_fp_peak = 187  

CPU2017 License: 3  
Test Sponsor: HPE  
Tested by: HPE  
Test Date: Nov-2020  
Hardware Availability: Nov-2020  
Software Availability: Apr-2020  

Platform Notes (Continued)  

via prctl and seccomp  
Mitigation: usercopy/swapgs barriers and __user  
pointer sanitization  
CVE-2017-5753 (Spectre variant 1):        Mitigation: Enhanced IBRS, IBPB: conditional,  
RSB filling  
CVE-2017-5715 (Spectre variant 2):  
tsx_async_abort:  
Not affected  
run-level 3 Dec 2 06:58  
SPEC is set to: /home/cpu2017  
Filesystem          Type  Size  Used Avail Use% Mounted on  
/dev/mapper/rhel-home xfs   876G  190G  687G  22% /home  
From /sys/devices/virtual/dmi/id  
BIOS:  HPE Bundle:1.0.142 SFW:008.000.189.000.2010080501 10/08/2020  
Vendor:  HPE  
Product: Superdome Flex 280  
Product Family: 1590F1D02020001  
Serial: 5UF0130953  

Additional information from dmidecode follows. WARNING: Use caution when you interpret  
this section. The 'dmidecode' program reads system data which is "intended to allow  
hardware to be accurately determined", but the intent may not be met, as there are  
frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.  
Memory:  
24x Hynix HMABAGL7ABR4N-XN 128 GB 4 rank 3200  
24x NO DIMM NO DIMM  
(End of data from sysinfo program)  

Compiler Version Notes  
==============================================================================  
C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak)  
| 644.nab_s(base, peak)  
------------------------------------------------------------------------------  
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.1.1.217 Build 20200306  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
------------------------------------------------------------------------------  

C++, C, Fortran | 607.cactuBSSN_s(base, peak)  
------------------------------------------------------------------------------  
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.1.1.217 Build 20200306  
(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
Superdome Flex 280
(2.80 GHz, Intel Xeon Gold 6328HL)

SPECspeed®2017_fp_base = 186
SPECspeed®2017_fp_peak = 187

Compiler Version Notes (Continued)

Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

------------------------------------------------------------------------------
==============================================================================
Fortran         | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
| 654.roms_s(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
==============================================================================
Fortran, C      | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
| 628.pop2_s(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
Base Compiler Invocation

C benchmarks:
icc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort
SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
Superdome Flex 280
(2.80 GHz, Intel Xeon Gold 6328HL)

SPECspeed®2017_fp_base = 186
SPECspeed®2017_fp_peak = 187

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Nov-2020
Hardware Availability: Nov-2020
Software Availability: Apr-2020

Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
assume byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP -mbranches-within-32B-boundaries

Fortran benchmarks:
-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs -mbranches-within-32B-boundaries -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using both Fortran and C:

Benchmarks using Fortran, C, and C++:

Peak Compiler Invocation

C benchmarks:
icc

(Continued on next page)
Peak Compiler Invocation (Continued)

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
619.lbm_s: basepeak = yes
638.imagick_s: basepeak = yes
644.nab_s: -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -gopenmp -DSPEC_OPENMP
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:
603.bwaves_s: basepeak = yes
649.fotonik3d_s: -m64 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-DSPEC_SUPPRESS_OPENMP -DSPEC_OPENMP -ipo -xCORE-AVX512
-O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -gopenmp -nostandard-realloc-lhs
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
654.roms_s: basepeak = yes

(Continued on next page)
Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
Superdome Flex 280  
(2.80 GHz, Intel Xeon Gold 6328HL)  

SPECspeed®2017_fp_base = 186  
SPECspeed®2017_fp_peak = 187

CPU2017 License: 3  
Test Sponsor:  HPE  
Tested by:  HPE

Test Date:  Nov-2020  
Hardware Availability:  Nov-2020  
Software Availability:  Apr-2020

Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C:

621.wrf_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1)  
-prof-use(pass 2) -ipo -xCORE-AVX512 -03 -no-prec-div  
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4

-DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP  
-mbranches-within-32B-boundaries -nostandard-realloc-lhs

-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

627.cam4_s: basepeak = yes

628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: basepeak = yes

The flags files that were used to format this result can be browsed at

http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.3-CLX-revC.html


You can also download the XML flags sources by saving the following links:

http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.3-CLX-revC.xml

http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml

SPEC CPU and SPECspeed are registered trademarks of the Standard Performance Evaluation Corporation. All other brand and product names appearing in this result are trademarks or registered trademarks of their respective holders.

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.0 on 2020-12-02 21:36:16-0500.  
Report generated on 2020-12-28 09:43:56 by CPU2017 PDF formatter v6255.

Originally published on 2020-12-22.