SPEC CPU®2017 Floating Point Rate Result

Hewlett Packard Enterprise

(Test Sponsor: HPE)

Superdome Flex 280
(2.80 GHz, Intel Xeon Gold 6328HL)

$SPECrate®2017\_fp\_base = 429$

$SPECrate®2017\_fp\_peak = 434$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Nov-2020

Hardware Availability: Nov-2020

Software Availability: Apr-2020

Benchmark	Copies	Base	Peak
503.bwaves_r	64	993	993
507.cactuBSSN_r	64	633	
508.namd_r	64	319	
510.parest_r	64	284	284
511.povray_r	64	460	532
519.lbm_r	64	223	
521.wrf_r	64	430	437
526.blender_r	64	364	
527.cam4_r	64	426	
538.imagick_r	64	1020	
544.nab_r	64	613	
549.fotonik3d_r	64	312	
554.roms_r	64	220	220

SPECrate®2017_fp_base (429)
SPECrate®2017_fp_peak (434)

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

Other: None

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) Kernel 4.18.0-193.el8.x86_64

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;

Parallel: No

Firmware: HPE Firmware Bundle Version 1.0.142 released Oct-2020

File System: xfs

System State: Run level 3 (multi-user)

Base Pointers: 64-bit

Peak Pointers: 64-bit

Other: jemalloc memory allocator V5.0.1; HPE Foundation Software 2.4, Build 734.0820.200723T0100.a.rhel82hpe-200723T0100

Power Management: BIOS set to prefer performance at the cost of additional power usage

Standard Performance Evaluation Corporation (info@spec.org) https://www.spec.org/

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Hewlett Packard Enterprise
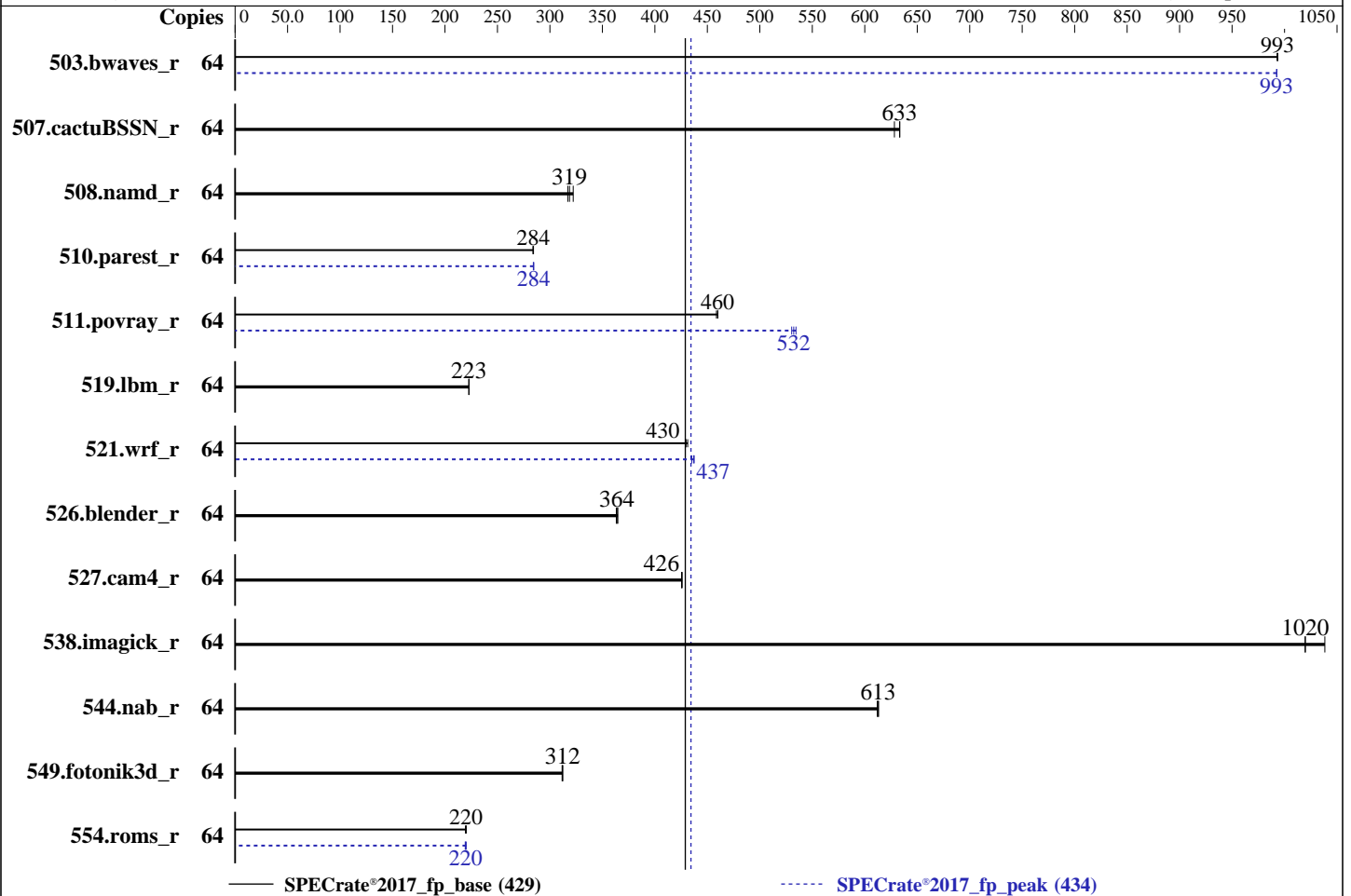(Test Sponsor: HPE)

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(2.80 GHz, Intel Xeon Gold 6328HL)

SPECrate®2017_fp_base = 429

SPECrate®2017_fp_peak = 434

CPU2017 License: 3	**Test Date:** Nov-2020
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Results Table

Benchmark	Base						Peak					
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	64	646	994	646	993	**646**	**993**	64	647	993	647	992	**647**	**993**
507.cactuBSSN_r	64	**128**	**633**	129	628	128	633	64	**128**	**633**	129	628	128	633
508.namd_r	64	192	317	189	322	**191**	**319**	64	192	317	189	322	**191**	**319**
510.parest_r	64	**589**	**284**	590	284	589	284	64	589	284	588	284	**589**	**284**
511.povray_r	64	**325**	**460**	326	459	325	460	64	282	530	280	534	**281**	**532**
519.lbm_r	64	303	223	303	223	**303**	**223**	64	303	223	303	223	**303**	**223**
521.wrf_r	64	334	429	**334**	**430**	332	431	64	328	437	329	435	**328**	**437**
526.blender_r	64	267	365	268	363	**268**	**364**	64	267	365	268	363	**268**	**364**
527.cam4_r	64	263	426	**263**	**426**	263	425	64	263	426	**263**	**426**	263	425
538.imagick_r	64	**156**	**1020**	156	1020	153	1040	64	**156**	**1020**	156	1020	153	1040
544.nab_r	64	176	613	176	612	**176**	**613**	64	176	613	176	612	**176**	**613**
549.fotonik3d_r	64	**799**	**312**	800	312	799	312	64	**799**	**312**	800	312	799	312
554.roms_r	64	462	220	**462**	**220**	463	220	64	**463**	**220**	464	219	462	220
SPECrate®2017_fp_base =	**429**
SPECrate®2017_fp_peak =	**434**

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler.
The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux
The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit'
was used to generate numactl commands to bind each copy to a specific processor.
For details, please see the config file.

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"
Transparent Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:
sync; echo 3>   /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
Tuned-adm profile was set to Throughput-Performance using "tuned-adm profile throughput-performance"

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

(Continued on next page)

Standard Performance Evaluation Corporation (info@spec.org)
https://www.spec.org/

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Hewlett Packard Enterprise

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(2.80 GHz, Intel Xeon Gold 6328HL)

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

Operating System Notes (Continued)

```
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 Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOC_CONF = "retain:true"
```

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.
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
sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases
```

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
  Sub-NUMA Clustering set to Enabled

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
running on ch-620.fchst.rdlabs.hpecorp.net Tue Dec  1 05:51:42 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"
```

(Continued on next page)

Hewlett Packard Enterprise
(Test Sponsor: HPE)

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SPECrate®2017_fp_base = 429

SPECrate®2017_fp_peak = 434

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

Platform Notes (Continued)

```
    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
      Core(s) per socket:   16
      Socket(s):            4
      NUMA node(s):         8
      Vendor ID:            GenuineIntel
      CPU family:           6
      Model:                85
      Model name:           Intel(R) Xeon(R) Gold 6328HL CPU @ 2.80GHz
      Stepping:             11
      CPU MHz:              2905.186
      CPU max MHz:          4300.0000
      CPU min MHz:          1000.0000
      BogoMIPS:             5600.10
      Virtualization:       VT-x
      L1d cache:            32K
      L1i cache:            32K
      L2 cache:             1024K
      L3 cache:             22528K
      NUMA node0 CPU(s):    0-3,8-11
      NUMA node1 CPU(s):    4-7,12-15
      NUMA node2 CPU(s):    16-19,24-27
      NUMA node3 CPU(s):    20-23,28-31
      NUMA node4 CPU(s):    32-35,40-43
      NUMA node5 CPU(s):    36-39,44-47
      NUMA node6 CPU(s):    48-51,56-59
      NUMA node7 CPU(s):    52-55,60-63
      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
      aperfmperf 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
```

(Continued on next page)

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Test Sponsor: HPE	**Hardware Availability:** Nov-2020
Tested by: HPE	**Software Availability:** Apr-2020

Platform Notes (Continued)

```
    invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
    flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
    cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
    avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
    cqm_mbm_local avx512_bf16 dtherm ida arat pln pts pku ospke avx512_vnni md_clear
    flush_l1d 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: 8 nodes (0-7)
   node 0 cpus: 0 1 2 3 8 9 10 11
   node 0 size: 385552 MB
   node 0 free: 383333 MB
   node 1 cpus: 4 5 6 7 12 13 14 15
   node 1 size: 387069 MB
   node 1 free: 385428 MB
   node 2 cpus: 16 17 18 19 24 25 26 27
   node 2 size: 387069 MB
   node 2 free: 385549 MB
   node 3 cpus: 20 21 22 23 28 29 30 31
   node 3 size: 387069 MB
   node 3 free: 385416 MB
   node 4 cpus: 32 33 34 35 40 41 42 43
   node 4 size: 387069 MB
   node 4 free: 385485 MB
   node 5 cpus: 36 37 38 39 44 45 46 47
   node 5 size: 387069 MB
   node 5 free: 385550 MB
   node 6 cpus: 48 49 50 51 56 57 58 59
   node 6 size: 387069 MB
   node 6 free: 385578 MB
   node 7 cpus: 52 53 54 55 60 61 62 63
   node 7 size: 386522 MB
   node 7 free: 385007 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  13  16  16  16  16  24  24
     1:  13  10  16  16  16  16  24  24
     2:  16  16  10  13  24  24  16  16
     3:  16  16  13  10  24  24  16  16
     4:  16  16  24  24  10  13  16  16
     5:  16  16  24  24  13  10  16  16
     6:  24  24  16  16  16  16  10  13
     7:  24  24  16  16  16  16  13  10
```

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Tested by: HPE

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

Platform Notes (Continued)

```
From /proc/meminfo
   MemTotal:       3168760320 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
                                  via prctl and seccomp
CVE-2017-5753 (Spectre variant 1):      Mitigation: usercopy/swapgs barriers and __user
                                  pointer sanitization
CVE-2017-5715 (Spectre variant 2):      Mitigation: Enhanced IBRS, IBPB: conditional,
                                  RSB filling
tsx_async_abort:                        Not affected

run-level 3 Nov 30 21:59

SPEC is set to: /home/cpu2017
   Filesystem             Type  Size  Used Avail Use% Mounted on
```

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

Platform Notes (Continued)

```
    /dev/mapper/rhel-home xfs   876G  188G  688G  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: 1590PID02020001
    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                | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
                 | 544.nab_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++              | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++, C           | 511.povray_r(base) 526.blender_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
```

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Tested by: HPE	**Software Availability:** Apr-2020

Compiler Version Notes (Continued)

```
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++, C          | 511.povray_r(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.
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          | 511.povray_r(base) 526.blender_r(base, peak)
------------------------------------------------------------------------------
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Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
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------------------------------------------------------------------------------


==============================================================================
C++, C          | 511.povray_r(peak)
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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 | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
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
```

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Compiler Version Notes (Continued)

```
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                | 554.roms_r(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      | 521.wrf_r(base) 527.cam4_r(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.
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran, C      | 521.wrf_r(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.
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.
------------------------------------------------------------------------------


==============================================================================
Fortran, C      | 521.wrf_r(base) 527.cam4_r(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.
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran, C      | 521.wrf_r(peak)
```

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SPECrate®2017_fp_base = 429

SPECrate®2017_fp_peak = 434

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

Compiler Version Notes (Continued)

```
-------------------------------------------------------------------------
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.
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.
-------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`icc`

C++ benchmarks:
`icpc`

Fortran benchmarks:
`ifort`

Benchmarks using both Fortran and C:
`ifort icc`

Benchmarks using both C and C++:
`icpc icc`

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

Base Portability Flags

503.bwaves_r: `-DSPEC_LP64`
507.cactuBSSN_r: `-DSPEC_LP64`
508.namd_r: `-DSPEC_LP64`
510.parest_r: `-DSPEC_LP64`
511.povray_r: `-DSPEC_LP64`
519.lbm_r: `-DSPEC_LP64`
521.wrf_r: `-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
526.blender_r: `-DSPEC_LP64 -DSPEC_LINUX -funsigned-char`
527.cam4_r: `-DSPEC_LP64 -DSPEC_CASE_FLAG`
538.imagick_r: `-DSPEC_LP64`
544.nab_r: `-DSPEC_LP64`
549.fotonik3d_r: `-DSPEC_LP64`

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SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

Superdome Flex 280
(2.80 GHz, Intel Xeon Gold 6328HL)

SPECrate®2017_fp_base = 429

SPECrate®2017_fp_peak = 434

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

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

Base Portability Flags (Continued)

554.roms_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

C++ benchmarks:
```
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Fortran benchmarks:
```
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using both Fortran and C:
```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs
-align array32byte -auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using both C and C++:
```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using Fortran, C, and C++:
```
-m64 -qnextgen -std=c11
```

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Superdome Flex 280
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CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Nov-2020

Hardware Availability: Nov-2020

Software Availability: Apr-2020

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
```
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs
-align array32byte -auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Peak Compiler Invocation

C benchmarks:
```
icc
```

C++ benchmarks:
```
icpc
```

Fortran benchmarks:
```
ifort
```

Benchmarks using both Fortran and C:
```
ifort icc
```

Benchmarks using both C and C++:
```
icpc icc
```

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

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

```
519.lbm_r: basepeak = yes
```

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

Peak Optimization Flags (Continued)

538.imagick_r: `basepeak = yes`

544.nab_r: `basepeak = yes`

C++ benchmarks:

508.namd_r: `basepeak = yes`

510.parest_r: `-m64 -qnextgen`
`-Wl,-plugin-opt=-x86-branches-within-32B-boundaries`
`-Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -Ofast`
`-ffast-math -flto -mfpmath=sse -funroll-loops`
`-qopt-mem-layout-trans=4 -L/usr/local/jemalloc64-5.0.1/lib`
`-ljemalloc`

Fortran benchmarks:

503.bwaves_r: `-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries`
`-Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -O3 -ipo`
`-no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-multiple-gather-scatter-by-shuffles`
`-qopt-mem-layout-trans=4 -nostandard-realloc-lhs`
`-align array32byte -auto -mbranches-within-32B-boundaries`
`-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

549.fotonik3d_r: `basepeak = yes`

554.roms_r: `Same as 503.bwaves_r`

Benchmarks using both Fortran and C:

521.wrf_r: `-prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3`
`-ipo -no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-multiple-gather-scatter-by-shuffles`
`-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries`
`-nostandard-realloc-lhs -align array32byte -auto`
`-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

527.cam4_r: `basepeak = yes`

Benchmarks using both C and C++:

511.povray_r: `-prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3`
`-ipo -no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-multiple-gather-scatter-by-shuffles`
`-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries`

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

Superdome Flex 280
(2.80 GHz, Intel Xeon Gold 6328HL)

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

Peak Optimization Flags (Continued)

511.povray_r (continued):
`-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

526.blender_r: `basepeak = yes`

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: `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
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.html

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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

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 2020-12-01 05:51:42-0500.
Report generated on 2020-12-28 09:44:47 by CPU2017 PDF formatter v6255.
Originally published on 2020-12-22.