SPEC CPU®2017 Integer Rate Result

Copyright 2017-2022 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL20 Gen10 Plus
(2.80 GHz, Intel Xeon E-2314)

$SPECrate®2017\_int\_base = 30.0$
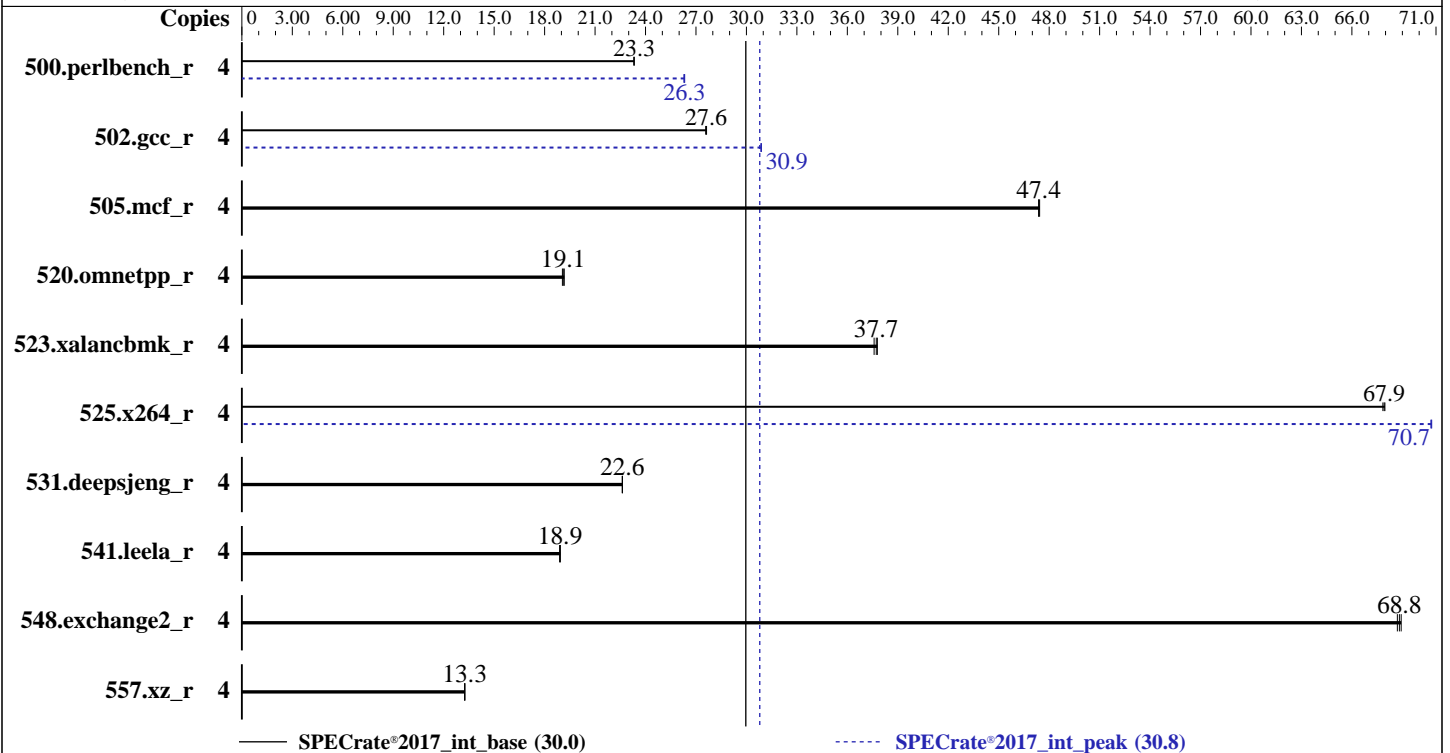
$SPECrate®2017\_int\_peak = 30.8$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Apr-2022

Hardware Availability: Jan-2022

Software Availability: Jun-2021

Copies

Benchmark	Copies	base	peak
500.perlbench_r	4	23.3	26.3
502.gcc_r	4	27.6	30.9
505.mcf_r	4	47.4	
520.omnetpp_r	4	19.1	
523.xalancbmk_r	4	37.7	
525.x264_r	4	67.9	70.7
531.deepsjeng_r	4	22.6	
541.leela_r	4	18.9	
548.exchange2_r	4	68.8	
557.xz_r	4	13.3	

—— SPECrate®2017_int_base (30.0)   ------ SPECrate®2017_int_peak (30.8)

Hardware

CPU Name: Intel Xeon E-2314
 Max MHz: 4500
 Nominal: 2800
Enabled: 4 cores, 1 chip
Orderable: 1 chip
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 512 KB I+D on chip per core
 L3: 8 MB I+D on chip per chip
 Other: None
Memory: 128 GB (4 x 32 GB 2Rx8 PC4-3200AA-E, running at 2933)
Storage: 1 x 480 GB SATA SSD, RAID 0
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP3
 Kernel 5.3.18-57-default
Compiler: C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux;
 Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux;
 C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux
Parallel: No
Firmware: HPE BIOS Version U60 v1.54 01/13/2022 released Jan-2022
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS set to prefer performance at the cost of additional power usage

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Results Table

Benchmark	Base						Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	4	273	23.3	**273**	**23.3**	273	23.3	4	242	26.3	**242**	**26.3**	242	26.3
502.gcc_r	4	**205**	**27.6**	205	27.6	205	27.6	4	**183**	**30.9**	183	30.9	183	30.9
505.mcf_r	4	**136**	**47.4**	136	47.4	136	47.4	4	**136**	**47.4**	136	47.4	136	47.4
520.omnetpp_r	4	274	19.2	275	19.1	**275**	**19.1**	4	274	19.2	275	19.1	**275**	**19.1**
523.xalancbmk_r	4	112	37.6	112	37.8	**112**	**37.7**	4	112	37.6	112	37.8	**112**	**37.7**
525.x264_r	4	103	67.8	103	68.0	**103**	**67.9**	4	99.1	70.7	99.0	70.7	**99.0**	**70.7**
531.deepsjeng_r	4	203	22.6	203	22.6	**203**	**22.6**	4	203	22.6	203	22.6	**203**	**22.6**
541.leela_r	4	350	18.9	351	18.9	**350**	**18.9**	4	350	18.9	351	18.9	**350**	**18.9**
548.exchange2_r	4	153	68.7	152	68.9	**152**	**68.8**	4	153	68.7	152	68.9	**152**	**68.8**
557.xz_r	4	326	13.2	326	13.3	**326**	**13.3**	4	326	13.2	326	13.3	**326**	**13.3**
SPECrate®2017_int_base =		**30.0**											
SPECrate®2017_int_peak =		**30.8**											

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

Submit Notes

The taskset mechanism was used to bind copies to processors. The config file option 'submit'
was used to generate taskset 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

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
    "/home/cpu2017/lib/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/je5.0.1-
    32"
MALLOC_CONF = "retain:true"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
memory using Red Hat Enterprise Linux 8.1

(Continued on next page)

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Test Sponsor:	HPE	**Hardware Availability:**	Jan-2022
Tested by:	HPE	**Software Availability:**	Jun-2021

General Notes (Continued)

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 General Throughput Compute
  Thermal Configuration set to Maximum Cooling
  Enhanced Processor Performance set to Enabled
  Last Level Cache (LLC) prefetch set to Enabled


 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on localhost Sat Apr  2 03:17:49 2022

 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) E-2314 CPU @ 2.80GHz
       1  "physical id"s (chips)
       4 "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 : 4
       siblings  : 4
       physical 0: cores 0 1 2 3

 From lscpu from util-linux 2.36.2:
      Architecture:            x86_64
      CPU op-mode(s):          32-bit, 64-bit
      Byte Order:              Little Endian
      Address sizes:           39 bits physical, 48 bits virtual
      CPU(s):                  4
      On-line CPU(s) list:     0-3
      Thread(s) per core:      1
      Core(s) per socket:      4
      Socket(s):               1
```

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CPU2017 License: 3   **Test Date:**   Apr-2022
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Tested by: HPE   **Software Availability:** Jun-2021

Platform Notes (Continued)

```
        NUMA node(s):                 1
        Vendor ID:                    GenuineIntel
        CPU family:                   6
        Model:                        167
        Model name:                   Intel(R) Xeon(R) E-2314 CPU @ 2.80GHz
        Stepping:                     1
        CPU MHz:                      4049.320
        BogoMIPS:                     5616.00
        Virtualization:               VT-x
        L1d cache:                    192 KiB
        L1i cache:                    128 KiB
        L2 cache:                     2 MiB
        L3 cache:                     8 MiB
        NUMA node0 CPU(s):            0-3
        Vulnerability Itlb multihit:  Not affected
        Vulnerability L1tf:           Not affected
        Vulnerability Mds:            Not affected
        Vulnerability Meltdown:       Not affected
        Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via
        prctl and seccomp
        Vulnerability Spectre v1:          Mitigation; usercopy/swapgs barriers and __user
        pointer sanitization
        Vulnerability Spectre v2:          Mitigation; Enhanced IBRS, IBPB conditional, RSB
        filling
        Vulnerability Srbds:          Not affected
        Vulnerability Tsx async abort:  Not affected
        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 tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx
        smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt
        tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault
        epb invpcid_single ssbd ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority
        ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid mpx avx512f
        avx512dq rdseed adx smap avx512ifma clflushopt intel_pt avx512cd sha_ni avx512bw
        avx512vl xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts avx512vbmi umip pku
        ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq
        rdpid fsrm md_clear flush_l1d arch_capabilities

  From lscpu --cache:
      NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL SETS PHY-LINE COHERENCY-SIZE
      L1d       48K     192K   12 Data            1   64        1             64
      L1i       32K     128K    8 Instruction     1   64        1             64
      L2       512K      2M     8 Unified         2 1024        1             64
      L3        8M       8M    16 Unified         3 8192        1             64

  /proc/cpuinfo cache data
```

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CPU2017 License:	3	**Test Date:**	Apr-2022
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Tested by:	HPE	**Software Availability:**	Jun-2021

Platform Notes (Continued)

```
     cache size : 8192 KB

 From numactl --hardware
 WARNING: a numactl 'node' might or might not correspond to a physical chip.
   available: 1 nodes (0)
   node 0 cpus: 0 1 2 3
   node 0 size: 128744 MB
   node 0 free: 128301 MB
   node distances:
   node   0
     0:  10

 From /proc/meminfo
    MemTotal:       131834044 kB
    HugePages_Total:        0
    Hugepagesize:       2048 kB

 From /etc/*release* /etc/*version*
    os-release:
        NAME="SLES"
        VERSION="15-SP3"
        VERSION_ID="15.3"
        PRETTY_NAME="SUSE Linux Enterprise Server 15 SP3"
        ID="sles"
        ID_LIKE="suse"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:15:sp3"

 uname -a:
    Linux localhost 5.3.18-57-default #1 SMP Wed Apr 28 10:54:41 UTC 2021 (ba3c2e9) x86_64
    x86_64 x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

 CVE-2018-12207 (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
   CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
```

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Platform Notes (Continued)

```
  CVE-2019-11135 (TSX Asynchronous Abort):                Not affected


  run-level 3 Apr 2 03:16


  SPEC is set to: /home/cpu2017
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sda4       xfs   404G   92G  312G  23% /home


  From /sys/devices/virtual/dmi/id
     Vendor:          HPE
     Product:         ProLiant DL20 Gen10 Plus
     Product Family:  ProLiant
     Serial:          SerNum.ACC


  Additional information from dmidecode 3.2 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:
      4x Hynix HMAA4GU7AJR8N-XN 32 GB 2 rank 3200, configured at 2933


  BIOS:
     BIOS Vendor:       HPE
     BIOS Version:      U60
     BIOS Date:         01/13/2022
     BIOS Revision:     1.54
     Firmware Revision: 2.55


  (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C        | 500.perlbench_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
  64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------



==============================================================================
C        | 502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version
  2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

(Continued on next page)

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Compiler Version Notes (Continued)

```
--------------------------------------------------------------------------

==========================================================================
C        | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
         | 525.x264_r(base, peak) 557.xz_r(base, peak)
--------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------


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C        | 500.perlbench_r(peak)
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--------------------------------------------------------------------------


==========================================================================
C        | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
         | 525.x264_r(base, peak) 557.xz_r(base, peak)
--------------------------------------------------------------------------
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--------------------------------------------------------------------------


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C        | 502.gcc_r(peak)
--------------------------------------------------------------------------
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------------------------------------------------------------------------------


==============================================================================
C        | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
         | 525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
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Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++      | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)
         | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

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Base Portability Flags

500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
502.gcc_r: `-DSPEC_LP64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LP64 -DSPEC_LINUX`
525.x264_r: `-DSPEC_LP64`
531.deepsjeng_r: `-DSPEC_LP64`
541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
```
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc
```

C++ benchmarks:
```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc
```

Fortran benchmarks:
```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-auto -mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc
```

Peak Compiler Invocation

C benchmarks (except as noted below):
```
icx
```

500.perlbench_r: `icc`

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Peak Compiler Invocation (Continued)

C++ benchmarks:
`icpx`

Fortran benchmarks:
`ifort`

Peak Portability Flags

500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
502.gcc_r: `-D_FILE_OFFSET_BITS=64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LP64 -DSPEC_LINUX`
525.x264_r: `-DSPEC_LP64`
531.deepsjeng_r: `-DSPEC_LP64`
541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_r: `-DSPEC_LP64`

Peak Optimization Flags

C benchmarks:

500.perlbench_r: `-Wl,-z,muldefs -prof-gen`(pass 1) `-prof-use`(pass 2)
`-xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-mem-layout-trans=4 -fno-strict-overflow`
`-mbranches-within-32B-boundaries`
`-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin`
`-lqkmalloc`

502.gcc_r: `-m32`
`-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/ia32_lin`
`-std=gnu89 -Wl,-z,muldefs -fprofile-generate`(pass 1)
`-fprofile-use=default.profdata`(pass 2) `-xCORE-AVX512 -flto`
`-Ofast`(pass 1) `-O3 -ffast-math -qopt-mem-layout-trans=4`
`-mbranches-within-32B-boundaries`
`-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc`

505.mcf_r: basepeak = yes

525.x264_r: `-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -flto`
`-O3 -ffast-math -qopt-mem-layout-trans=4 -fno-alias`

(Continued on next page)

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Tested by: HPE

Test Date: Apr-2022

Hardware Availability: Jan-2022

Software Availability: Jun-2021

Peak Optimization Flags (Continued)

525.x264_r (continued):
```
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc
```

557.xz_r: `basepeak = yes`

C++ benchmarks:

520.omnetpp_r: `basepeak = yes`

523.xalancbmk_r: `basepeak = yes`

531.deepsjeng_r: `basepeak = yes`

541.leela_r: `basepeak = yes`

Fortran benchmarks:

548.exchange2_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-V1.0-ICX-revE.html
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.html
```

You can also download the XML flags sources by saving the following links:
```
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.0-ICX-revE.xml
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
```

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

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