SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

$SPECrate®2017_int_base = $ 575

ProLiant DL380 Gen11
(2.10 Ghz, Intel Xeon Gold 6448Y)

$SPECrate®2017_int_peak = $ Not Run

CPU2017 License: 3	**Test Date:** Apr-2024
Test Sponsor: HPE	**Hardware Availability:** Dec-2023
Tested by: HPE	**Software Availability:** Mar-2024

Copies

- 500.perlbench_r 128 — 435
- 502.gcc_r 128 — 479
- 505.mcf_r 128 — 964
- 520.omnetpp_r 128 — 384
- 523.xalancbmk_r 128 — 812
- 525.x264_r 128 — 1130
- 531.deepsjeng_r 128 — 415
- 541.leela_r 128 — 397
- 548.exchange2_r 128 — 1220
- 557.xz_r 128 — 276

SPECrate®2017_int_base (575)

Hardware

CPU Name: Intel Xeon Gold 6448Y
  Max MHz: 4100
  Nominal: 2100
Enabled: 64 cores, 2 chips, 2 threads/core
Orderable: 1, 2 chips
Cache L1: 32 KB I + 48 KB D on chip per core
  L2: 2 MB I+D on chip per core
  L3: 60 MB I+D on chip per chip
  Other: None
Memory: 512 GB (16 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 960 GB SATA SSD
Other: CPU Cooling: Air

Software

OS: SUSE Linux Enterprise Server 15 SP4
  Kernel 5.14.21-150400.22-default
Compiler: C/C++: Version 2024.0.2 of Intel oneAPI DPC++/C++ Compiler for Linux;
  Fortran: Version 2024.0.2 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: HPE BIOS Version v2.12 12/13/2023 released Dec-2023
File System: btrfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: BIOS and OS 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
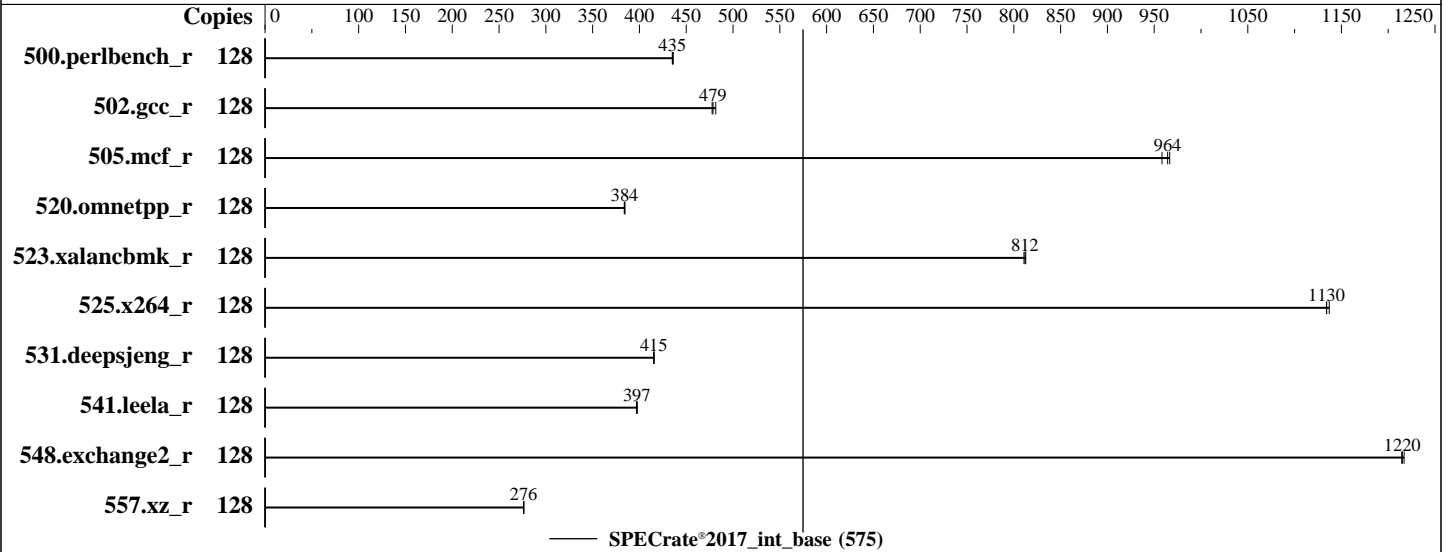(Test Sponsor: HPE)

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	128	468	435	467	436	**468**	**435**							
502.gcc_r	128	**379**	**479**	379	478	376	482							
505.mcf_r	128	216	958	214	967	**214**	**964**							
520.omnetpp_r	128	438	384	437	385	**437**	**384**							
523.xalancbmk_r	128	167	811	166	813	**166**	**812**							
525.x264_r	128	**198**	**1130**	197	1140	198	1130							
531.deepsjeng_r	128	**353**	**415**	353	416	353	415							
541.leela_r	128	**534**	**397**	533	398	534	397							
548.exchange2_r	128	276	1220	276	1210	**276**	**1220**							
557.xz_r	128	501	276	500	277	**500**	**276**							

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

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>

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 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
memory using Red Hat Enterprise Linux 8.4
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
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.

(Continued on next page)

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Software Availability: Mar-2024

General Notes (Continued)

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.

Platform Notes

```
BIOS Configuration:
 Workload Profile set to General Throughput Compute
 Thermal Configuration set to Maximum Cooling
 Memory Patrol Scrubbing set to Disabled
 Enhanced Processor Performance Profile set to Aggressive
 Last Level Cache (LLC) Dead Line Allocation set to Disabled
 Workload Profile set to Custom
  Adjacent Sector Prefetch set to Disabled
  DCU Stream Prefetcher set to Disabled
  Minimum Processor Idle Power Package C-State set to Package C6 (non-retention) State

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Mon Apr 15 00:09:27 2024

 SUT (System Under Test) info as seen by some common utilities.

 ------------------------------------------------------------
 Table of contents
 ------------------------------------------------------------
  1. uname -a
  2. w
  3. Username
  4. ulimit -a
  5. sysinfo process ancestry
  6. /proc/cpuinfo
  7. lscpu
  8. numactl --hardware
  9. /proc/meminfo
 10. who -r
 11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
 12. Services, from systemctl list-unit-files
 13. Linux kernel boot-time arguments, from /proc/cmdline
 14. cpupower frequency-info
 15. tuned-adm active
 16. sysctl
 17. /sys/kernel/mm/transparent_hugepage
 18. /sys/kernel/mm/transparent_hugepage/khugepaged
 19. OS release
 20. Disk information
 21. /sys/devices/virtual/dmi/id
 22. dmidecode
 23. BIOS
 ------------------------------------------------------------


 ------------------------------------------------------------
 1. uname -a
   Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222)
   x86_64 x86_64 x86_64 GNU/Linux


 ------------------------------------------------------------
 2. w
   00:09:27 up  9:04,  1 user,  load average: 0.00, 0.01, 0.00
    USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
```

(Continued on next page)

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Platform Notes (Continued)

```
   root     tty1         -                00:07   1:03   0.02s  0.02s -bash


   ------------------------------------------------------------
   3. Username
     From environment variable $USER:  root


   ------------------------------------------------------------
   4. ulimit -a
     core file size          (blocks, -c) unlimited
     data seg size           (kbytes, -d) unlimited
     scheduling priority             (-e) 0
     file size               (blocks, -f) unlimited
     pending signals                 (-i) 2062602
     max locked memory       (kbytes, -l) 64
     max memory size         (kbytes, -m) unlimited
     open files                      (-n) 1024
     pipe size            (512 bytes, -p) 8
     POSIX message queues     (bytes, -q) 819200
     real-time priority              (-r) 0
     stack size              (kbytes, -s) unlimited
     cpu time               (seconds, -t) unlimited
     max user processes              (-u) 2062602
     virtual memory          (kbytes, -v) unlimited
     file locks                      (-x) unlimited


   ------------------------------------------------------------
   5. sysinfo process ancestry
    /usr/lib/systemd/systemd --switched-root --system --deserialize 30
    sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
    sshd: root@notty
    bash -c cd $SPEC/ && $SPEC/intrate.sh
    runcpu --nobuild --action validate --define default-platform-flags --define numcopies=128 -c
      ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --define smt-on --define cores=64 --define physicalfirst
      --define invoke_with_interleave --define drop_caches --tune base -o all intrate
    runcpu --nobuild --action validate --define default-platform-flags --define numcopies=128 --configfile
      ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --define smt-on --define cores=64 --define physicalfirst
      --define invoke_with_interleave --define drop_caches --tune base --output_format all --nopower --runmode
      rate --tune base --size refrate intrate --nopreenv --note-preenv --logfile
      $SPEC/tmp/CPU2017.001/templogs/preenv.intrate.001.0.log --lognum 001.0 --from_runcpu 2
    specperl $SPEC/bin/sysinfo
   $SPEC = /home/cpu2017


   ------------------------------------------------------------
   6. /proc/cpuinfo
       model name      : Intel(R) Xeon(R) Gold 6448Y
       vendor_id       : GenuineIntel
       cpu family      : 6
       model           : 143
       stepping        : 8
       microcode       : 0x2b000571
       bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
       cpu cores       : 32
       siblings        : 64
       2 physical ids (chips)
       128 processors (hardware threads)
       physical id 0: core ids 0-31
       physical id 1: core ids 0-31
       physical id 0: apicids 0-63
       physical id 1: apicids 128-191
     Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
```

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Platform Notes (Continued)

```
   virtualized systems.  Use the above data carefully.


    -----------------------------------------------------------
    7. lscpu

    From lscpu from util-linux 2.37.2:
      Architecture:               x86_64
      CPU op-mode(s):             32-bit, 64-bit
      Address sizes:              46 bits physical, 57 bits virtual
      Byte Order:                 Little Endian
      CPU(s):                     128
      On-line CPU(s) list:        0-127
      Vendor ID:                  GenuineIntel
      Model name:                 Intel(R) Xeon(R) Gold 6448Y
      CPU family:                 6
      Model:                      143
      Thread(s) per core:         2
      Core(s) per socket:         32
      Socket(s):                  2
      Stepping:                   8
      BogoMIPS:                   4200.00
      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 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 cat_l2 cdp_l3
                                  invpcid_single cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow
                                  vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep
                                  bmi2 erms invpcid rtm cqm rdt_a avx512f avx512dq rdseed adx smap
                                  avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl
                                  xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
                                  cqm_mbm_local split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm ida
                                  arat pln pts avx512vbmi umip pku ospke waitpkg avx512_vbmi2 gfni vaes
                                  vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid
                                  bus_lock_detect cldemote movdiri movdir64b enqcmd fsrm md_clear serialize
                                  tsxldtrk pconfig arch_lbr avx512_fp16 amx_tile flush_l1d arch_capabilities
      Virtualization:             VT-x
      L1d cache:                  3 MiB (64 instances)
      L1i cache:                  2 MiB (64 instances)
      L2 cache:                   128 MiB (64 instances)
      L3 cache:                   120 MiB (2 instances)
      NUMA node(s):               4
      NUMA node0 CPU(s):          0-15,64-79
      NUMA node1 CPU(s):          16-31,80-95
      NUMA node2 CPU(s):          32-47,96-111
      NUMA node3 CPU(s):          48-63,112-127
      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

    From lscpu --cache:
         NAME ONE-SIZE ALL-SIZE WAYS TYPE         LEVEL  SETS PHY-LINE COHERENCY-SIZE
```

(Continued on next page)

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Platform Notes (Continued)

```
     L1d       48K       3M  12 Data          1   64      1        64
     L1i       32K       2M   8 Instruction   1   64      1        64
     L2         2M     128M  16 Unified       2 2048      1        64
     L3        60M     120M  15 Unified       3 65536     1        64


    ------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 4 nodes (0-3)
  node 0 cpus: 0-15,64-79
  node 0 size: 128709 MB
  node 0 free: 127561 MB
  node 1 cpus: 16-31,80-95
  node 1 size: 129015 MB
  node 1 free: 128629 MB
  node 2 cpus: 32-47,96-111
  node 2 size: 128981 MB
  node 2 free: 128565 MB
  node 3 cpus: 48-63,112-127
  node 3 size: 128969 MB
  node 3 free: 128158 MB
  node distances:
  node   0   1   2   3
    0:  10  20  30  30
    1:  20  10  30  30
    2:  30  30  10  20
    3:  30  30  20  10


    ------------------------------------------------------------
9. /proc/meminfo
   MemTotal:     528051588 kB


    ------------------------------------------------------------
10. who -r
  run-level 3 Apr 14 15:07


    ------------------------------------------------------------
11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
   Default Target  Status
   multi-user      running


    ------------------------------------------------------------
12. Services, from systemctl list-unit-files
   STATE            UNIT FILES
   enabled          ModemManager YaST2-Firstboot YaST2-Second-Stage apparmor auditd bluetooth cron
                    display-manager getty@ haveged irqbalance iscsi issue-generator kbdsettings klog
                    lvm2-monitor nscd postfix purge-kernels rollback rsyslog smartd sshd wicked wickedd-auto4
                    wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny wpa_supplicant
   enabled-runtime  systemd-remount-fs
   disabled         NetworkManager NetworkManager-dispatcher NetworkManager-wait-online accounts-daemon
                    appstream-sync-cache autofs autoyast-initscripts blk-availability bluetooth-mesh
                    boot-sysctl ca-certificates chrony-wait chronyd console-getty cups cups-browsed
                    debug-shell dnsmasq ebtables exchange-bmc-os-info firewalld gpm grub2-once
                    haveged-switch-root hwloc-dump-hwdata ipmi ipmievd iscsi-init iscsid iscsiuio
                    issue-add-ssh-keys kexec-load lunmask man-db-create multipathd nfs nfs-blkmap
                    nm-cloud-setup nmb openvpn@ ostree-remount pppoe pppoe-server rdisc rpcbind rpmconfigcheck
                    rsyncd rtkit-daemon serial-getty@ smartd_generate_opts smb snmpd snmptrapd
                    speech-dispatcherd systemd-boot-check-no-failures systemd-network-generator systemd-sysext
                    systemd-time-wait-sync systemd-timesyncd tuned udisks2 upower wpa_supplicant@
   indirect         pcscd saned@ wickedd
```

(Continued on next page)

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Platform Notes (Continued)

```
----------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
   root=UUID=665be65a-9872-42fc-9af6-8e6fd32cb465
   splash=silent
   mitigations=auto
   quiet
   security=apparmor


----------------------------------------------------------
14. cpupower frequency-info
   analyzing CPU 0:
     Unable to determine current policy
     boost state support:
       Supported: yes
       Active: yes


----------------------------------------------------------
15. tuned-adm active
   No current active profile.


----------------------------------------------------------
16. sysctl
   kernel.numa_balancing            1
   kernel.randomize_va_space        2
   vm.compaction_proactiveness      20
   vm.dirty_background_bytes        0
   vm.dirty_background_ratio        10
   vm.dirty_bytes                   0
   vm.dirty_expire_centisecs        3000
   vm.dirty_ratio                   20
   vm.dirty_writeback_centisecs     500
   vm.dirtytime_expire_seconds      43200
   vm.extfrag_threshold             500
   vm.min_unmapped_ratio            1
   vm.nr_hugepages                  0
   vm.nr_hugepages_mempolicy        0
   vm.nr_overcommit_hugepages       0
   vm.swappiness                    60
   vm.watermark_boost_factor        15000
   vm.watermark_scale_factor        10
   vm.zone_reclaim_mode             0


----------------------------------------------------------
17. /sys/kernel/mm/transparent_hugepage
   defrag          always defer defer+madvise [madvise] never
   enabled         [always] madvise never
   hpage_pmd_size  2097152
   shmem_enabled   always within_size advise [never] deny force


----------------------------------------------------------
18. /sys/kernel/mm/transparent_hugepage/khugepaged
   alloc_sleep_millisecs   60000
   defrag                  1
   max_ptes_none           511
   max_ptes_shared         256
   max_ptes_swap           64
   pages_to_scan           4096
   scan_sleep_millisecs    10000
```

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Platform Notes (Continued)

```
   ----------------------------------------------------------------
   19. OS release
     From /etc/*-release /etc/*-version
     os-release SUSE Linux Enterprise Server 15 SP4

   ----------------------------------------------------------------
   20. Disk information
   SPEC is set to: /home/cpu2017
     Filesystem      Type   Size  Used Avail Use% Mounted on
     /dev/sdb2       btrfs  447G   17G  430G   4% /home

   ----------------------------------------------------------------
   21. /sys/devices/virtual/dmi/id
       Vendor:          HPE
       Product:         ProLiant DL380 Gen11
       Product Family:  ProLiant
       Serial:          CNX21000G3

   ----------------------------------------------------------------
   22. dmidecode
     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:
       2x Hynix HMCG88AEBRA168N 32 GB 2 rank 4800
       12x Hynix HMCG88MEBRA113N 32 GB 2 rank 4800
       2x Hynix HMCG88MEBRA115N 32 GB 2 rank 4800


   ----------------------------------------------------------------
   23. BIOS
   (This section combines info from /sys/devices and dmidecode.)
      BIOS Vendor:       HPE
      BIOS Version:      2.12
      BIOS Date:         12/13/2023
      BIOS Revision:     2.12
      Firmware Revision: 1.52
```

Compiler Version Notes

```
==============================================================================
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base) 525.x264_r(base) 557.xz_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++     | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base) 541.leela_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base)
------------------------------------------------------------------------------
```

(Continued on next page)

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Compiler Version Notes (Continued)

```
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
-------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`icx`

C++ benchmarks:
`icpx`

Fortran benchmarks:
`ifx`

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 -xsapphirerapids -O3 -ffast-math`
`-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
`-L/opt/intel/oneapi/compiler/2024.0/lib -lqkmalloc`

C++ benchmarks:
`-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math`
`-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
`-L/opt/intel/oneapi/compiler/2024.0/lib -lqkmalloc`

Fortran benchmarks:
`-w -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math -flto`

(Continued on next page)

SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL380 Gen11
(2.10 Ghz, Intel Xeon Gold 6448Y)

SPECrate®2017_int_base =   575

SPECrate®2017_int_peak = Not Run

CPU2017 License:	3	**Test Date:**	Apr-2024
Test Sponsor:	HPE	**Hardware Availability:**	Dec-2023
Tested by:	HPE	**Software Availability:**	Mar-2024

Base Optimization Flags (Continued)

Fortran benchmarks (continued):

```
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-L/opt/intel/oneapi/compiler/2024.0/lib -lqkmalloc
```

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

http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.html
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-SPR-rev3.0.html

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

http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-SPR-rev3.0.xml

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

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