SPEC CPU®2017 Floating Point Rate Result

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Dell Inc.

PowerEdge XE9640 (Intel Xeon Platinum 8470)

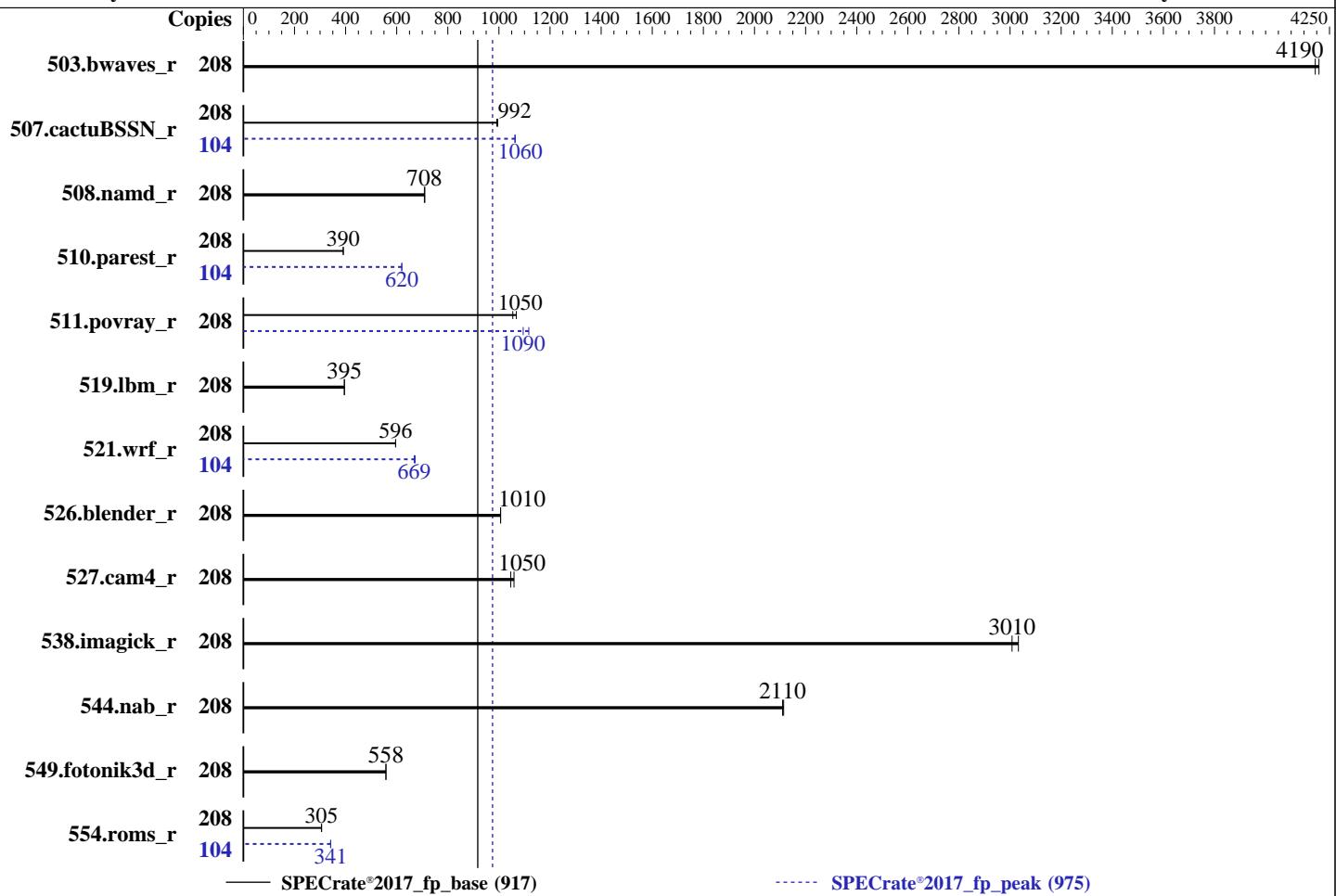$SPECrate®2017\_fp\_base = 917$

$SPECrate®2017\_fp\_peak = 975$

CPU2017 License: 6573

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Jun-2023

Hardware Availability: Sep-2023

Software Availability: Dec-2022

Benchmark	Copies	base	peak
503.bwaves_r	208	4190	
507.cactuBSSN_r	208 / 104	992	1060
508.namd_r	208	708	
510.parest_r	208 / 104	390	620
511.povray_r	208	1050	1090
519.lbm_r	208	395	
521.wrf_r	208 / 104	596	669
526.blender_r	208	1010	
527.cam4_r	208	1050	
538.imagick_r	208	3010	
544.nab_r	208	2110	
549.fotonik3d_r	208	558	
554.roms_r	208 / 104	305	341

SPECrate®2017_fp_base (917) SPECrate®2017_fp_peak (975)

Hardware

CPU Name: Intel Xeon Platinum 8470
 Max MHz: 3800
 Nominal: 2000
Enabled: 104 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: 105 MB I+D on chip per chip
 Other: None
Memory: 1 TB (16 x 64 GB 2Rx4 PC5-4800B-R)
Storage: 120 GB on tmpfs
Other: None

Software

OS: Red Hat Enterprise Linux 9.0 (Plow)
 5.14.0-70.13.1.el9_0.x86_64
Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;
 Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: Version 0.5.33 released May-2023
File System: tmpfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage.

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CPU2017 License: 6573	**Test Date:**	Jun-2023
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Results Table

	Base							Peak						
Benchmark	**Copies**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Copies**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Seconds**	**Ratio**
503.bwaves_r	208	**497**	**4190**	496	4210			208	**497**	**4190**	496	4210		
507.cactuBSSN_r	208	**266**	**992**	265	995			104	124	1060	**124**	**1060**		
508.namd_r	208	278	710	**279**	**708**			208	278	710	**279**	**708**		
510.parest_r	208	1391	391	**1394**	**390**			104	439	620	**439**	**620**		
511.povray_r	208	455	1070	**461**	**1050**			208	435	1120	**444**	**1090**		
519.lbm_r	208	**555**	**395**	554	395			208	**555**	**395**	554	395		
521.wrf_r	208	**782**	**596**	782	596			104	347	672	**348**	**669**		
526.blender_r	208	**315**	**1010**	315	1010			208	**315**	**1010**	315	1010		
527.cam4_r	208	**348**	**1050**	344	1060			208	**348**	**1050**	344	1060		
538.imagick_r	208	171	3030	**172**	**3010**			208	171	3030	**172**	**3010**		
544.nab_r	208	**166**	**2110**	166	2110			208	**166**	**2110**	166	2110		
549.fotonik3d_r	208	1453	558	**1453**	**558**			208	1453	558	**1453**	**558**		
554.roms_r	208	**1082**	**305**	1079	306			104	**484**	**341**	484	342		
SPECrate®2017_fp_base =		**917**												
SPECrate®2017_fp_peak =		**975**												

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"

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/mnt/ramdisk/cpu2017-1.1.9-ic2023.0/lib/intel64:/mnt/ramdisk/cpu2017-1.1.9-ic2023.0/je5.0.1-64"
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
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>
jemalloc, a general purpose malloc implementation

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General Notes (Continued)

```
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

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.

Benchmark run from a 120 GB ramdisk created with the cmd: "mount -t tmpfs -o size=120G tmpfs /mnt/ramdisk"
```

Platform Notes

```
BIOS settings:
                 ADDDC Setting : Disabled
         DIMM Self Healing on
    Uncorrectable Memory Error : Disabled
     Virtualization Technology : Disabled
       DCU Streamer Prefetcher : Disabled
              Sub NUMA Cluster : 4-way Clustering
                  LLC Prefetch : Disabled
          Dead Line LLC Alloc : Disabled
                Optimizer Mode : Enabled

                System Profile : Custom
         CPU Power Management : Maximum Performance
                           C1E : Disabled
                      C States : Autonomous
           Memory Patrol Scrub : Disabled
      Energy Efficiency Policy : Performance
             PCI ASPM L1 Link
              Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.9-ic2023.0/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Thu Jun  1 23:27:03 2023

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 250 (250-6.el9_0)
 12. Services, from systemctl list-unit-files
 13. Linux kernel boot-time arguments, from /proc/cmdline
 14. cpupower frequency-info
 15. sysctl
```

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Platform Notes (Continued)

```
  16. /sys/kernel/mm/transparent_hugepage
  17. /sys/kernel/mm/transparent_hugepage/khugepaged
  18. OS release
  19. Disk information
  20. /sys/devices/virtual/dmi/id
  21. dmidecode
  22. BIOS
    -----------------------------------------------------------

    -----------------------------------------------------------
  1. uname -a
    Linux localhost.localdomain 5.14.0-70.13.1.el9_0.x86_64 #1 SMP PREEMPT Thu Apr 14 12:42:38 EDT 2022 x86_64
    x86_64 x86_64 GNU/Linux

    -----------------------------------------------------------
  2. w
     23:27:03 up  4:24,  1 user,  load average: 132.17, 189.61, 200.66
    USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
    root     tty1       19:03    4:22m  1.59s  0.00s /bin/bash ./dell-run-speccpu.sh rate --define
    DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1 --define DL-BIOS-VirtD=1 --define DL-BIOS-SNC=4
    --define DL-VERS=v4.6 --define DL-LQC=1 --output_format html,pdf,txt

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

    -----------------------------------------------------------
  4. ulimit -a
    real-time non-blocking time  (microseconds, -R) unlimited
    core file size              (blocks, -c) 0
    data seg size               (kbytes, -d) unlimited
    scheduling priority               (-e) 0
    file size                   (blocks, -f) unlimited
    pending signals                   (-i) 4123882
    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) 4123882
    virtual memory              (kbytes, -v) unlimited
    file locks                        (-x) unlimited

    -----------------------------------------------------------
  5. sysinfo process ancestry
    /usr/lib/systemd/systemd rhgb --switched-root --system --deserialize 31
    login -- root
    -bash
    /bin/bash ./DELL_rate.sh
    /bin/bash ./dell-run-main.sh rate
    /bin/bash ./dell-run-main.sh rate
    /bin/bash ./dell-run-speccpu.sh rate --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1
      --define DL-BIOS-VirtD=1 --define DL-BIOS-SNC=4 --define DL-VERS=v4.6 --define DL-LQC=1 --output_format
      html,pdf,txt
    /bin/bash ./dell-run-speccpu.sh rate --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1
      --define DL-BIOS-VirtD=1 --define DL-BIOS-SNC=4 --define DL-VERS=v4.6 --define DL-LQC=1 --output_format
      html,pdf,txt
```

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Platform Notes (Continued)

```
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=208 -c
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=104 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base,peak -o all --iterations 2 --define
   DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1 --define DL-BIOS-VirtD=1 --define DL-BIOS-SNC=4
   --define DL-VERS=v4.6 --define DL-LQC=1 --output_format html,pdf,txt fprate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=208 --configfile
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=104 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base,peak --output_format all --iterations 2
   --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-adddcD=1 --define DL-BIOS-VirtD=1 --define
   DL-BIOS-SNC=4 --define DL-VERS=v4.6 --define DL-LQC=1 --output_format html,pdf,txt --nopower --runmode
   rate --tune base:peak --size refrate fprate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.002/templogs/preenv.fprate.002.0.log --lognum 002.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /mnt/ramdisk/cpu2017-1.1.9-ic2023.0


 ----------------------------------------------------------
6. /proc/cpuinfo
    model name      : Intel(R) Xeon(R) Platinum 8470
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 143
    stepping        : 6
    microcode       : 0x2b0004b1
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
    cpu cores       : 52
    siblings        : 104
    2 physical ids (chips)
    208 processors (hardware threads)
    physical id 0: core ids 0-51
    physical id 1: core ids 0-51
    physical id 0: apicids 0-103
    physical id 1: apicids 128-231
  Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
  virtualized systems.  Use the above data carefully.


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

From lscpu from util-linux 2.37.4:
  Architecture:           x86_64
  CPU op-mode(s):         32-bit, 64-bit
  Address sizes:          52 bits physical, 57 bits virtual
  Byte Order:             Little Endian
  CPU(s):                 208
  On-line CPU(s) list:    0-207
  Vendor ID:              GenuineIntel
  BIOS Vendor ID:         Intel
  Model name:             Intel(R) Xeon(R) Platinum 8470
  BIOS Model name:        Intel(R) Xeon(R) Platinum 8470
  CPU family:             6
  Model:                  143
  Thread(s) per core:     2
  Core(s) per socket:     52
  Socket(s):              2
  Stepping:               6
  BogoMIPS:               4000.00
  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
```

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```
                             ds_cpl 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 fsgsbase tsc_adjust bmi1
                             avx2 smep bmi2 erms invpcid 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
   L1d cache:                4.9 MiB (104 instances)
   L1i cache:                3.3 MiB (104 instances)
   L2 cache:                 208 MiB (104 instances)
   L3 cache:                 210 MiB (2 instances)
   NUMA node(s):             8
   NUMA node0 CPU(s):        0,10,18,26,30,38,46,54,66,72,80,88,96,104,114,122,130,134,142,150,158,170,
                             176,184,192,200
   NUMA node1 CPU(s):        4,14,22,34,42,50,58,62,70,76,84,92,100,108,118,126,138,146,154,162,166,174
                             ,180,188,196,204
   NUMA node2 CPU(s):        2,12,20,28,32,40,48,56,68,74,82,90,98,106,116,124,132,136,144,152,160,172,
                             178,186,194,202
   NUMA node3 CPU(s):        6,8,16,24,36,44,52,60,64,78,86,94,102,110,112,120,128,140,148,156,164,168,
                             182,190,198,206
   NUMA node4 CPU(s):        1,9,15,23,31,33,41,47,55,73,81,89,97,105,113,119,127,135,137,145,151,159,1
                             77,185,193,201
   NUMA node5 CPU(s):        5,13,19,27,37,51,59,65,69,77,85,93,101,109,117,123,131,141,155,163,169,173
                             ,181,189,197,205
   NUMA node6 CPU(s):        3,11,17,25,35,43,49,57,63,75,83,91,99,107,115,121,129,139,147,153,161,167,
                             179,187,195,203
   NUMA node7 CPU(s):        7,21,29,39,45,53,61,67,71,79,87,95,103,111,125,133,143,149,157,165,171,175
                             ,183,191,199,207
   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
   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
       L1d      48K     4.9M   12 Data           1     64      1           64
       L1i      32K     3.3M    8 Instruction    1     64      1           64
       L2        2M     208M   16 Unified        2   2048      1           64
       L3      105M     210M   15 Unified        3 114688      1           64

   ------------------------------------------------------------
   8. numactl --hardware
   NOTE: a numactl 'node' might or might not correspond to a physical chip.
     available: 8 nodes (0-7)
     node 0 cpus: 0,10,18,26,30,38,46,54,66,72,80,88,96,104,114,122,130,134,142,150,158,170,176,184,192,200
     node 0 size: 127958 MB
     node 0 free: 117966 MB
     node 1 cpus: 4,14,22,34,42,50,58,62,70,76,84,92,100,108,118,126,138,146,154,162,166,174,180,188,196,204
     node 1 size: 129018 MB
     node 1 free: 128098 MB
```

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Platform Notes (Continued)

```
  node 2 cpus: 2,12,20,28,32,40,48,56,68,74,82,90,98,106,116,124,132,136,144,152,160,172,178,186,194,202
  node 2 size: 129018 MB
  node 2 free: 128095 MB
  node 3 cpus: 6,8,16,24,36,44,52,60,64,78,86,94,102,110,112,120,128,140,148,156,164,168,182,190,198,206
  node 3 size: 129018 MB
  node 3 free: 128095 MB
  node 4 cpus: 1,9,15,23,31,33,41,47,55,73,81,89,97,105,113,119,127,135,137,145,151,159,177,185,193,201
  node 4 size: 129018 MB
  node 4 free: 128070 MB
  node 5 cpus: 5,13,19,27,37,51,59,65,69,77,85,93,101,109,117,123,131,141,155,163,169,173,181,189,197,205
  node 5 size: 128981 MB
  node 5 free: 128042 MB
  node 6 cpus: 3,11,17,25,35,43,49,57,63,75,83,91,99,107,115,121,129,139,147,153,161,167,179,187,195,203
  node 6 size: 129018 MB
  node 6 free: 128105 MB
  node 7 cpus: 7,21,29,39,45,53,61,67,71,79,87,95,103,111,125,133,143,149,157,165,171,175,183,191,199,207
  node 7 size: 128998 MB
  node 7 free: 128040 MB
  node distances:
  node   0   1   2   3   4   5   6   7
    0:  10  12  12  12  21  21  21  21
    1:  12  10  12  12  21  21  21  21
    2:  12  12  10  12  21  21  21  21
    3:  12  12  12  10  21  21  21  21
    4:  21  21  21  21  10  12  12  12
    5:  21  21  21  21  12  10  12  12
    6:  21  21  21  21  12  12  10  12
    7:  21  21  21  21  12  12  12  10


  ------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       1055775984 kB


  ------------------------------------------------------------
10. who -r
   run-level 3 Jun 1 19:03


  ------------------------------------------------------------
11. Systemd service manager version: systemd 250 (250-6.el9_0)
   Default Target  Status
   multi-user      running


  ------------------------------------------------------------
12. Services, from systemctl list-unit-files
   STATE             UNIT FILES
   enabled           ModemManager NetworkManager NetworkManager-dispatcher NetworkManager-wait-online
                     accounts-daemon atd auditd avahi-daemon bluetooth chronyd crond cups dbus-broker firewalld
                     gdm getty@ insights-client-boot irqbalance iscsi iscsi-onboot kdump libstoragemgmt
                     low-memory-monitor lvm2-monitor mcelog mdmonitor microcode multipathd nis-domainname
                     nvmefc-boot-connections ostree-remount power-profiles-daemon qemu-guest-agent rhsmcertd
                     rsyslog rtkit-daemon selinux-autorelabel-mark smartd sshd sssd switcheroo-control
                     systemd-network-generator udisks2 upower vgauthd vmtoolsd
   enabled-runtime   systemd-remount-fs
   disabled          arp-ethers blk-availability brltty canberra-system-bootup canberra-system-shutdown
                     canberra-system-shutdown-reboot chrony-wait cni-dhcp console-getty cpupower cups-browsed
                     dbus-daemon debug-shell dnsmasq iprdump iprinit iprupdate iscsid iscsiuio kpatch kvm_stat
                     ledmon man-db-restart-cache-update nftables nvmf-autoconnect podman podman-auto-update
                     podman-restart psacct ras-mc-ctl rasdaemon rdisc rhcd rhsm rhsm-facts rpmdb-rebuild
                     serial-getty@ speech-dispatcherd sshd-keygen@ systemd-boot-check-no-failures
                     systemd-pstore systemd-sysext wpa_supplicant
```

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Software Availability: Dec-2022

Platform Notes (Continued)

```
   indirect          spice-vdagentd sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo

  ------------------------------------------------------------
  13. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=(hd0,gpt2)/vmlinuz-5.14.0-70.13.1.el9_0.x86_64
    root=/dev/mapper/rhel-root
    ro
    crashkernel=1G-4G:192M,4G-64G:256M,64G-:512M
    resume=/dev/mapper/rhel-swap
    rd.lvm.lv=rhel/root
    rd.lvm.lv=rhel/swap
    rhgb
    quiet

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

  ------------------------------------------------------------
  15. 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

  ------------------------------------------------------------
  16. /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

  ------------------------------------------------------------
  17. /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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Dell Inc.

PowerEdge XE9640 (Intel Xeon Platinum 8470)

$SPECrate^{®}2017\_fp\_base = 917$

$SPECrate^{®}2017\_fp\_peak = 975$

CPU2017 License: 6573		**Test Date:**	Jun-2023
Test Sponsor: Dell Inc.		**Hardware Availability:** Sep-2023
Tested by: Dell Inc.		**Software Availability:** Dec-2022

Platform Notes (Continued)

```
          ----------------------------------------------------------
          18. OS release
            From /etc/*-release /etc/*-version
            os-release    Red Hat Enterprise Linux 9.0 (Plow)
            redhat-release Red Hat Enterprise Linux release 9.0 (Plow)
            system-release Red Hat Enterprise Linux release 9.0 (Plow)


          ----------------------------------------------------------
          19. Disk information
          SPEC is set to: /mnt/ramdisk/cpu2017-1.1.9-ic2023.0
            Filesystem      Type   Size  Used Avail Use% Mounted on
            tmpfs           tmpfs  120G  4.2G  116G   4% /mnt/ramdisk


          ----------------------------------------------------------
          20. /sys/devices/virtual/dmi/id
            Vendor:         Dell Inc.
            Product:        PowerEdge XE9640
            Product Family: PowerEdge
            Serial:         MS01513


          ----------------------------------------------------------
          21. dmidecode
            Additional information from dmidecode 3.3 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:
              14x 00AD063200AD HMCG94MEBRA109N 64 GB 2 rank 4800
              2x 00CE00B300CE M321R8GA0BB0-CQKEG 64 GB 2 rank 4800


          ----------------------------------------------------------
          22. BIOS
          (This section combines info from /sys/devices and dmidecode.)
            BIOS Vendor:    Dell Inc.
            BIOS Version:   0.5.33
            BIOS Date:      05/18/2023
            BIOS Revision:  0.5
```

Compiler Version Notes

```
==============================================================================
C           | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++         | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++, C      | 511.povray_r(base, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
```

(Continued on next page)

Dell Inc.

PowerEdge XE9640 (Intel Xeon Platinum 8470)

$SPECrate^{®}2017\_fp\_base = 917$

$SPECrate^{®}2017\_fp\_peak = 975$

CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Jun-2023
Hardware Availability: Sep-2023
Software Availability: Dec-2022

Compiler Version Notes (Continued)

```
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------------------------------------

============================================================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------------------------------------

============================================================================================================
Fortran        | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)
------------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------------------------------------

============================================================================================================
Fortran, C     | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
------------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`icx`

C++ benchmarks:
`icpx`

Fortran benchmarks:
`ifx`

Benchmarks using both Fortran and C:
`ifx icx`

Benchmarks using both C and C++:
`icpx icx`

Benchmarks using Fortran, C, and C++:
`icpx icx ifx`

SPEC CPU®2017 Floating Point Rate Result

Dell Inc.

PowerEdge XE9640 (Intel Xeon Platinum 8470)

SPECrate®2017_fp_base = 917

SPECrate®2017_fp_peak = 975

CPU2017 License: 6573		**Test Date:**	Jun-2023
Test Sponsor: Dell Inc.		**Hardware Availability:**	Sep-2023
Tested by: Dell Inc.		**Software Availability:**	Dec-2022

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
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:
-w -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -mprefer-vector-width=512 -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both C and C++:
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512

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SPEC CPU®2017 Floating Point Rate Result

Dell Inc.

PowerEdge XE9640 (Intel Xeon Platinum 8470)

SPECrate®2017_fp_base = 917

SPECrate®2017_fp_peak = 975

CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Jun-2023
Hardware Availability: Sep-2023
Software Availability: Dec-2022

Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):
```
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using Fortran, C, and C++:
```
-w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Peak Compiler Invocation

C benchmarks:
```
icx
```

C++ benchmarks:
```
icpx
```

Fortran benchmarks:
```
ifx
```

Benchmarks using both Fortran and C:
```
ifx icx
```

Benchmarks using both C and C++:
```
icpx icx
```

Benchmarks using Fortran, C, and C++:
```
icpx icx ifx
```

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

  519.lbm_r: `basepeak = yes`

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

Dell Inc.

PowerEdge XE9640 (Intel Xeon Platinum 8470)

SPECrate®2017_fp_base = 917

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Test Date: Jun-2023
Hardware Availability: Sep-2023
Software Availability: Dec-2022

Peak Optimization Flags (Continued)

538.imagick_r: `basepeak = yes`

544.nab_r: `basepeak = yes`

C++ benchmarks:

508.namd_r: `basepeak = yes`

510.parest_r: `-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -mprefer-vector-width=512 -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

Fortran benchmarks:

503.bwaves_r: `basepeak = yes`

549.fotonik3d_r: `basepeak = yes`

554.roms_r: `-w -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

Benchmarks using both Fortran and C:

521.wrf_r: `-w -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512 -nostandard-realloc-lhs -align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

527.cam4_r: `basepeak = yes`

Benchmarks using both C and C++:

511.povray_r: `-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -fprofile-generate`(pass 1)
`-fprofile-use=default.profdata`(pass 2) `-xCORE-AVX2`(pass 1)
`-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512 -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

Dell Inc.

PowerEdge XE9640 (Intel Xeon Platinum 8470)

SPECrate®2017_fp_base = 917

SPECrate®2017_fp_peak = 975

CPU2017 License: 6573
Test Sponsor: Dell Inc.
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Test Date: Jun-2023
Hardware Availability: Sep-2023
Software Availability: Dec-2022

Peak Optimization Flags (Continued)

526.blender_r: `basepeak = yes`

Benchmarks using Fortran, C, and C++:
```
-w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.html
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.5.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.5.xml

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

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