# SPEC CPU®2017 Floating Point Speed Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

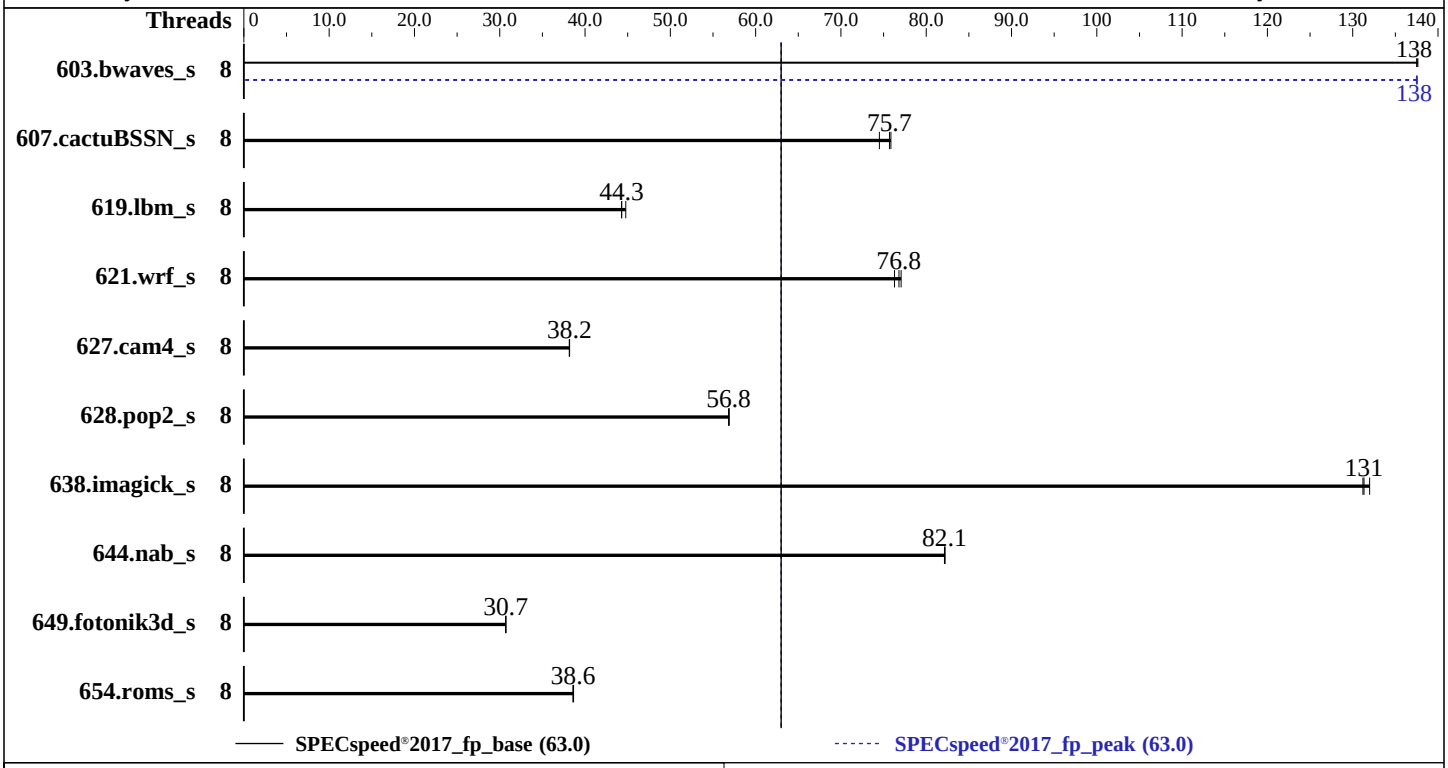
ProLiant MicroServer Gen11
(3.40 Ghz, Intel Xeon E-2434)

SPECspeed®2017_fp_base = 63.0

SPECspeed®2017_fp_peak = 63.0

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

**Test Date:** Apr-2024
**Hardware Availability:** Jun-2024
**Software Availability:** Dec-2023




## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon E-2434 |
| Max MHz: | 5000 |
| Nominal: | 3400 |
| Enabled: | 4 cores, 1 chip, 2 threads/core |
| Orderable: | 1 chip |
| Cache L1: | 32 KB I + 48 KB D on chip per core |
| L2: | 2 MB I+D on chip per core |
| L3: | 12 MB I+D on chip per chip |
| Other: | None |
| Memory: | 64 GB (2 x 32 GB 2Rx8 PC5-5600B-R, running at 4400), orderable using HPE part# P64339-B21 |
| Storage: | 1 x 1 TB 7.2 K SATA HDD |
| Other: | CPU Cooling: Air |

## Software

| | |
|---|---|
| OS: | Red Hat Enterprise Linux 9.2 (Plow)<br>Kernel 5.14.0-284.11.1.el9_2.x86_64 |
| Compiler: | C/C++: Version 2024.0.2 of Intel oneAPI DPC++/C++ Compiler for Linux;<br>Fortran: Version 2024.0.2 of Intel Fortran Compiler for Linux; |
| Parallel: | Yes |
| Firmware: | HPE BIOS Version v1.48 03/14/2024 released Mar-2024 |
| 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 |
| Power Management: | BIOS set to prefer performance at the cost of additional power usage |

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## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 603.bwaves_s | 8 | **429** | **138** | 429 | 138 | 429 | 138 | 8 | 429 | 138 | 429 | 137 | **429** | **138** |
| 607.cactuBSSN_s | 8 | 224 | 74.5 | **220** | **75.7** | 220 | 75.9 | 8 | 224 | 74.5 | **220** | **75.7** | 220 | 75.9 |
| 619.lbm_s | 8 | 118 | 44.3 | **118** | **44.3** | 117 | 44.8 | 8 | 118 | 44.3 | **118** | **44.3** | 117 | 44.8 |
| 621.wrf_s | 8 | 172 | 77.1 | 173 | 76.3 | **172** | **76.8** | 8 | 172 | 77.1 | 173 | 76.3 | **172** | **76.8** |
| 627.cam4_s | 8 | **232** | **38.2** | 232 | 38.2 | 232 | 38.2 | 8 | **232** | **38.2** | 232 | 38.2 | 232 | 38.2 |
| 628.pop2_s | 8 | 209 | 56.8 | **209** | **56.8** | 209 | 56.9 | 8 | 209 | 56.8 | **209** | **56.8** | 209 | 56.9 |
| 638.imagick_s | 8 | 109 | 132 | **110** | **131** | 110 | 131 | 8 | 109 | 132 | **110** | **131** | 110 | 131 |
| 644.nab_s | 8 | **213** | **82.1** | 213 | 82.2 | 213 | 82.1 | 8 | **213** | **82.1** | 213 | 82.2 | 213 | 82.1 |
| 649.fotonik3d_s | 8 | 297 | 30.7 | 297 | 30.7 | **297** | **30.7** | 8 | 297 | 30.7 | 297 | 30.7 | **297** | **30.7** |
| 654.roms_s | 8 | 407 | 38.7 | **408** | **38.6** | 408 | 38.6 | 8 | 407 | 38.7 | **408** | **38.6** | 408 | 38.6 |

**SPECspeed®2017_fp_base = 63.0**

**SPECspeed®2017_fp_peak = 63.0**

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

## 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:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/CPU2017/lib/intel64:/home/CPU2017/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"
```

## General Notes

```
 Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
 memory using Red Hat Enterprise Linux 8.4
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 Peak Frequency Compute
 Thermal Configuration set to Maximum Cooling
 Enhanced Processor Performance Profile set to Enabled

 Sysinfo program /home/CPU2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Sun Apr 14 14:58:53 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 252 (252-13.el9_2)
 12. Services, from systemctl list-unit-files
 13. Linux kernel boot-time arguments, from /proc/cmdline
 14. cpupower frequency-info
 15. sysctl
 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 5.14.0-284.11.1.el9_2.x86_64 #1 SMP PREEMPT_DYNAMIC Wed Apr 12 10:45:03 EDT
   2023 x86_64 x86_64 x86_64 GNU/Linux

 ------------------------------------------------------------
 2. w
    14:58:53 up 1 min,  0 users,  load average: 0.28, 0.16, 0.06
   USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT

 ------------------------------------------------------------
 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) 256675
```

**(Continued on next page)**

## Platform Notes (Continued)

```
   max locked memory           (kbytes, -l) 8192
   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) 256675
   virtual memory              (kbytes, -v) unlimited
   file locks                          (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 31
 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
 sshd: root [priv]
 sshd: root@notty
 bash -c cd $SPEC/ && $SPEC/fpspeed.sh
 runcpu --nobuild --action validate --define default-platform-flags -c
   ic2024.0.2-lin-core-avx2-speed-20231213.cfg --define cores=8 --tune base,peak -o all --define drop_caches
   fpspeed
 runcpu --nobuild --action validate --define default-platform-flags --configfile
   ic2024.0.2-lin-core-avx2-speed-20231213.cfg --define cores=8 --tune base,peak --output_format all --define
   drop_caches --nopower --runmode speed --tune base:peak --size refspeed fpspeed --nopreenv --note-preenv
   --logfile $SPEC/tmp/CPU2017.001/templogs/preenv.fpspeed.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) E E-2434
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 183
    stepping        : 1
    microcode       : 0x121
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
    cpu cores       : 4
    siblings        : 8
    1 physical ids (chips)
    8 processors (hardware threads)
    physical id 0: core ids 0-3
    physical id 0: apicids 0-7
  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:                   46 bits physical, 48 bits virtual
  Byte Order:                      Little Endian
  CPU(s):                          8
  On-line CPU(s) list:             0-7
  Vendor ID:                       GenuineIntel
  BIOS Vendor ID:                  Intel(R) Corporation
  Model name:                      Intel(R) Xeon(R) E E-2434
```

**(Continued on next page)**

## Platform Notes (Continued)

```
  BIOS Model name:                  Intel(R) Xeon(R) E E-2434
  CPU family:                       6
  Model:                            183
  Thread(s) per core:               2
  Core(s) per socket:               4
  Socket(s):                        1
  Stepping:                         1
  BogoMIPS:                         6835.20
  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 rdseed adx smap clflushopt
                                    clwb intel_pt sha_ni xsaveopt xsavec xgetbv1 xsaves split_lock_detect
                                    avx_vnni dtherm ida arat pln pts hfi umip pku ospke waitpkg gfni vaes
                                    vpclmulqdq tme rdpid movdiri movdir64b fsrm md_clear serialize pconfig
                                    arch_lbr ibt flush_l1d arch_capabilities
  Virtualization:                   VT-x
  L1d cache:                        192 KiB (4 instances)
  L1i cache:                        128 KiB (4 instances)
  L2 cache:                         8 MiB (4 instances)
  L3 cache:                         12 MiB (1 instance)
  NUMA node(s):                     1
  NUMA node0 CPU(s):                0-7
  Vulnerability Itlb multihit:      Not affected
  Vulnerability L1tf:               Not affected
  Vulnerability Mds:                Not affected
  Vulnerability Meltdown:           Not affected
  Vulnerability Mmio stale data:    Not affected
  Vulnerability Retbleed:           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, PBRSB-eIBRS SW
                                    sequence
  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     192K   12 Data            1    64        1             64
     L1i       32K     128K    8 Instruction     1    64        1             64
     L2         2M       8M   16 Unified         2  2048        1             64
     L3        12M      12M    6 Unified         3 32768        1             64

------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 1 nodes (0)
  node 0 cpus: 0-7
  node 0 size: 64210 MB
  node 0 free: 63592 MB
  node distances:
  node   0
    0:  10

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

(Continued on next page)

## Platform Notes (Continued)

```
 9. /proc/meminfo
    MemTotal:       65751676 kB

 ------------------------------------------------------------
 10. who -r
   run-level 3 Apr 14 14:57

 ------------------------------------------------------------
 11. Systemd service manager version: systemd 252 (252-13.el9_2)
   Default Target  Status
   multi-user      running

 ------------------------------------------------------------
 12. Services, from systemctl list-unit-files
   STATE            UNIT FILES
   enabled          NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd crond
                    dbus-broker firewalld getty@ insights-client-boot irqbalance kdump lvm2-monitor mdmonitor
                    microcode nis-domainname rhsmcertd rsyslog selinux-autorelabel-mark sshd sssd
                    systemd-boot-update systemd-network-generator udisks2
   enabled-runtime  systemd-remount-fs
   disabled         blk-availability chrony-wait chronyd console-getty cpupower debug-shell dnf-system-upgrade
                    hwloc-dump-hwdata kvm_stat man-db-restart-cache-update nftables rdisc rhcd rhsm rhsm-facts
                    rpmdb-rebuild selinux-check-proper-disable serial-getty@ sshd-keygen@
                    systemd-boot-check-no-failures systemd-pstore systemd-sysext
   indirect         sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo systemd-sysupdate
                    systemd-sysupdate-reboot

 ------------------------------------------------------------
 13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=(hd0,gpt2)/vmlinuz-5.14.0-284.11.1.el9_2.x86_64
   root=/dev/mapper/rhel-root
   ro
   resume=/dev/mapper/rhel-swap
   rd.lvm.lv=rhel/root
   rd.lvm.lv=rhel/swap

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

 ------------------------------------------------------------
 15. sysctl
   kernel.numa_balancing               0
   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
```

**(Continued on next page)**

## Platform Notes (Continued)

```
  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

------------------------------------------------------------
18. OS release
  From /etc/*-release /etc/*-version
  os-release     Red Hat Enterprise Linux 9.2 (Plow)
  redhat-release Red Hat Enterprise Linux release 9.2 (Plow)
  system-release Red Hat Enterprise Linux release 9.2 (Plow)

------------------------------------------------------------
19. Disk information
SPEC is set to: /home/CPU2017
  Filesystem            Type  Size  Used Avail Use% Mounted on
  /dev/mapper/rhel-home xfs   829G   94G  735G  12% /home

------------------------------------------------------------
20. /sys/devices/virtual/dmi/id
    Vendor:         HPE
    Product:        ProLiant MicroServer Gen11
    Product Family: ProLiant
    Serial:         JRT31JQXTD

------------------------------------------------------------
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:
    2x Hynix HMCG88AGBEA084N 32 GB 2 rank 5600, configured at 4400


------------------------------------------------------------
22. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       HPE
   BIOS Version:      1.48
   BIOS Date:         03/14/2024
   BIOS Revision:     1.48
```

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## Platform Notes (Continued)

```
    Firmware Revision: 1.56
```

## Compiler Version Notes

```
==============================================================================================================
C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
--------------------------------------------------------------------------------------------------------------
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++, C, Fortran | 607.cactuBSSN_s(base, peak)
--------------------------------------------------------------------------------------------------------------
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.
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.
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.
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
Fortran         | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak)
--------------------------------------------------------------------------------------------------------------
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.
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
Fortran, C      | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)
--------------------------------------------------------------------------------------------------------------
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.
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.
--------------------------------------------------------------------------------------------------------------
```

# Base Compiler Invocation

C benchmarks:
`icx`

Fortran benchmarks:
`ifx`

Benchmarks using both Fortran and C:
`ifx icx`

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

## Base Portability Flags

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

## Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX2 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -Wno-implicit-int -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX2 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using both Fortran and C:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -Wno-implicit-int -nostandard-realloc-lhs
-align array32byte -auto -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using Fortran, C, and C++:
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP -Wno-implicit-int
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

## Peak Compiler Invocation

C benchmarks:
icx

Fortran benchmarks:
ifx

Benchmarks using both Fortran and C:
ifx icx

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

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

619.lbm_s: basepeak = yes

638.imagick_s: basepeak = yes

644.nab_s: basepeak = yes

Fortran benchmarks:

603.bwaves_s: -w -m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX2 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -nostandard-realloc-lhs
-align array32byte -auto -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc

649.fotonik3d_s: basepeak = yes

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

**(Continued on next page)**

## Peak Optimization Flags (Continued)

627.cam4_s: `basepeak = yes`

628.pop2_s: `basepeak = yes`

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: `basepeak = yes`

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-RPL-rev2.0.html`
`http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-RPL-rev2.0.xml`
`http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml`


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