xFusion

FusionServer 2488H V7 (Intel Xeon Gold 6448H)

SPECrater2017_int_base = 1250
SPECrater2017_int_peak = 1280

CPU2017 License: 6488
Test Sponsor: xFusion
Tested by: xFusion

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

Hardware

CPU Name: Intel Xeon Gold 6448H
Max MHz: 4100
Nominal: 2400
Enabled: 128 cores, 4 chips, 2 threads/core
Orderable: 1, 2, 4 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 core
Other: None
Memory: 1 TB (32 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 960 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux release 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 01.02.00.05 Released Jul-2023
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 and OS set to prefer performance at the cost of additional power usage

<table>
<thead>
<tr>
<th>SPECrate2017_int_base (1250)</th>
<th>SPECrate2017_int_peak (1280)</th>
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<tbody>
<tr>
<td>500.perlbench_r 256</td>
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<tr>
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<td></td>
</tr>
<tr>
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<tr>
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<tr>
<td>525.x264_r 256</td>
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<tr>
<td>531.deepsjeng_r 256</td>
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<tr>
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<tr>
<td>548.exchange2_r 256</td>
<td></td>
</tr>
<tr>
<td>557.xz_r 256</td>
<td></td>
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</tbody>
</table>

Copies

0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500 2600

500.perlbench_r 256
502.gcc_r 256
505.mcf_r 256
520.omnetpp_r 256
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xFusion
**SPEC CPU®2017 Integer Rate Result**

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FusionServer 2488H V7 (Intel Xeon Gold 6448H)

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<tr>
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<tr>
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<td>256</td>
<td>478</td>
<td>578</td>
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<td>578</td>
</tr>
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</table>

**Results Table**

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

**Compiler Notes**

SPEC has ruled that the compiler used for this result was performing a compilation that specifically improves the performance of the 523.xalanchmk_r / 623.xalanchmk_s benchmarks using a priori knowledge of the SPEC code and dataset to perform a transformation that has narrow applicability.

In order to encourage optimizations that have wide applicability (see rule 1.4 https://www.spec.org/cpu2017/Docs/runrules.html#rule_1.4), SPEC will no longer publish results using this optimization.

This result is left in the SPEC results database for historical reference.

**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 = 
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:

```bash
sync; echo 3> /proc/sys/vm/drop_caches
```

runcpu command invoked through numactl i.e.:

```
numactl --interleave=all runcpu <etc>
```

NR: 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.


**Platform Notes**

BIOS configuration:
Performance Profile Set to Performance

SNC Set to Enable SNC2 (2-clusters)

Sysinfo program /home/Uniautos/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c3a2e2c92cc097bec197
running on localhost.localdomain Thu Sep 7 15:29:11 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.e19_0)
12. Failed units, from systemctl list-units --state=failed
13. Services, from systemctl list-unit-files
14. Linux kernel boot-time arguments, from /proc/cmdline
15. cpupower frequency-info
16. tuned-adm active
17. sysctl
18. /sys/kernel/mm/transparent_hugepage
19. /sys/kernel/mm/transparent_hugepage/transparent
20. OS release
21. Disk information
22. /sys/devices/virtual/dmi/id
23. dmidecode
24. BIOS

(Continued on next page)
Platform Notes (Continued)

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 GNU/Linux

2. `w`
   15:29:11 up 5 min, 1 user, load average: 0.15, 0.77, 0.47
   USER  TTY LOGNAME IDLE JCPU PCPU WHAT
   root pts/0 15:25 7.00s 1.01s 0.03s -bash

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) 4125103
   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) 4125103
   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 [priv]
   sshd: root@pts/0
   /bin/sh /run_rate.sh
   runcpu --define default-platform-flags --copies 256 --ic2023.0-lin-sapphirerapids-rate-20221201.cfg
   --define smt-on --define cores=128 --define physicalfirst --define invoke_with_interleave --define drop_caches --tune base,peak --o all intrate
   runcpu --define default-platform-flags --copies 256 --configfile
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=128 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base,peak --output_format all --nopower
   --runmode rate --tune base:peak --size refrate intrate --nopreenv --not-preenv --logfile
   $SPEC/tmp/CPU2017.089/templogs/preenv.intrate.089.0.log --lognum 089.0 --from_runcpu 2
   specperl $SPEC/bin/sysinfo
   $SPEC = /home/Uniautos/cpu2017

6. `/proc/cpuinfo`
   model name : Intel(R) Xeon(R) Gold 6448H
   vendor_id : GenuineIntel
   cpu family : 6
   model : 143

(Continued on next page)
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Test Date: Sep-2023
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Platform Notes (Continued)

stepping : 8
microcode : 0x2b0001b0
bugs : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores : 32
siblings : 64
4 physical ids (chips)
256 processors (hardware threads)
physical id 0: core ids 0-31
physical id 1: core ids 0-31
physical id 2: core ids 0-31
physical id 3: core ids 0-31
physical id 0: apicids 0-63
physical id 1: apicids 128-191
physical id 2: apicids 256-319
physical id 3: apicids 384-447
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, 57 bits virtual
Byte Order: Little Endian
CPU(s): 256
On-line CPU(s) list: 0-255
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel(R) Corporation
Model name: Intel(R) Xeon(R) Gold 6448H
CPU family: 6
Model: 143
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s): 4
Stepping: 8
BogoMIPS: 4800.00
Flags:

Virtualization: VT-x
L1d cache: 6 MiB (128 instances)
L1i cache: 4 MiB (128 instances)
L2 cache: 256 MiB (128 instances)

(Continued on next page)
SPEC CPU®2017 Integer Rate Result

xFusion FusionServer 2488H V7 (Intel Xeon Gold 6448H)

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x Fleming

CPU2017 License: 6488
Test Sponsor: x Fleming
Tested by: x Fleming

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

Platform Notes (Continued)

L3 cache: 240 MiB (4 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0-15,128-143
NUMA node1 CPU(s): 16-31,144-159
NUMA node2 CPU(s): 32-47,160-175
NUMA node3 CPU(s): 48-63,176-191
NUMA node4 CPU(s): 64-79,192-207
NUMA node5 CPU(s): 80-95,208-223
NUMA node6 CPU(s): 96-111,224-239
NUMA node7 CPU(s): 112-127,240-255
Vulnerability Itlb multihit: Not affected
Vulnerability L1f: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spectre v1: Mitigation; Speculative Store Bypass disabled via prctl
Vulnerability Spectre v2: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Srbds: Not affected
Vulnerability Tsx async abort: Not affected

From lscpu --cache:

NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHYS-LINE COHERENCY-SIZE
L1d 48K 6M 12 Data 1 64 1 64
L1i 32K 4M 8 Instruction 1 64 1 64
L2 2M 256M 16 Unified 2 2048 1 64
L3 60M 240M 15 Unified 3 65536 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: 0-15,128-143
node 0 size: 128249 MB
node 0 free: 126937 MB
node 1 cpus: 16-31,144-159
node 1 size: 129017 MB
node 1 free: 128615 MB
node 2 cpus: 32-47,160-175
node 2 size: 129017 MB
node 2 free: 128615 MB
node 3 cpus: 48-63,176-191
node 3 size: 129017 MB
node 3 free: 128614 MB
node 4 cpus: 64-79,192-207
node 4 size: 129017 MB
node 4 free: 128590 MB
node 5 cpus: 80-95,208-223
node 5 size: 129017 MB
node 5 free: 128618 MB
node 6 cpus: 96-111,224-239
node 6 size: 128980 MB
node 6 free: 128857 MB
node 7 cpus: 112-127,240-255
node 7 size: 128997 MB
node 7 free: 128569 MB
node distances:
node 0 1 2 3 4 5 6 7
0: 10 12 21 21 21 21 21
1: 12 10 21 21 21 21 21
2: 21 21 10 12 21 21 21

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Platform Notes (Continued)

3:  21  21  12  10  21  21  21  21
4:  21  21  21  10  12  21  21  21
5:  21  21  21  12  10  21  21  21
6:  21  21  21  21  10  12  21  21
7:  21  21  21  21  21  21  12  10

9. /proc/meminfo
   MemTotal: 1056064636 kB

10. who -r
    run-level 3 Sep 7 15:24

11. Systemd service manager version: systemd 250 (250-6.e19_0)
    Default Target Status
    multi-user degraded

12. Failed units, from systemctl list-units --state=failed
    UNIT LOAD ACTIVE SUB DESCRIPTION
    * sep5.service loaded failed systemd script to load sep5 driver at boot time

13. Services, from systemctl list-unit-files
    STATE  UNIT FILES
    enabled NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd chrony crond
dbus-broker firewalld getty@ irqbalance mdmonitor microcode nis-domainname rhmcertd
rsyslog selinux-autorelabel-mark sep5 sshd sssd systemd-network-generator tuned udisks2
dbus-broker firewalld getty@ irqbalance mdmonitor microcode nis-domainname rhmcertd
rsyslog selinux-autorelabel-mark sep5 sshd sssd systemd-network-generator tuned udisks2
    enabled-runtime systemd-remount-fs
    disabled chrony-wait console-getty cpupower debug-shell kvm_stat man-db-restart-cache-update
    nftables rdisc rsys rhsm-facts rpmdb-rebuild serial-getty@ sshd-keygen@
systemd-boot-check-no-failures systemd-pstore systemd-sysext
    indirect sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-ssh sssd-sudo

14. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=(hd0,gpt2)/vmlinuz-5.14.0-70.13.1.e19_0.x86_64
    root=UUID=058bfdf1-c62b-4fad-8d41-5c40aa179007
    ro
    crashkernel=1G-4G:192M,4G-64G:256M,64G-:512M
    resume=UUID=b47f1685-a5fa-4d39-b2d7-e3f6e95ad499
    nohz_full=1-72

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

16. tuned-adm active
    Current active profile: throughput-performance

17. sysctl
    kernel.numa_balancing 1

(Continued on next page)
Platform Notes (Continued)

18. /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

19. /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

20. 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)

21. Disk information
    SPEC is set to: /home/Uniautos/cpu2017
    Filesystem Type Size Used Avail Use% Mounted on
    /dev/sdb5 xfs 820G 49G 772G 6% /home

22. /sys/devices/virtual/dmi/id
    Vendor: XFUSION
    Product: 2488H V7
    Product Family: EagleStream

23. 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

(Continued on next page)
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Platform Notes (Continued)

"DMTF SMBIOS" standard.
Memory:
32x Samsung M321R4GA3BB6-CQKDG 32 GB 2 rank 4800

24. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor: XFUSION
BIOS Version: 01.02.00.05
BIOS Date: 07/13/2023

Compiler Version Notes

---
C       | 502.gcc_r(peak)
---
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
---
C       | 500.perlbench_r(base, peak) 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 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
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C       | 502.gcc_r(peak)
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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++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_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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---
Fortran | 548.exchange2_r(base, peak)
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---

**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/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin  
-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/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin  
-lqkmalloc

Fortran benchmarks:  
-w -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math -flto  
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-nostandard-realloc-lhs -align array32byte -auto  
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin  
-lqkmalloc
SPEC CPU®2017 Integer Rate Result

xFusion
FusionServer 2488H V7 (Intel Xeon Gold 6448H)

SPECrate®2017_int_base = 1250
SPECrate®2017_int_peak = 1280

CPU2017 License: 6488
Test Sponsor: xFusion
Tested by: xFusion
Test Date: Sep-2023
Hardware Availability: Jul-2023
Software Availability: Dec-2022

Peak Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifx

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: -w -std=c11 -m64 -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 -gopt-mem-layout-trans=4
-fno-strict-overflow
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc

502.gcc_r: -m32
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/ia32_lin
-std=gnu89 -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 -gopt-mem-layout-trans=4
-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc

(Continued on next page)
Peak Optimization Flags (Continued)

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/intel/compiler/2023.0.0/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/Intel-ic2023-official-linux64.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