xFusion

FusionServer 5288 V7 (Intel Xeon Silver 4510T)

SPECrate®2017_int_base = 215
SPECrate®2017_int_peak = 222

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

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

CPU Name: Intel Xeon Silver 4510T
Max MHz: 3700
Nominal: 2000
Enabled: 24 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: 30 MB I+D on chip per chip
Other: None
Memory: 512 GB (16 x 32 GB 2Rx8 PC5-5600B-R, running at 4400)
Storage: 1 x 1.92 TB SATA SSD
Other: CPU Cooling: Air

OS: Red Hat Enterprise Linux 9.2 (Plow)
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:
Fortran: Version 2024.0.2 of Intel Fortran
Compiler for Linux:
Parallel: No
Firmware: Version 01.01.03.05 Released Apr-2024
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

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Table: Copy

<table>
<thead>
<tr>
<th>Benchmark</th>
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<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
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<td>500.perlbench_r</td>
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<td>225</td>
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<td>502.gcc_r</td>
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## SPEC CPU®2017 Integer Rate Result

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### Results Table

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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"

Kernel Boot Parameter set with : nohz_full=1-47

### Environment Variables Notes

Environment variables set by runcpu before the start of the run:

```
LD_LIBRARY_PATH =
/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

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>
```

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)

(Continued on next page)
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---

**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:
Performance Profile Set to Performance  
SNC Set to Enable SNC2 (2-clusters)  
Enable LP [Global] Set to ALL LPs

Sysinfo program /home/Uniautos/speccpu2017/bin/sysinfo  
Rev: r6732 of 2022-11-07 fe91c89b7ed5c6ae2c92cc097bec197  
running on localhost.localdomain Thu Jun  6 19:01:54 2024

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

---

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19. /sys/kernel/mm/transparent_hugepage/khugepaged  
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21. Disk information  
22. /sys/devices/virtual/dmi/id  
23. dmidecode  
24. 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
   19:01:54 up 4 min, 3 users, load average: 0.22, 0.44, 0.23
   USER   TTY     LOGIN@   IDLE   JCPU   PCPU   WHAT
   root   tty1    19:01 10.00s 1.41s 0.05s -bash

(Continued on next page)
Platform Notes (Continued)

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) 2060223
   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 (kbytes, -q) 819200
   real-time priority (-r) 0
   stack size (kbytes, -s) unlimited
   cpu time (seconds, -t) unlimited
   max user processes (u) 2060223
   virtual memory (kbytes, -v) unlimited
   file locks (-x) unlimited

5. sysinfo process ancestry
   /usr/lib/systemd/systemd --switched-root --system --deserialize 31
   login -- root
   -bash
   -bash
   runcpu --define default-platform-flags --copies 48 -c ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg
   --define smt-on --define cores=24 --define physicalfirst --define invoke_with_interleave --define
drop_caches --tune base,peak --o all intrate
   runcpu --define default-platform-flags --copies 48 --configfile
   ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --define smt-on --define cores=24 --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 --note-preenv --logfile
   $SPEC/tmp/CPU2017.076/templogs/preenv.intrate.076.0.log --lognum 076.0 --from_runcpu 2
   specperl $SPEC/bin/sysinfo
   $SPEC = /home/Uniautos/speccpu2017

6. /proc/cpuinfo
   model name : INTEL(R) XEON(R) SILVER 4510T
   vendor_id : GenuineIntel
   cpu family : 6
   model : 143
   stepping : 8
   microcode : 0x2b000590
   bugs : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
   cpu cores : 12
   siblings : 24
   2 physical ids (chips)
   48 processors (hardware threads)
   physical id 0: core ids 0-11
   physical id 1: core ids 0-11
   physical id 0: apicids 0-23

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Platform Notes (Continued)

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): 48
On-line CPU(s) list: 0-47
Vendor ID: GenuineIntel
BUS Vendor ID: Intel(R) Corporation
Model name: INTEL(R) XEON(R) SILVER 4510T
BIOS Model name: INTEL(R) XEON(R) SILVER 4510T
CPU family: 6
Model: 143
Thread(s) per core: 2
Core(s) per socket: 12
Socket(s): 2
Stepping: 8
BogomIPS: 4000.00
Flags: fpu vme de pse tsc msr pae mca cmov pat pse36 clflush dtc acpi mpx mxr mmmv ms Intel Constant Tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 ms cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1 lse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault ebg cat_13 cat_12 cpd_13 invpcid_single intel_puin cpd_12 ssbd mba ibrs ibpb stibp ibrsenhanced trp_shadow vmni flexpriority xpuid ept_ad fsargsbase tsc_adjust bmi1 avx2 smem erms invpcid qcm rdt_a avx512f avx512dq rdseed adx smap avx512sfma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsaveopt xsave xgetbv1 xsaveopt xsavexgetbv1 xsaveopt xsaves qcm lld cqm occcup lld cqm mb total qcm mb local split lock detect avx_vnni avx512_bf16 wbnomivd dtherm ida arat pln pts hfi avx512v bmi umip pku oskpe waitkp avx512_vmib2 gfini vae vcpulmldq avx512_vnni avx512_bitalg tme avx512_vpopcntdq ia57 rdpid bus_lock detect cldemote movdiri movdir64b enqcmd warm m_clear serialize tsxldtrk pconfig arch_lbr ibt amxx_bf16 avx512_fp16 amxx_tile amxx int8 flush lld arch_capabilities

Virtualization: VT-x
L1d cache: 1.1 MIB (24 instances)
L1i cache: 768 KIB (24 instances)
L2 cache: 48 MIB (24 instances)
L3 cache: 60 MIB (2 instances)
NUMA node(s): 4
NUMA node0 CPU(s): 0-5,24-29
NUMA node1 CPU(s): 6-10,30-35
NUMA node2 CPU(s): 11-17,36-41
NUMA node3 CPU(s): 18-23,42-47
Vulnerability Itlb multihit: Not affected
Vulnerability Lttf: 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

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Platform Notes (Continued)

Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRSB-eIBRS SW sequence
Vulnerability Srbd: Not affected
Vulnerability Tsx async abort: Not affected

From lscpu --cache:

<table>
<thead>
<tr>
<th>NAME</th>
<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
<th>PHY-LINE</th>
<th>COHERENCY-SIZE</th>
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<tr>
<td>L1d</td>
<td>48K</td>
<td>1.1M</td>
<td>12</td>
<td>Data</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L1i</td>
<td>32K</td>
<td>768K</td>
<td>8</td>
<td>Instruction</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
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<tr>
<td>L2</td>
<td>2M</td>
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<td>2</td>
<td>2048</td>
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<td>64</td>
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<td>L3</td>
<td>30M</td>
<td>60M</td>
<td>15</td>
<td>Unified</td>
<td>3</td>
<td>32768</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0-5,24-29
node 0 size: 128039 MB
node 0 free: 120986 MB
node 1 cpus: 6-11,30-35
node 1 size: 129021 MB
node 1 free: 128433 MB
node 2 cpus: 12-17,36-41
node 2 size: 129021 MB
node 2 free: 128524 MB
node 3 cpus: 18-23,42-47
node 3 size: 129016 MB
node 3 free: 128531 MB
node distances:
node   0   1   2   3
0:  10  12  21  21
1:  12  10  21  21
2:  21  21  10  12
3:  21  21  12  10

9. /proc/meminfo
MemTotal: 527460828 kB

10. who -r
run-level 3 Jun 6 18:58

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

12. Failed units, from systemctl list-units --state=failed
  UNIT LOAD ACTIVE SUB DESCRIPTION
  * sep5.service loaded failed 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 crond
dbus-broker getty@ insights-client-boot irqbalance kdump lvm2-monitor mdmonitor microcode
nis-domainname rhsmcertd rsyslog selinux-autorelabel-mark sep5 sshd sssd
systemd-boot-update systemd-network-generator tuned udisks2

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Platform Notes (Continued)

```
enabled-runtime systemctl-remount-fs
disabled blk-availability console-getty cpupower debug-shell dnf-system-upgrade firewalld kvm_stat
man-db-restart-cache-update nftables rdisc rhcd rhsm-facts rpmdb-rebuild
systemd-pstore systemd-sysext
indirect systemd-boot-check-no-failures

---------------------------------------------
14. 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
crashkernel=1G-4G:192M,4G-64G:256M,64G-:512M
   resume=/dev/mapper/rhel-swap
   rd.lvm.lv=rhel/root
   rd.lvm.lv=rhel/swap
   nohz_full=1-47

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
   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 40
   vm.dirty_writeback_centisecs 500
   vm.dirtytime_expire_seconds 43200
   vm.extrfrag_threshold 500
   vm.min_unmapped_ratio 1
   vm.nr_hugepages 0
   vm.nr_hugepages_mempolicy 0
   vm.nr_overcommit_hugepages 0
   vm.swappiness 10
   vm.watermark_boost_factor 15000
   vm.watermark_scale_factor 10
   vm.zone_reclaim_mode 0

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
```

(Continued on next page)
Platform Notes (Continued)

19. /sys/kernel/mm/transparent_hugepage/khugepaged
   alloc_sleep_millisecs  60000
   defrag              1
   max_pjes_none     511
   max_pjes_shared  256
   max_pjes_swap    64
   pages_to_scan    4096
   scan_sleep_millisecs 10000

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

21. Disk information
    SPEC is set to: /home/Uniautos/speccpu2017
    Filesystem            Type  Size  Used Avail Use% Mounted on
    /dev/mapper/rhel-home xfs   1.7T  182G  1.5T  11% /home

22. /sys/devices/virtual/dmi/id
    Vendor:         XFUSION
    Product:        5288 V7
    Product Family: Eagle Stream
    Serial:         12345678

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
    "DMTF SMBIOS" standard.
    Memory:
    2x Samsung M321R4GA3PB0-CWMCH 32 GB 2 rank 5600, configured at 4400
    14x Samsung M321R4GA3PB0-CWMXH 32 GB 2 rank 5600, configured at 4400

24. BIOS
    (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       XFUSION
    BIOS Version:      01.01.03.05
    BIOS Date:         04/12/2024
    BIOS Revision:     3.5

Compiler Version Notes

C       | 502.gcc_r(peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2024.0.2 Build 20231213
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(Continued on next page)
**xFusion**

**FusionServer 5288 V7 (Intel Xeon Silver 4510T)**

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>215</th>
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<td>SPECrate®2017_int_peak</td>
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<tr>
<td>Test Date:</td>
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### Compiler Version Notes (Continued)

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<th>Compiler Invocation</th>
<th>Compiler Name</th>
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<tr>
<td>C</td>
<td>500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak) 557.xz_r(base, peak)</td>
<td>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.</td>
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</tr>
<tr>
<td>C++</td>
<td>520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_r(base, peak)</td>
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<tr>
<td>Fortran</td>
<td>548.exchange2_r(base, peak)</td>
<td>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.</td>
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</tbody>
</table>

### Base Compiler Invocation

- **C benchmarks:**
  - icx

- **C++ benchmarks:**
  - icpx

- **Fortran benchmarks:**
  - ifx
xFusion
FusionServer 5288 V7 (Intel Xeon Silver 4510T)

**SPEC CPU®2017 Integer Rate Result**

| SPECrate®2017_int_base = 215 |
| SPECrate®2017_int_peak = 222 |

- **CPU2017 License:** 6488
- **Test Sponsor:** xFusion
- **Tested by:** xFusion
- **Test Date:** Jun-2024
- **Hardware Availability:** Dec-2023
- **Software Availability:** Dec-2023

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

**Peak Compiler Invocation**

- **C benchmarks:**
  - `icx`

- **C++ benchmarks:**
  - `icpx`

- **Fortran benchmarks:**
  - `ifx`
## SPEC CPU®2017 Integer Rate Result

**xFusion**

FusionServer 5288 V7 (Intel Xeon Silver 4510T)

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</table>

### 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)
   -ffast-math -ffast-math -ffast-math -ffast-math -ffast-math -ffast-math
   -funroll-loops -goopt-mem-layout-trans=4
   -fno-strict-overflow
   -L/opt/intel/oneapi/compiler/2024.0/lib -lqkmalloc

502.gcc_r: -m32 -L/opt/intel/oneapi/compiler/2024.0/lib32 -std=gnu89
   -Wl,-z,muldefs -fprofile-generate(pass 1)
   -fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
   -ffast-math -ffast-math -ffast-math -ffast-math -ffast-math -ffast-math
   -funroll-loops -goopt-mem-layout-trans=4
   -L/usr/local/jemalloc32-5.0.1/lib -ljemalloc

505.mcf_r: basepeak = yes

520.omnetpp_r: basepeak = yes

### C++ benchmarks:

520.omnetpp_r: basepeak = yes

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

xFusion

FusionServer 5288 V7 (Intel Xeon Silver 4510T)

SPECrater®2017_int_base = 215
SPECrater®2017_int_peak = 222

Peak Optimization Flags (Continued)

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-ic2024-official-linux64.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/xFusion-Platform-Settings-EMR-V1.1.xml
http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml

CPU2017 License: 6488
Test Sponsor: xFusion
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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.9 on 2024-06-06 07:01:54-0400.
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